The PO-VE Framework

Understanding the Relationships Between Player Objects and Virtual Environments in Digital Games

Ea Christina Willumsen

Thesis for the degree of Philosophiae Doctor (PhD)
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Abstract

Based on a qualitative analysis of 99 different digital games, this study develops a framework for understanding the functionality and relationships between *player objects* and *virtual environments*, explored in what has been named *the PO-VE framework*. The PO-VE framework encompasses a general theory, a dedicated terminology, and an analysis model.

A virtual environment is a navigable geometry and a computational, relational model that represents the relative positions and functions of objects within it. Based on a relational and functional approach, objects are conceived of as integrated in the virtual environment by being spatially and functionally related to other objects within it, thus emphasising the virtual environment's relational system-structure. Within the virtual environment, player objects constitute the player's point of control. As *integrated* and *movable* objects, they consist of attributes (properties such as health, speed, and size) and affordances (possible actions such as running, shooting, and jumping). In most cases, player objects are *dynamic* (i.e., their attributes and affordances are altered over time); they can not only move along a single axis, but also be used for *navigating* the virtual environment along multiple axes; and they have some sort of *visual presentation*, which varies according to the specific *visual framing* of the player object and the virtual environment.

The PO-VE framework results from an analysis and iterative coding process of 99 digital games. The games were chosen using a purposive sampling method guided by a pre-conceptualisation of what constitutes an avatar-based game (the initial focus of the study), popular game examples from game studies literature, and certain diversity labels: year of publication, platform, and country of origin. The PO-VE framework thus results from observational data iteratively translated into codes from games published between 1978 and 2018, across 32 different platforms, developed in 17 different countries. The iterative data collection and coding process, which resembled to some extent that of grounded theory, was finally conceptualised into the PO-VE framework, consisting of a general theory of virtual environments as relational systems, a

terminology of player objects in virtual environments, and an analysis model that consists of seven categories related to different aspects of PO-VE relations.

To illustrate the applicability of the PO-VE model, two levels of application were employed. The first was a broad analysis of the 78 of the 99 games in the sample that meet the player object definition, which reveals general trends and patterns according to types, genres, and production year of games. The second were close readings of ten chosen games from the sample: *Space Attack*, *Altered Beast*, *Passage*, *Hotline Miami*, *Subway Surfers*, *ZombiU*, *LEGO Marvel Super Heroes*, *Papers, Please*, *The Witcher 3: Wild Hunt*, and *Reigns: Her Majesty*, that each illustrate the depth of the PO-VE framework, while also clarifying some of the limitations of the framework, including how and why some games, such as *Papers, Please* and *Reigns: Her Majesty*, cannot be analysed using the PO-VE framework.

The relational foundation of the PO-VE model offers a unique and descriptive approach to analytical game studies that utilises a functional understanding of the digital object. This enables a focus on the environment as a relational system and on integration within it, rather than, for example, on rules, goals, or player experiences. Utilising an OOA/D inspired terminology in the analytical framework is a step towards bridging the gap between humanities-based, theoretical game studies, more technical game studies, and game development.

This study is thus a contribution to the most fundamental level of any research endeavour: attempting to map out (parts of) the research object and develop a language that facilitates closer inspection and ultimately a better understanding of digital games and virtual environments.

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1. Introduction

1.1 Chapter introduction

Our lives, both professional and social, are governed by technology. It is by now a truism that digital media have become a central part of our daily existence. These arguments have been repeated and increased in strength over the past 10, 15, 20 years, with the proliferation of smartphones, tablets, and laptops, making technology an integral part of everyday lives across the world. Because of the COVID-19 pandemic, classrooms became virtual and office meetings moved online. Even my weekly board game sessions with friends, previously so appreciated for their analogue form, took place, for a time being, in *Tabletop Simulator* (Berserk Games, 2015).

Pandemic or not, virtual environments are a part of many people's daily lives, whether in the form of games, news media, social media, or professional training software. Recent developments in virtual reality, for example in news media such as The Guardian's and The New York Times' dedicated VR apps for smartphones, shows that virtual environments are more than 'just games'. They can be used for conveying information and simulating aspects of a physical environment, thus creating emotionally engaging experiences. If a picture is worth a thousand words, imagine the representational and communicational wealth of virtual environments.

The term sounds fancy, with *virtuality* promising something almost magical, beyond the constraints of our physical reality, and *environment* hinting at a spatial quality, perhaps simulating the structure of the physical environments we know from our everyday lives. Whether an escapist fantasy or a terrifying dystopia, increased involvement with virtual environments requires better understanding of the media involving said environments, thus begging questions about the nature and structure of such environments as well as their content – and, ultimately, the way in which users and players engage with them.

While virtual environments are found in a multiplicity of media and forms, digital games have historically been first-movers when it comes to technological developments of virtual environments and selling experiences within these environments. A game is a promise of a challenge or an experience that requires *something* from the player, and many of the digital products sold by companies since the dawn of game development are situated within virtual environments. In these environments, the player is tasked with controlling one or more objects with which they can perform actions that influence the environment inhabited by the objects of control. There is a sense of causality to the experience – I press a button and my object moves left, I press another button and it moves right. I press a third button and my object performs an attack on another object in the environment, who in turn attacks me back. Or perhaps I simply prompt by object to pick up a piece of paper informing me that this is no ordinary game…

This study uses digital games as a testing ground for studying virtual environments. Digital games take many forms – forms which have changed over the course of time, from the late 1950's *Tennis for Two* (Higinbotham, 1958), to contemporary VR titles such as *Farpoint* (Impulse Gear, 2017). Their forms depend on the software and hardware restrictions as well as design-conventions for genres and platforms, and even though many have tried (see Stenros [2017] for a comprehensive overview), it seems an impossible task to settle upon a definition or defining certain characteristics of digital games. What is more, the development process, budget, and final form of digital games is varied in large part due to different scopes of game productions, ranging from independent 'indie' designers to AAA, multi-million-dollar game studios. Due to these significant variations of the study object, a subsection of this chapter is dedicated to thorough demarcation of what is meant by *digital games* in this project.

Game studies is becoming increasingly relevant due to the still-growing popularity of games, but it is also expanding its influence on other fields, due to some of the functional similarities between digital games and the structures of other forms of digital media. Whereas the playful or challenging structures of games has been adapted in a broad range of media under the general label of *gamification*, the *gameness* is not the only possible point in which findings in game studies can contribute to media studies beyond games. Exploring the functional structure of virtual environments in digital games, for example, may very well help us better understand the functional structures of other digital media set in virtual environments.

The emphasis here is on *functional structure*. Games are unique because of the player's central role in the way in which the game 'plays out'. Content is accessed according to the player's input, often through non-trivial effort. The structural complexity of games and their flexible form adjusting to player input make them particularly challenging to study. Being at once cultural artifacts, software programs, media products, and experiences, the specific approach to the analysis and particular attention to methodological details need thorough clarification before a research endeavour is undertaken. Section 1.2 of this introduction makes these necessary clarifications and section 1.4 further situates the study within larger research traditions, in particular the structuralist and formalist tradition of literary theory, which is a significant inspiration for as well as a challenge to the method employed in the research project.

Before the method, however, comes the problem, as a question or problem area must be known in order to identify a satisfactory method of answering said problem. Digital games have been chosen as a particularly interesting area for studying virtual environments and the objects within them. The objective of the study is thus demarcated according to the study object: this research project explores virtual environments in digital games, in which I propose we speak of the object(s) facilitating interaction as *player objects*.

The relationship between the two central terms, *virtual environment* and *player objects*, is at the heart of the project, thus explaining the title of the study: PO-VE is an abbreviation of player object and virtual environment, and the hyphen between the two illustrates their inevitable relationship. In digital games in which the player controls a player object (which is not the case for all digital games, as will become increasingly apparent throughout the study), the virtual environment is accessible *through* this player object. The player object facilitates interactions with objects of the environment, thus allowing the player to navigate and explore the structures of the environment. At the same time, the player object is only ever experienced within the virtual environment of the game in question, meaning that the player's understanding of the player object and its possible actions results from the relationships between the player object and the virtual environment.

Therefore, an analysis of either player object or virtual environment necessitates an analysis of the other. This project will explore the various PO-VE relations, mapping them out according to data from a comprehensive analytical venture where 99 different digital games were analysed, ultimately resulting in a theoretical framework that offers terminology for describing the PO-VE relations as well as an analysis model applicable as a tangible analytical tool of PO-VE relations in digital games.

Understanding the functional PO-VE relations and being able to precisely describe the different relationships between player objects and their virtual environments is only one step towards better understanding virtual environments in digital games. If scholars are to uncover the relationships between players or users and virtual environments, whether from a place of concern, design innovation, or practical uses in everyday life, they need a shared language and a shared understanding of what makes up these relational systems. Thus, this exploration of the basic PO-VE relations is considered necessary groundwork for more in-depth understandings of players engaging with digital games, as well as users engaging with other types of virtual environments.

The study at hand is of an empirically grounded, qualitative, theoretical, and a conceptual nature. While being rooted in observations from a diverse sample of digital games, it aims to condense those vast and various findings into tangible terminology and tools that can be applied in an analysis, in a step towards deeper understandings of the relationships between players or users and virtual environments. Thus, the study aims to contribute to the more theoretical branch of game studies, including those areas of the field pertaining to ontology and structuralist analysis. At the same time, it is the hope that the findings resulting from this project can be applied by scholars interested in furthering their understanding of player experiences resulting from the various PO-VE structures uncovered throughout the dissertation. Finally, due to the relational and functional lens upon the analysis of virtual environments, further explained in 1.5 and the chapter dedicated to virtual environments, I hope that the findings of the project will be insightful for those involved in the design and development of media involving virtual environments.

1.2 Playing games, studying environments – an FAQ

When investigating virtual environments by studying them in their digital games form, there are many methodological, theoretical, and practical pitfalls complicating such an endeavour. Questions lurking under the surface of any study attempting to make any bold theoretical claims about games include the notorious *but how do you define your object of study? What are (digital) games?* These and other immediate uncertainties and problems call for early clarification which will ultimately influence how a study is conducted. The following section is structured according to the questions identified as most prominent and important to answer in order to introduce and undertake the study of player objects in virtual environments.

What are 'digital games' and what is your object of study?

Stenros' (2017) paper on game definitions illustrates not only the impressive number of such definitions – a whopping 63 different takes on defining games are explored therein – but also the many and varied elements in these definitions (including, but not limited to *rules*, *purpose*, *competition*, *goals*, and *players*, to name a few of the most recurring defining characteristics identified [ibid, p. 3-13]). Although Stenros explores definitions of games in general, and not of the narrower category of *digital games*, his comprehensive comparative study illustrates what has also been stated by other scholars of games. Games "diverge so much in their constituent characteristics that they cannot all be taken as one homogeneous mass" (Calleja, 2011, p. 3), and, as a result, "computer games are not one medium, but many different media" (Aarseth, 2001). Consequently, it is the responsibility of the individual scholar to examine what they consider a game (Stenros, 2017, p. 17).

A clear demarcation of the object of study of any research project (perhaps particularly one involving games that are seemingly impossible to comprehend using any single designation) will make apparent to readers not only *what* is studied, but also likely increase awareness of *how* findings might be utilised in other studies. This is deemed even more important for this project, where the goal is to develop an analytical framework in the hope that it will be applied in future research on virtual environments.

Thus far, I have used the term *digital games* alongside the concept of *virtual environments* to introduce the overarching theme of the dissertation. This terminology is clarified in section 1.3.1 and further defined in the concepts' dedicated chapters. The PO-VE framework, however, results from analyses of a broader category of digital games, including some that expand beyond those involving player objects in virtual environments. The specific sampling method used for selecting the 99 games that has formed the empirical basis for the development of the framework is covered in the methodology in chapter 2.

A pragmatic approach to the concept of digital games governs the initial parts of the study. Rather than following a set of defining characteristics, the first delimitation of the object of study is based on studying only digital games defined as *software products marketed as games*. This excludes tabletop games, both with and without digital components, but includes for example *walking simulators* (a genre-label or colloquial term typically associated with games in which slow-paced exploration dominates over ludic challenges), exemplified by the inclusion of games such as *Firewatch* (Camp Santo, 2016) and *The Stanley Parable* (Galactic Cafe, 2013). Games such as *Her Story* (Barlow, 2015) and *A Normal Lost Phone* (Accidental Queens, 2017), were similarly included (although ultimately found to contain neither virtual environments nor player objects) because they are marketed as digital games on distribution platforms, while perhaps diverging from some of the most dominant conceptions of what constitute games or *gameness*.

There are further limitations to the objects studied: *multiplayer games*, or more precisely, *multiplayer game modes*, are excluded. This specification is necessary to make as some games, such as *Mario Kart 8 Deluxe* (Nintendo EAD, 2017), can be played both by single and multiple players. The decision to include only single player games/game modes is primarily a practical one. Playing and analysing games with multiple players would complicate both methodology and theory, and since the project studies 99 different titles, it would be a practical hassle to involve multiple players in the play sessions. The decision to exclude multiplayer games is further discussed in the methodology.

An additional demarcation of the study object is the project's focus on *graphic virtual environments*. The definition of virtual environments allows for the inclusion of non-graphic digital games such as audio- or text-based games. These forms of games, however, represent a minority of digital games. Hence, in order to make the PO-VE framework as specific and in-depth as possible, I decided to exclude these relative rare outliers and instead focus on games in which the relational system of the virtual environment is visualised through graphics, i.e., images and/or animations. While a single text-based game is included in the sample to explore potential consequences of this decision, the remaining 98 games from which the data set is derived consists solely of graphic digital games.

As will become increasingly clear throughout the dissertation, the study objects that are explored through the PO-VE framework represent a much more narrowly defined group of software products than what is described above. The defining principles of player objects, for example, severely limit the type of games that can be described using the terminology proposed. While *software products marketed as games* further limited to those with a *single player game mode* is a broad and encompassing category, *player object-based games* are limited according to the definitions of the player object, involving the concepts of integration and movement, ultimately excluding both *Her Story* and *A Normal Lost Phone* mentioned above. In total, 78 of the original set's 99 games were found to meet the definitions of player objects, some of which are borderline cases that help clarify some of the distinctions and definitions within the PO-VE framework. Thus, the contribution of the project is relevant not for all, but rather for a specific form of digital games.

I final point that must be considered in the demarcation of the study object is, that while I refer to *software products*, a game is "a process rather than an object" and "there can be no game without players playing" (Aarseth, 2003, p. 2). As will be discussed later, when defining the concept of the 'game text', a game is actualised through play, and it is this experiential form that constitutes the object of study. This means, that the game analyses offered here do not dive into the source code as would be done in software studies proper. Instead, the dissertation follows the tradition of game studies and games research, where the games are analysed as they present themselves to the player, and thus the PO-VE framework is based on observational data. Therefore, the analyst must pay special attention to the way in which games are played, to be able to account for the type and level of engagement with the study object.

Why study games if you don't care about 'gameness'?

Digital games, as understood in response to the question above, offer detailed and varied virtual environments in ways that is thus far not found in a similar variety in other media forms. At the same time, the academic area of theoretical and analytical game studies is still relatively young, and analytical models based on empirical data are thus far rare.

Therefore, this study, while focused on the virtual environments of games, and on the relationships between these environments and the integrated objects controlled by the player, *is* a study situated within the area or domain of analytical game studies. It differs from most established theories and models within analytical game studies in that the environment is understood as a relational model, explored first and foremost from a functional perspective describing the makeup of the objects within it and their relationships, and only secondarily the way in which they are (visually) represented.

The study *is not* a study of specific game structures such as goals or rules beyond PO-VE structures, and thus excludes, for example, the accumulation of points or timed challenges, or generally any focus on *ludic* structures. For this very reason, it is not the interest of the study to define games, nor to get a comprehensive understanding of digital games. The demarcation of the virtual environment as the primary point of interest instead makes it possible to go in-depth with the development and definitions of the PO-VE framework used for the thorough study of the individual elements in the framework.

What does 'ludic' mean and what is 'ludology'?

According to Salen and Zimmerman (2004, p. 303), who build on the works of Huizinga (2016 [1944/1938]), ludic means "*of or relating to play*" and the term is often used to refer to *that which facilitates play*. The ludic quality, in this understanding of the term, however, is not unique to structured games, as non-game activities, such as playing will dolls, are playful, too (ibid), although these are not governed by rules as are often considered a defining characteristic of games (Stenros, 2017).

The term *ludic* has gained a slightly different meaning within research broadly described as *ludology*, sometimes referring simply to "the study of games" (Juul, 2011[2005], p. 16), but also used to describe "a particular approach to game studies" (Aarseth, 2014, p. 185) or "a movement active in the years 1998-2001" (ibid). When understanding ludology as Juul defines it – as the study of games – *ludic* is often used to refer to parts of the game text or game experience that are unique to its form and that cannot be accounted for by using, for example, narrative theory[1]. Implicit in this use of the term is the notion of *rules* not inherent in the original definition of *ludic* as relating to *play*. Instead, *ludic* is – in the context of this study, but seemingly also in most recent literature within game studies in which the term is rarely defined – used to refer to the medium-specific rules and structures of (most) games, that *may*, when played out, facilitate playful experiences.

What is 'gameplay' and why does everyone keep talking about ergodicity?

As if the difficulties of defining (digital) games, and juggling continuously meanings of terms were not enough, many definitions of *gameplay* influence many game analysis methods and theories. Conceptions of gameplay are as varied as game definitions, and further depend on how a study approaches games – as, for example, activities or material and/or technological artifacts.

[1] For example, Klevjer (2006, p. 44) uses *ludic* as synonymous with 'game' or 'gameness'.

According to Leino, the term *gameplay* can be used for describing both experiential, material, and processual qualities, resulting in a kind of *hybridity* that refers to "an inextricable intertwinement of qualities across ontological domains" (Leino, 2012, p. 73). Put differently, gameplay is something which involves both the player and their experience of playing the game, and the game's content – functions and underlying procedures as well as (typically visual) representation of beings and events.

If it sounds complex, it is because it is. Games are tricky to study because they come into being only as they are played, while also being software products that can seemingly be contained within a rectangular plastic box, that exist as code before it is executed. This is something which is expressed not only in the complexity of the gameplay concept or the difficulties in defining the study object in any inquiry into digital games, but also in the notion of *ergodicity* that appears in theories of digital games.

In his 1997 book, *Cybertext: Perspectives on Ergodic Literature*, Aarseth describes how the concept of 'reading' does not account for the performance involved with cybertext engagement. He uses the term *ergodic* to describe the 'nontrivial effort' required of the reader of a cybertext, which involves 'selective movement' in traversing the text (Aarseth, 1997, p. 1). Ergodicity has since been used to describe the unique interactive properties of digital games, as, for example, navigation within a virtual environment almost always depends on selective movement, much like Aarseth described in the traversal of the cybertext.

The term *ergodic*, as well as digital games' general status as ergodic, have been contested by, for example, Newman (2002), who points out that games consist of a combination of interactive/ergodic elements and non-interactive/non-ergodic elements. Describing games in general terms and stating that they are per definition ergodic is therefore misleading. Instead, Newman suggests, we can distinguish between two modes of engagement with games: *On-Line* and *Off-Line* (henceforth not capitalised), corresponding largely to ergodic and non-ergodic engagement. Both are explored further in chapter 4 with focus on their specific relevance for player objects. This study is focused primarily on on-line engagement, as these are the parts of gameplay in which it makes sense to speak of the functional relationships between player objects and virtual environments.

If (parts of) games are ergodic, how do you play with an analytical purpose?

Acknowledging that at least parts of digital games are ergodic (and that ergodicity demands nontrivial, selective movement of the player) means acknowledging that games will play out differently according to each individual player's input. Unlike a movie or a book in which the content remains the same independently of a viewing or reading (unless parts are skipped or the user's attention falters), the content experienced when playing a digital game vary from player to player, according to their specific choices and individual performances. Games are special because the player becomes a co-author of the 'central text' (Consalvo, 2017).

Already when launching a new game, players are typically faced with the selecting difficulty settings, which may determine (parts of) the content of the game, such as the number, types, or strength of enemies. In some games, specific choices will have substantial consequences for both on-line and off-line content, for example through narrative-altering effects. In other games, a lack of kinaesthetic skill may prevent the player from proceeding further in the game.

At the same time, a player may simply have a preferred way of approaching a game. When playing as a free time activity (a rare occurrence when spending four years working on a dissertation about digital games), I tend to skip cutscenes and other off-line, narrative elements whenever I can, to 'get to the action' as fast as possible. Sometimes, I play to see if I can somehow circumvent the rules or play in a transgressive way likely not intended by the game's designers.

This is not how a scholar should play for analytical purposes, and not how the 99 games of the sample were played for the study at hand. A more thorough description of how games were played and coded is presented in the methodology in chapter 2. Beyond the specificities of analytical play for this very project is a more general notion of approaching games for analysis – the conceptual construct of *the implied player*.

Building on Iser's (1974) concept of the *implied reader*, Aarseth (2007) defines an *implied player* as "as a role made for the player by the game, a set of expectations that the player must fulfill for the game to 'exercise its effect'" (ibid., p. 132). This theoretical construct can be used when approaching games from a theoretical perspective and allows the analyst to disregard the specific, historical player. In practice, the concept of the implied player proposes that scholars can analyse games without considering the subjective nature of play.

Some games may present the player with only one clearly marked role to fulfil for this effect associated with the implied player, but it is by far not always the case. Any RPG that lets the player choose a class from a list of predefined options clearly communicates through these choices that there are multiple roles to be assumed, each with its own set of expectations – each with its own implied player.

Acknowledging that the implied player should perhaps rather exist in plural form, as modern games typically invite players to utilise different tools or strategies for solving tasks and reaching goals, brings back some of the methodological complications that Aarseth's (2007) concept attempted to circumvent.

Thus, it seems that analysts can perhaps let themselves be inspired by the notion of the implied player and play in a way that appears to meet (one of) the role(s) that the game invites the player into, while remaining aware of the choices that leads them on a path unique for one type of implied player amongst many. Documenting these choices, to make them apparent when presenting digital game analyses, is thus a strategy that may result in more careful consideration on the analyst's side, in terms of the implied player-role assumed, while conveying clearly to the reader the circumstances resulting in the *game text* analysed.

What is a 'game text'?

The notion of *game-as-text* or references to *the game text* in digital game analysis implies a certain way of understanding games in comparison to other media. While textuality may seem to reference written and textual media or media without ergodic modes, thus rejecting digital games' unique form that also complicates the analysis, this is not precisely how the notion of *game text* is used:

> To call a game a text is not to deny that it involves play, mutability, chance, interactivity or change. Being a text does not mean that something has to have materiality; nor is it limited to things that are written down, as texts might well incorporate a variety of communicative modes (speech, song, sound, writing, visual design). A text is composed for some kind of purpose beyond the everyday, the disposable or the ephemeral. What matters is that it is recognizable and that (in some broad sense) it is replicable. [… The] fact that computer games are only fully realized when they are played does not exempt them from being 'texts'. (Carr, Buckingham, Burn, and Schott, 2006, p. 12)

From this description, we see that *game text* corresponds largely to the alternative *game object*, an 'informational object', consisting of mechanics and semiotics, engaged through gameplay (Aarseth, 2011, p. 59). While the *text* aspect of the game text notion may result in unwarranted associations to non-ergodic media, it appears that both *text* and *object* are used as designators describing the analytical object of study in a game analysis, without disregarding its dependence on (game)play to be actualised.

Studying game texts or game objects therefore means that it is the informational object – and not the player's experience with said object – that is the primary focus of the analysis. Involving the notion of the implied player means that the text or object studied is one which is replicable by other players and scholars.

In this study, I use the term *game text* to refer to this informational object that is only actualised through play. The terminological decision of using *text* instead of *object* is explained by the terminology developed as a part of the PO-VE framework, which involves many different types of objects. I thus refer to Carr et al. (2006) when arguing that *text* does not imply lack of ergodicity or a specific type of comparison to other media forms. Neither does it involve any perspective on the playing experience corresponding to a *reading process* or assign any particular value to digital games. It is simply a designator used to describe what Aarseth refers to as the semiotics and mechanics of the game, accessible through gameplay.

What is this difference between 'functionality' and 'representation'?

Inherent in Aarseth's definition of the game object is a distinction between mechanics (or *game structure*) and semiotics (or *game world*). He explains:

> The semiotic layer of the Game Object is the part of the game that informs the player about the game world and the game state through visual, auditory, textual and sometimes haptic feedback. The mechanical layer of the game object (its game mechanics) is the engine that drives the game action, allows the players to make their moves, and changes the game state. (Aarseth, 2011, p. 60)

This makes the mechanics/semiotics distinction a conceptual one, as neither can be experienced independently of the other. Only through processing of the information facilitated through the semiotics of the game object will the player understand how to engage with its mechanics. Likewise, the mechanics are what makes the game a game; without this 'engine that drives the game action', the player would be unable to input data into the system and see it translate into action represented through various sign-systems.

Aarseth's approach emphasises the *gameness* of digital games that I previously discussed as less relevant for the study at hand. In this project, digital games are first and foremost explored as virtual environments in which player objects serve as integrated points of control. Therefore, Aarseth's terminology is not always applied directly in this study. Instead, I distinguish between *functionality* and *representation*.

Representation refers to the semiotics at play that allow a player to experience a game, both in terms of access and interpretation. As pointed out by Aarseth (2011), the representation typically includes visuals, sound, text, and/or haptics. As systems of signs, games can represent in different ways, according to the specificity of the representations at play, and the modes and modalities involved in the representation. Ultimately, representation brings attention to the player's active role in *interpreting* and thus making sense of that which is represented. The subjectivity of interpretation is undeniable, and thus any game analysis will be subject to some bias, according to the interpretant in question – although this is the case for other media forms, too, including traditional narrative media. The subjectivity of interpretation is therefore not the same as the subjectivity involved in the process of play, where the analytical difficulties result from the game's ergodicity. The consequences of game analyses that are based on observations, where the functionality, i.e., the game's underlying system can only be explored as a 'black box' are discussed further in the methodology in chapter 2.

The distinction between representation and functionality can be illustrated through an example: Take a well-known game from the set, such as *Mario Kart 8 Deluxe*. As in any other game of the series, the player chooses a character and vehicle at the beginning of each new race. When the game starts, vehicle and character are functionally united into a single object. From a technical perspective, the player controls a *player object* with a set of variables and methods, or attributes and affordances. It has a certain size, weight, acceleration, and maximum speed (attributes), and it can accelerate, break, and drift (affordances). The chosen character and vehicle will determine the specific values of the attributes, and in addition determine how the player object is represented, primarily in terms of its visual presentation (but also including audial presentation). Functionality, in this case, describes the player object, its attributes, and its affordances as it exists as an object within the virtual environment, as an entity within a system of relations; representation, on the other hand, refers to the ways in which the player object is semiotically presented, as for example Princess Peach riding a Cat Cruiser.

In this study, the player's interpretative role is less relevant, although undeniably key in understanding how games are experienced. This project dives deeper into the *functional* structures of the virtual environment, using terminology and concepts inspired by object-oriented analysis and design (OOA/D) to explore the many different types of configurations of PO-VE relations across the 99 games of the set. Consequently, less effort is put towards the integration of representation within the PO-VE model, which emphasises structures and functions over representation.

The distinction between representation and functionality builds on a tradition of game analysis in which game objects or game texts become the object of study, explored as independently as possible from the subjective, historical gameplay experience of the individual player, but the distinction is a conceptual and theoretical one. While the PO-VE model emphasises functionality, it is certainly relevant for analyses that combine both perspectives since some types of representation in games are contingent on functionality. And because games are only ever experienced as the systems are represented through for example audiovisual means, the analysis of functionality inherently depends on the game's representation.

1.3 Player objects in virtual environments

Integrated within the FAQ above were terms specific for the PO-VE framework that have yet to be clarified. While whole chapters of the dissertation are dedicated to defining these most central concepts of virtual environments and player objects, this section will give a brief introduction to the core terminology. Following the overview of the terminology, the project and its methodology are outlined in order to position them in relation to the most influential research traditions and approaches involved.

1.3.1 PO-VE terminology

Affordances – One of two constituent elements of objects in the virtual environment, including player objects. Affordances describe the possible actions of the object in question, what could also be considered its *methods*, which oftentimes depend on combinations with other objects. For example, a player object's affordances differ according to its location in and vicinity to other objects in the virtual environment.

Alterations – Player objects can change over time and the notion of alterations describe changes to an object's affordances and/or attributes. Alterations result in new variants of a player object, and often result from actions involving markers or objects in the virtual environment.

Attributes – The second of two constituent elements of objects in the virtual environment, including player objects. Attributes describe the properties of the object in question, such as its size or health, which may influence the object's affordances and be altered during the game, for example by acting on or being acted upon by other objects in the virtual environment.

Conversion – Involves the changes caused by alterations, but which further change the player object's visualisation and designation. Whereas alterations result in new variants, conversions result in new versions of a player object which is typically represented as either multiple or a different narrative character.

Framework – The theory, terminology, and model developed throughout the project constitute the PO-VE framework.

Marker – A special type of objects that have non-permanent manifestations in the environment. When interacted with, they can be picked up or used and seemingly disappear from the environment, instead appearing in an inventory or as a marker of a value associated with the player object.

Model – The PO-VE model is a conceptual analysis model consisting of seven different categories that allows the analyst to explore different PO-VE relations in a digital game that meets the definition of being player object-based. The model is a result of the analysis and coding of 99 digital single-player games.

Movement – When input results in the player object's change of location along a single axis, this can be described as movement. Movement is a defining characteristic of player objects.

Navigation – The extended version of movement and a non-defining characteristic of many player object-based games, navigation describes games in which player input results in the player object's change of location along multiple axes. Thus, navigation often brings with it a sense of spatial traversal of the virtual environment.

Object – Entities in the virtual environment, defined by their integration and their visual representation. As opposed to markers, objects are persistent and thus permanently integrated in the virtual environment.

Player object – The object(s) that function as the player's point of control in the virtual environment. Player objects are defined according to two defining characteristics: *integration* and *movement*. They can often be described using additional three non-defining characteristics: *navigation*, *dynamics* (alterations and conversions), and *visual framing*.

PO-VE – The abbreviation of *player objects – virtual environment*.

Representation – The semiotics, most prominently the visual presentation, of the relational model and system of objects that constitute the virtual environment. In this study, the role of representation is downplayed to instead emphasise functionality.

Virtual environment – First and foremost a navigable geometry, while also a computational, relational model that represents the relative positions and functions of objects within it. Objects are integrated in the virtual environment by being spatially and functionally related to other objects within it, thus emphasising its relational system-structure. In player object-based games, one or more of such integrated objects are controlled by the player.

1.3.2 Iterative and empirically grounded: from 99 games to one framework

The chapter has thus far introduced the overarching topic of the dissertation, discussed some of the most central challenges to studying games, and clarified concepts used to make sense of the game text as an ergodic object of study, consisting of on-line and off-line sequences, where on-line parts are prioritised in the functional analysis. The terminological overview above introduced in the briefest of ways the vocabulary of the PO-VE framework, thus indicating its theoretical focal points. At the same time, I have briefly, yet without specifying the details of the methodology, mentioned that the study is based on empirical data from the analysis of 99 different digital games. These games have been through an iterative coding process where conceptual compression resulted in the PO-VE model.

The empirical aspect of the study calls for further explanation and positioning in relation to other research traditions, most importantly to the structuralist and formalist tradition. Before moving into the first proper chapter of the dissertation – the methodology, which gives extensive insights into the process of developing the PO-VE framework – I will give a brief outline of the project, facilitating a more thorough positioning in section 1.4.

This study is about virtual environments, more specifically virtual environments in digital games, from a functional perspective that emphasises the player's point of control in situations in which this is manifested in object(s) integrated in the virtual environment. Initially, however, what motivated the project was a curiosity about the methodologies utilised when developing analytical models for the theoretical study of games. Having spent some time exploring avatar theory, I came to realise that most of the theories that formed my fundamental understanding of digital games, avatars, and gameworlds – concepts I were originally drawn to – were developed through deductive methodologies, with limited empirical grounding.

As a young and perhaps slightly naïve PhD student, I was (and still am, at least to some degree) an idealist. I thought that since so many scholars use so many terms in so many interchangeable ways, resulting in them losing any analytical value, there will be value in developing a theory, a vocabulary, of my topic of interest – avatars and gameworlds – by looking at a great variety of games and basing the theory on what can be observed in these objects: their forms, structures, differences and similarities. Why not do a morphology of the avatar?

The research design reflects this ambition of using an empirically rooted method for the development of a theoretical framework. It thus shares similarities with grounded theory, a "constant comparative method" (Strauss & Corbin, 1994, p. 273). Just as is the goal of this project, grounded theory studies tend to be "directed at developing substantive theory" (ibid). But whereas grounded theory methods "begins with inductive data" and "invokes iterative strategies of going back and forth between data and analysis" (Charmaz, 2014, p. 1), this project has a limited claim to inductivity, as theoretical definitions guide the sampling and thus also data, analysis, and the resulting analysis model.

As will be expanded upon in the methodology, 99 games form the basis of the study, all of which have been played and analysed with special attention dedicated to their functionality (on contrast to their representation). This means that the data on which the study is based is *observational* rather than based on a review of the game's source code. From early notes, through iterations of coding, and finally through critical compression of most pertinent codes into conceptual categories in the PO-VE model, the entirety of the PO-VE framework *did* follow the rough outline of my early, ambitious dream of a morphology of the avatar. Only, the topic of interest changed, from avatars in gameworlds to player objects in virtual environments, as did the form. The PO-VE framework is no morphology, no ontology, and no hierarchical model. The empirical data did not lend itself well to this type of structure. Instead, the data almost begged for a makeover montage, transforming from well-structured notes on the immediately observable to more conceptual types within categories of what appeared most relevant and important for understanding the player object's integration within virtual environments.

Regardless of its final form, the project was highly motivated and inspired by structuralist and formalist research traditions, as the homage to Propp (2015 [1968/1928]) shows. At the same time, the development and final form of the PO-VE framework relies heavily on game studies traditions and draws to some extent on software studies concepts, both of which are discussed in the following section.

1.4 Structuralist traditions, software development influences

The two theoretical chapters of this dissertation explore the virtual environment and player objects respectively, with a primary focus on how the two central terms and related concepts have previously been studied in a digital games context. While the study is thus rooted in the still young research field of game studies, two other traditions are influential and therefore worth presenting here.

The first of these is the structuralist tradition, which is explored in the methodology in the scholarship of Propp (2015 [1968/1928]) and his *Morphology of the Folktale*. A similar emphasis on form can be found in other canonical works, including for example Campbell's monomyth (2004 [1949]), although this work is rarely referred to as formalist or structuralist *per se*.

The second is object-oriented analysis and design (OOA/D), a Unified Process (UP) approach to software development that incorporates analysis and design models of the software product under development, where the central purpose is "finding and describing the objects—or concepts—in the problem domain" (Larman, 2002, p. 7).

The structuralist tradition is an influence on the methodology described above, most prominently in the empirical foundation from which the theory is developed. Studying a large selection of research objects makes it possible to observe patterns, structures, and relationships, which is ultimately at the heart of the structuralist agenda.

In addition to being inspired by structuralism, the project may also be described as *formalist*, at least in one use of the term, referring to the *aesthetic form* of the game-as-aesthetic-artifact (another version of game text/game object). In this type of aesthetic formalism used in some digital game analyses or in the development of theories for the study of digital games, the analyst contrasts the game itself with its relation to outside entities (Willumsen, 2018a). Thus, the emphasis of the analysis is on the *form* of the object studied – in this context, the virtual environments of digital games – and not on a *formal* way of studying it. The link between this type of formalism and the structuralism of, for example, Propp, can thus be found in the framing of analyses, which focuses on a specific aesthetic form (in Propp's study, the Russian folktale). The notion of *formality*, while relevant in Propp's formulaic analytical approach, is thus not involved in this PO-VE study.

Software development is similarly influential in the project's methodology, but mostly so in the framing that prioritises the functionality of the virtual environment. This software system framing is detailed in 3.4.1, as a step towards defining virtual environments and the objects within them. For now, it will suffice to present the software development-inspired approach as one which explores what was previously defined as the *functionality* of the game text (as opposed to the representation), wherein the virtual environment is understood as a relational model and objects within it are studied with a specific focus on their relationships to other objects. This is done without diving into the game's code, instead exploring the functionality through analytical play and observation-based analysis.

The Unified Process approach, with its iterative nature, has influenced the coding process of this project. From the initial analysis of 99 games to the development of the conceptual framework, the coding stage of object-oriented analyses of virtual environments in games was a cyclical process, which involved multiple rounds of examination, structuring, classification, and analysis. This iterative nature, however, is not unique to the Unified Process (Larman, 2002), but also a premise of grounded theory (Strauss & Corbin, 1994).

1.5 The structure of the dissertation

In this introduction, I have presented the increasing importance of understanding virtual environments and argued why digital games, in their many different forms, present particularly interesting examples of such environments. I have presented and discussed some of the challenges involved in analysing digital games and stated how terms and concepts such as *ergodicity*, *ludic/ludology*, *gameness*, *gameplay*, *game text*, and *implied players* are used for delimiting both the study object and the process involved in analysing digital single-player games in the context of this dissertation. Furthermore, I have presented the central terminology applied throughout the study, outlined the project and its methodology, and positioned it in relation to grounded theory as well as structuralist and formalist traditions. I have situated the project within a certain branch of game studies that has as its study object the *game text* and outlined how the project involves a software studies-inspired perspective upon virtual environments. The empirically grounded and iterative nature that characterises the project thus makes it an original contribution to the field of game studies.

Chapter 2 consists of the methodology as it explores the study's foundation in structuralism, emphasising the inspiration drawn from Propp's (2015 [1968/1928]) *Morphology of the Folktale* and Campbell's (2004 [1949]) mapping of the monomyth. I then present the multidisciplinary nature of game studies research, rooted in a specific tradition within the humanities, prioritising more detailed presentations of specific analysis methods that inform and inspire the analyses undertaken for the project at hand.

After a comparison between inductive and deductive approaches to the study of game texts, as well as a discussion of how the project is situated in-between, and the problems arising from the limits of observational data, I introduce the approach of the study: an analysis of 99 different games, focused on what came to be encompassed by the concept of PO-VE relations, but which at the point of analysis were considered the structures concerning avatars, gameworlds, and the relationships between the two. The remainder of the methodology chapter thus consists of a thorough review of the research method structured under the headings of *Game selection method* (presenting and discussing the sampling method and its limitations), *Analysis method* (involving discussions of types of play, documentation, etc.), and *Methodological challenges and limitations*.

Chapter 3 is all about the concept of the virtual environment. Positioning the virtual environment first in relation to theories of space in digital games, various world concepts involving both narrative/fictional worlds and ecologies, I discuss selected theories representative of each concept in the first section of the chapter. The second section of the chapter introduces the virtuality concept with emphasis on the discussion of virtuality in a digital games context (presented in contrast to fictionality and reality). Drawing on theories from the two theoretical sections, the virtual environment is defined as a navigable geometry constituted by a computational, relational model. The virtual environment as a spatial structure represents the relative positions of objects that can be described as integrated by virtue of being both spatially and functionally related to other objects within it. In this, I explore how OOA/D is influential in the PO-VE-specific conception of the virtual environment.

The different types of objects in the virtual environment are then described according to two major categories: *objects* proper – entities in the virtual environment, defined by their integration and their visual representation whose most important makeup consist of attributes (properties) and affordances (possible actions); and *markers* – a special type of objects that have non-permanent manifestations in the environment.

Finally, the virtuality status of objects in the environment is discussed in contrast to purely decorative objects, positioning the virtual environment as defined within the PO-VE framework in relation to the theories presented at the beginning of the chapter.

In chapter 4, I develop the concept of player objects based on the previous definitions of objects in the virtual environment. As with the previous chapter, I first explore alternative approaches, focusing on avatar concepts and related terms developed for the analytical and theoretical study of game texts. The theories are sorted according to two heuristic categories: the *ludic* tradition of avatar theory and the *phenomenological* tradition of avatar theory. The last section of the theory review explores alternative approaches to the player object 'in context', i.e., integrated within larger analysis models or ontologies.

The player object is defined according to its *integration*, specifying that player objects have relationships to the other objects of the virtual environment that determines what they can do (i.e., their affordances), and *movement*, resulting in the player object's change of location in the virtual environment along a single axis. Three additional non-defining characteristics common to many player object-based games are *navigation*, *dynamics*, and *visual framing*. *Navigation* refers to player objects capable of moving along multiple axes, thus drawing attention to the virtual environment as a spatial structure and navigable geometry. *Dynamics* describe how player objects change during a game, and thus do not remain static but instead have dynamic attributes and affordances. Finally, *visual framing* refers to how the player object and its relation to the virtual environment determine how the graphic environment is visually presented to the player, thus accentuating that the player is always in a dual-relationship with both player object and virtual environment.

The two primary ways in which player objects change during a game, through *alterations* and *conversions*, are illustrated with examples before the chapter is concluded with a thorough discussion of how player objects compare to the alternative approaches covered in the first section of the chapter, in particular *avatars* and *playable figures*. This section serves to further position the study in relation to other text-centric analyses of the player's point of control in a game. It highlights how the concept of the player object is distinct from other terms and concepts, most prominently because it is grounded in a functional and more software-centric approach to the virtual environment as a relational model.

The PO-VE model is presented in chapter 5, in which I walk the reader through the process of developing the model and then dive into each of the model's seven categories to give thorough explanations of each of them. Using illustrative examples from the data set, the categories *player object*, *type of control*, *player object navigation*, *player object alterations*, *player object conversions*, *virtual environment information access*, and *virtual environment spatial access* as well as their corresponding types are explained and explored with reference to the central concepts developed in the previous chapters.

The analysis of chapter 6 brings the former chapters together, as it puts the PO-VE model into practice. In the first section, I present the results of analysing the player object-based games of the sample using the PO-VE model only. Since not all 99 titles meet the minimal definition of player objects, only 78 games are analysed in this more comprehensive overview in which each type of each category is discussed based on the types of games it is presented in, as well as the typical combinations of types, both within and across categories. This part of the analysis reveals a big discrepancy between older, arcade-style games and modern titles, especially those belonging to the RPG genre. Perhaps this is no surprise to the reader, but the details offered by the PO-VE model allow the analyst to pinpoint exactly how a modern, Western RPG has more complex PO-VE relations than a late 70s arcade-style game, and what the complexity in each of the categories of the model means for the game in question.

This is explored further in the second half of the analysis, in which ten selected games are analysed through close-readings based on the PO-VE framework. The chosen games range from having simple to complex PO-VE relations, but the selection also include two games that do not meet the definition of player objects but diverge from the definition in different ways (*Papers, Please* [3909 LLC, 2013] and *Reigns: Her Majesty* [Nerial, 2017]). The analyses of these two non-PO-games illustrate some of the limitations of the model and brings attention to some of the specific structures that exclude some games from being appropriately explored through the PO-VE framework.

The ten games explored in the analysis are *Space Attack* (UA, 1982), *Altered Beast* (Team Shinobi, 1989), *Passage* (Rohrer, 2007), *Lego Marvel Super Heroes* (Traveller's

Tales, 2013), *Hotline Miami* (Dennaton Games, 2012), *ZombiU* (Ubisoft Montpellier, 2012), *Papers, Please*, *Subway Surfers* (Kiloo & SYBO Games, 2012), *The Witcher 3: Wild Hunt* (CD Projekt RED, 2015), and *Reigns: Her Majesty*. The games represent not only different levels of complexity in terms of their PO-VE relations, but also exemplify different types of and perspectives upon the virtual environment, including 2D as well as 3D games, and first-person, third-person, and top down perspectives. While the selected games do not represent the true diversity of platforms on which games in the sample were played, it contains games played on different consoles, PC, and touchscreen (Android smartphone), thus illustrating some of the differences in controllers and input-method, facilitating comparative exploration of the different controllers' role with regards to PO-VE relations.

Chapter 7 is a discussion, evaluation, and reflection upon the project and its findings. In this chapter, I position the PO-VE framework in relation to ontological work on digital games, where I conclude that the PO-VE model should be understood as a domain-specific analytical tool that offers insights into a specific part of (some) digital games, rather than as an ontology or part of any ontology.

The tensions and balances between functionality and representation are also discussed, and I argue that PO-VE relations are best understood if both are considered, even though the framework prioritises functionality and excludes structured analysis of representation.

The primary literature referenced throughout the dissertation, in particular certain understandings of avatars and playable figures, are discussed and compared to the concept of player objects, and some observations made about player objects through the analyses are expanded upon, including the diachronic structure alterations and the synchronic nature of conversions.

Finally, I argue for the PO-VE model's applicability in game design and development. I further discuss possible uses in non-game media and explore the potential for a UO-VE model for user objects in, for example, VR journalism. This reveals that only some categories of the PO-VE model are relevant for non-game media. I conclude that the contribution of the PO-VE framework first and foremost lies in its facilitation of analysis on various levels of depth, which may help scholars explore and understand the structures of these complex systems.

2. Methodology

2.1 Chapter introduction

The empirical body of this study consists of 99 different digital single player games. The iterative development of theory based on a corpus of this size is a new and innovative approach to the study of digital games. Methodological and epistemological reflections are of primary importance, as they allow for transparency about the benefits and limitations of the method in question. This chapter will guide the reader through the processes involved in the development of the method, selecting the 99 titles for the study, and the following analyses of the data generated from gameplay.

No study is an island, and existing approaches to the study of digital games and related phenomena have played a central role in forming the basis of the method. In fact, this method was born out of a fascination with the structuralist approach employed in Propp's (2015 [1968/1928]) *Morphology of the Folktale*, and a sense of surprise at the lack of empirically grounded research methodologies within theoretical and analytical game studies. This chapter will therefore outline a brief history of game studies methodologies, devoting special attention to those within the theoretical and analytical domain, to situate the study at hand within a larger context. This facilitates the introduction of the novel method in contrast to alternative approaches. But first, I will further explore the structuralist inspiration and its influence on the study.

2.1.1 Structuralism – the primary foundation

The primary inspiration for the research method of this study is found in structuralist formalism, particularly in Propp's *Morphology of the Folktale*, but also to some extent Campbell's less obviously formalist research on monomyths. Whereas only Propp has a most obvious claim to formalism, the two scholars share a structuralist approach to their study objects: they apply variations on qualitative content analysis to textual material in order to understand the formal structures of a set of texts. Then, they develop terminology to account for the various components – the structure – of the study objects.

Finally, they propose a theoretical framework that offers structured systems for analysing or organising the specific texts studied.

Propp's morphology of the folktale

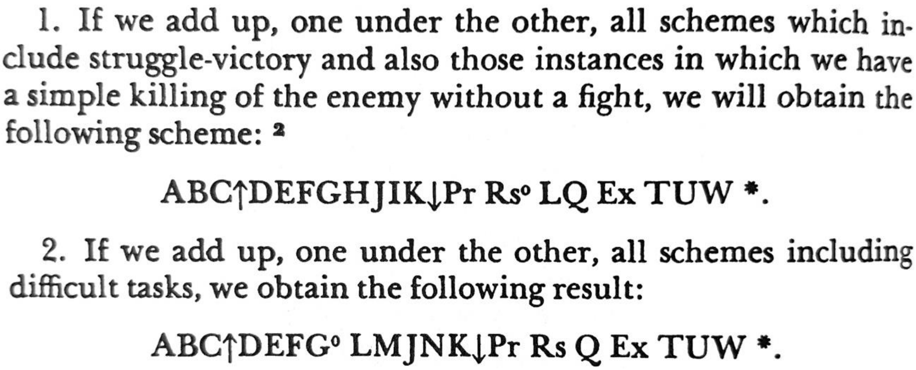
For Propp, the object of study is Russian folktales for which he attempts to develop a *morphology*: "a description of the tale according to its component parts and the relationship of these components to each other and to the whole" (Propp, 2015 [1968/1928], p. 19). To reach this objective, he analyses 100 different tales that are chosen from an already existing collection[2]. The number appears somewhat random at first, but Propp states, regarding the size of the sample, that "the accumulation of material can be suspended as soon as it becomes apparent that the new tales considered present no new functions" and that he found that "100 tales constitute more than enough material" (ibid., p. 24), thus saturating his set.

Not dwelling further on the potential consequences of the sample chosen for analysis, Propp argues that the order in which the findings are presented, in this case the book *Morphology of the Folktale* itself, may be reversed as to make it easier for the reader to follow the development of the study and the theory (Propp, 2015 [1968/1928], p. 23). This means that while Propp's study may be inductive by nature, it is not necessarily presented as such and his work does not explicate the analysis process of the 100 tales, but rather presents the identified functions immediately following the limited methodological overview. This gives the study a seemingly *deductive* appearance, where certain tales are listed as illustrative examples and not the foundation for his theory. Yet, when considering the statement about the order of presentation, we see that the study is simply easier to understand when the conclusions, most prominently the idea of the functions of the tales and their relationship to the identified types of *dramatis personae* (i.e., narrative characters), are presented first.

[2] He argues himself, that the "limitation of material will undoubtedly call forth many objections, but it is theoretically justified" (Propp, 2015 [1968/1928], p. 25), without explicating said justification.

Thus, Propp makes explicit the unavoidable appearance of circularity – between inductive and deductive thinking – of the structuralist analytical endeavour, where meaningful presentation that puts forward core theoretical concepts at the very beginning and withholds explicit presentation of the cumbersome analytical work is at odds with a potential inductive nature of the method. Because Propp's sampling method is equivocal, however, it is difficult to assess the extent to which his project can be described as inductive.

Propp shares an interest in structures in and of specific types of texts with scholars such as Campbell, Greimas, and Jakobson. The most extensive chapter of Propp's book – Chapter III: The Functions of Dramatis Personae – contains that which he considers "the morphological foundation of fairy tales in general" (Propp, 2015 [1968/1928], p. 25), namely 31 distinct functions. "The action of all tales included in our material develops within the limits of these functions" (ibid., p. 64), Propp states, and thus, according to him, they constitute the very essence of fairy tales. His ultimate contribution is the formulistic language, based on the identified functions, that allows him to describe the basic structure of any fairy tale according to a relatively simple formula. The formula for each tale may vary according to which functions are included, but it will always, Propp argues, consist of some combination of the 31 functions. Below is an excerpt comparing two different tale structures which is meant as an illustration of the form of the formulas.


1. If we add up, one under the other, all schemes which include struggle-victory and also those instances in which we have a simple killing of the enemy without a fight, we will obtain the following scheme: [2]

ABC↑DEFGHJIK↓Pr Rs° LQ Ex TUW *.

2. If we add up, one under the other, all schemes including difficult tasks, we obtain the following result:

ABC↑DEFG° LMJNK↓Pr Rs Q Ex TUW *.

Image 2.1. Excerpt from Propp's *Morphology of the Folktale* (Propp, 2015 [1968/1928], p. 104).

Campbell and the hero's journey

Campbell's (2004 [1949]) study of the monomyth is comparable to Propp's morphology in some ways. In *The Hero With A Thousand Faces*, Campbell explores a wealth of myths from different times and places and arranges the presentation of their different elements according to the structure known as the *monomyth* or *the hero's journey*. The structure consists of three main parts: departure, initiation, and return. Each of these consists of a plethora of elements, where the departure contains five identified elements and the initiation and return contain six elements each. These elements vary in content depending on the specific myth, but according to Campbell, all follow a basic structure. Below is a diagram which illustrates the structure of the hero's journey.

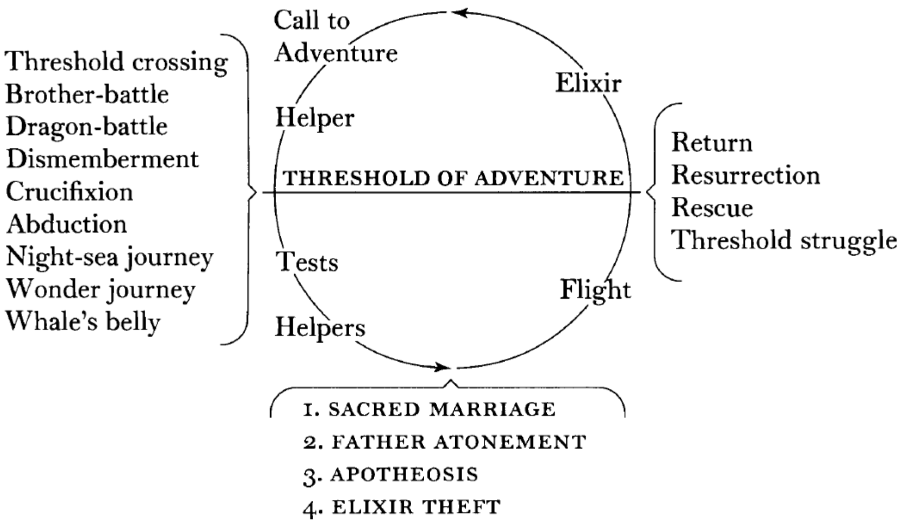


Image 2.2. The structure of the hero's journey (Campbell, 2004 [1949], p. 227).

Campbell notes, in line with Propp, that "[m]any tales isolate and greatly enlarge upon one or two of the typical elements of the full cycle" (Campbell, 2004 [1949], p. 228). That is, the various elements of the journey are, like Propp's functions of the tale, the constituent elements, but not all elements listed need to be present in the individual myth. Thus, while not typically described as such, Campbell's theory of the hero's journey appears a structuralist contribution to his field.

Variations in structuralist inquiries

While both Campbell and Propp suggest models for understanding the basic structures of a certain object of study, they differ significantly in their approach, both in terms of research method and the nature of the resulting theory.

Propp explains (parts of) the research method used for arriving at his framework. His findings are explicitly empirically grounded in the study of 100 folk tales that were deliberately chosen from a specific pre-defined set constructed by another author. Because his sample is based on someone else's set, the reader is left unsure as to whether the selection criteria warrants claims of inductivity, or whether the pre-defined set serves a limitation to Propp's study, both regarding its methods and results. While the bulk of his analytical work is undisclosed in his book, several appendices document parts of the analysis process and help account for the study's empirical grounding.

What is not accounted for, however, is the inevitable interpretation involved in assessing, for example, the different functions of the Dramatis Personae involved in a myth. While these functions may have been easily distinguishable in Propp's data (i.e., the 100 Russian folk tales), there seem to be cases where the analyst must rely on their own knowledge, experiences, and beliefs in the interpretation. Take for example the function designated by the letter A: *The villain causes harm or injury to a member of a family* (Propp, 2015 [1968/1928], p. 30). Propp marks this function as "exceptionally important" (ibid) yet illustrates through examples how vague the notion of "harm to a member of a family" is taken to be, when including for example *a firebird stealing golden apples* (ibid, p. 32). This is not to say that I disagree with Propp's reading that the firebird's action of stealing may be interpreted as harmful to the family depending on said apples. But it is exactly that – a reading, an interpretation, that questions the extent to which the different formal components are as clearly distinguishable as the formalist framework would have them seem. This critique remains relevant also for the study at hand, as it shares with Propp's morphology the issue of describing form without considering what formal components signify, and, ultimately, without considering their *meaning*.

Campbell elaborates even less than Propp on how and why some myths are included, and others are not, how many and which myths form the empirical body for his study, or how these were analysed in order to arrive at the suggested framework of the hero's journey and its component parts. One might say that Propp's study is closer to being inductive than Campbell's work, which may have a limited inductive quality to it, although we can never be sure.

What is more, Propp's framework appears more strictly structuralist than Campbells. This can in large part be attributed to the model used for illustrating his theory; the formula appears to define a more rigid structure than the diagram. Propp's ambition of mimicking the natural sciences – morphology as a branch of biology, in particular – explains his choice of model, and the way in which it is structured and illustrated determines, at least in part, how it can be potentially used. Perhaps this explains why Campbell's less rigid structure is frequently referenced and applied by students and scholars across various disciplines, while Propp's study is used as an example of structuralist formalism with limited applicability.

Propp and Campbell are not the only scholars to have utilised a method resembling qualitative content analysis of certain study objects to develop theories and suggest frameworks and models for understanding them. The same can be said about many scholars who have been associated with structuralist methodologies or mode of reasoning, including, amongst others, Jakobson and Greimas. Like Campbell's monomyth, Greimas' actantial model (Prince, 1987) has become a canonical part of narrative theory, and these two models illustrate how seemingly narrow and highly theoretical structuralist research projects can result in frameworks so significant yet easily simplified and understandable that they make it into high school and college curricula.

Structuralism adapted

The success of the frameworks resulting from structuralist methods as they have been used in the study of narrative and literature explains part of the motivation behind the present study. Although Propp's morphology seems an extreme case deserving of some raised brows, both due to the extreme specificity of the analysis and resulting model, but also because of the more fundamental issue formalism faces with regards to interpretation, there appears to be something to be gained through comprehensive and systematic qualitative investigations of large samples within the humanities. If such an approach can result in widely applicable, yet specific and detailed frameworks, as has been the case for some of the scholars mentioned above, then a similar method applied to the study of games could yield interesting and relevant results, too. I thus draw great inspiration from the structuralist projects, while acknowledging the challenges that a formalist approach may bring with it to a study based on *observations* (thus subject to interpretation) rather than precise knowledge of software structures, a point I will return to later in this chapter.

As is the case for the works listed above, it is the goal of this project to develop, based on a variation on *qualitative content analysis*, a theory of player objects in virtual environments, which offers an analysis model and a vocabulary that can be used as a tool for game analysis. Taken as a whole, this will be referred to as a *framework*.

Since this study is inspired by structuralist research methods and mode of reason, it follows that a certain view on knowledge and science lies at its foundation. It is assumed that new knowledge can be gained from studying a larger selection of study objects – in this case digital games – and analysing their constituent parts or their *structure* comparatively and iteratively, in relation to the remaining set.

The study therefore also shares similarities with the grounded theory method. While grounded theory conflicts with structuralism, as the former emphasises the scholars' interpretative role in (for example) "action and interaction between and among various types of social units" (Strauss & Corbin, 1994, p. 278), and is "posed against dominant functionalist and structuralist theories" (ibid, p. 275), the two traditions share the approach to a vast empirical foundation as the basis for developing theory. Perhaps grounded theory opposes itself to structuralism in large part also due to the common deductive nature of structuralist theories and frameworks.

Thus, from both a grounded theory approach and from the inspiration drawn from the structuralist and formalist studies, the size of the sample is relevant insofar that it contributes a significant empirical grounding to the study. For this grounding to be truly empirical, the sample must not only be carefully selected, but also represent some diversity in terms of the games included. If the sample is too narrow, either in the types of games included or the numbers, the resulting framework may be applicable only for that narrow group of games (as became the case for Propp's morphology, which proved applicable only to Russian folktales) or prove insufficient in accounting for the many differences between games. However, if the sample is too broad, either by including too broad a variety or simply too many games, the resulting framework may turn out rather vague, or the qualitative analytical task will prove too cumbersome for the analyst. The specific selection method and criteria are therefore carefully discussed in section 2.4, to make clear the principles for inclusion.

It is this empirical grounding and the iterative coding process which make the study stand out from established methods used in the field of digital game studies. Some of the existing methods that share characteristics with the method employed in this project are discussed in section 2.2.

Finally, this study is, much like the structuralist investigation of Propp, inductive and deductive at the same time – or never truly one or the other. I bring to the study some basic assumptions about interesting phenomena to observe in the context of games – that there are structures to be observed and mapped out in relation to the entities that allow the player to interact with the virtual environments of digital games. The knowledge generated through this study is a result of qualitative, iterative labour through which the framework is ultimately generated. However, the iterative development of the framework, the alterations that are made to better situate it within existing discourses in game studies and game development, the inevitable influence of the author's pre-existing knowledge of games and game studies, the sampling method based (in part) on theory, and the compressions made to fit everything into a model all bring to the study an undeniable *deductive* quality. This is considered an inevitability of the method, which is instead discussed as *a posteriori*, emphasising its empirical foundation while acknowledging that the inclusion of a theoretically guided sampling method means that it cannot be described as inductive.

Having presented the structuralist method as the primary inspiration for the study, I will move on to other related approaches and methods from digital game studies, which will explain and contextualise the research design at large, while facilitating the much needed discussion outlined in the previous paragraph. Subsequently, the research method for the project will be explained in detail, covering the process from game selection to coding to iterative, analytical work. Discussion of the challenges and limitations of the method appear throughout the chapter, including arguments for whether it makes sense to speak of it as inductive, empirical, or *a posteriori*, how it compares to and differs from existing methods in games research, the limits of observational data, and the (problems of the) sampling method. The chapter is concluded with more general considerations of methodological limitations, as well as a brief summary highlighting the central arguments presented throughout the chapter.

2.2 Game studies methodologies

2.2.1 Multidisciplinary field, multidisciplinary perspective

In their 2013 paper, Mäyrä et al. present statistics on the disciplinary identity of game scholars. They found that while the most represented self-identified disciplinary backgrounds of the participants were Communication Studies, Humanities, and Educational Sciences, members of the game studies community represented a larger spread of disciplines, including Computer Science, Psychology, Engineering, and Design.

The notion that game studies is a multidisciplinary field is supported by Martin's study of the various areas, or the 'intellectual structure' of games research, in which he identifies five specific communities as contributors to game research: Education, Humanities/Social Science, Computer Science, Communications, and Health. Through the analysis of keywords, he identifies four communities: Education/Culture, Technology, Effects, and Medical (Martin, 2018).

As presented in the introduction, this study is situated within a very specific approach to digital games, one found in the overlap between what Martin (2018) identified as

Humanities/Social Science and Computer Science. While the more theoretical branch of analytical game studies is often associated with fields such as film studies and literary theory, thus leaning towards the humanities community identified by Martin, there is also a group of scholars who have bridged this approach with the more technical study of games, which considers the software structure and hardware as components that warrant analysis. Advocates and practitioners of this multidisciplinary approach to games include, for example, Mateas (2003) and his concept of expressive AI; Wardrip-Fruin's (2009) work on expressive processing; Parisi's (2015) studies of the tactile materiality of digital games and game controllers; Montfort and Bogost's (2009) platform studies of the Atari VCS; and my own research (Willumsen, 2017) on how to analyse code as a part of a formal game analysis. All the scholars listed also explore and relate their studies to game design, in either theory, practice, or both, and it seems that game design is a connecting link between the theoretical and the technical aspects of game studies. In a similar vein, this study taps into game design, as the PO-VE framework shares some structures and ideas with *game design patterns* (Björk et al., 2003) and incorporates vocabulary from a software systems approach which has certain overlaps with discourses on (game) design.

Having briefly accounted for the multidisciplinary nature of the study, it remains important to acknowledge the variety of approaches to digital games and recognise the difficulty of presenting methods from all disciplines integrated in game studies. Thus, the following section is dedicated to the presentation of only some central and particularly relevant methods for studying and analysing games.

2.2.2 Game analysis methods

Within the theoretical and analytical domain of what we might call game-text-specific game studies, it appears that a few research methods dominate the discourse, perhaps because of the difficulties of escaping the influence of other dominant disciplines. It is by now a truism that game studies research is highly influenced by the study of narrative media like literature, cinema, and theatre, which has caused a debate on the appropriateness of applying methods and theories developed for one type of research object to another (and whether digital games are best understood as having narrative potential or not). I see no need for retracing these debates and will instead focus on presenting several selected research methods that emphasise the game form, i.e., the specific qualities of digital games – what we might describe as ludology, when this is taken to mean simply "the study of games" (Juul, 2011[2005], p. 16). The sections below will present two types of analysis methods: *content analysis*, a method applied in various types of media and game studies, for various purposes, and based on different types of data; and *applied ludology*, a specific analysis method suggested by Järvinen (2007), which resembles some aspects of content analysis while employing a basic ontology, a set of structural elements, as an analytical framework.

Content analysis

Content analysis, and more specifically *qualitative content analysis*, describes a group of research techniques that are all used for interpreting meaning from content, i.e., textual data (Hsieh & Shannon, 2005). There are three primary types of content analysis: *conventional content analysis*, where coding categories are derived directly from textual data; *directed content analysis*, in which theory guides the coding process; and *summative content analysis*, which constitutes a comparative approach, often involving counting. The central idea for all three techniques is that "the many words of the text are classified into much fewer content categories" (Weber, 1990, p. 118). The methods thus offer ways of reducing a full data set into tangible classifications, or in some cases *codes*. Whereas earlier forms of content analysis have been used for analysing textual material, modern uses of the method, deriving from the communication sciences, need not only target the *content* of a text, but may also include "formal aspects and latent meaning" (Mayring, 2004, p. 266).

According to Weber (1990), it is important that content analysis is reliable in the sense of being consistent: "Different people should code the same text in the same way" (ibid., p. 118). Digital games present a particularly interesting challenge to the use and application of qualitative content analysis, vis-à-vis their ergodic (Aarseth. 1997) or on-line states (Newman, 2002) that make the player a co-author of the game text (Consalvo, 2017).

This may explain why qualitative content analysis is rarely quoted as a method in much research on games, when in fact most game analyses, both digital and analogue, are based around some type of analysis of content. Studies that are explicit about the use of content analysis tend to focus on the type of content that does not vary significantly from play session to play session, such as characters and representation with regards to e.g., gender, race, and sexuality (see e.g., Downs & Smith, 2010: Martins et al., 2011; Waddell et al., 2014; and Williams et al., 2009). Most of this research, however, uses a quantitative or mixed-methods approach and presents the findings as statistics.

Wishing to further the research on qualitative content analysis and digital games, Malliet (2007) proposes a content analysis methodology for games that relies on a scheme based on existing theories on digital games. That is, the method becomes *directed*, to use the term suggested by Hsieh and Shannon (2005), and the textual data is seen through the lens of an already established framework, which inevitably influences the resulting codes. Malliet concludes the study by acknowledging what seems to be an unavoidable challenge of game analysis: "the issue of the interpretative position of the researcher is even more relevant than it already was in the context of traditional text analysis" (Malliet, 2007). Explicit awareness of this interpretative position of the researcher is thus necessary if a study is to successfully employ the method of qualitative content analysis, especially if any claim to empiricism is to remain. This is discussed further in section 2.3.3.

Applied ludology and structuralist game studies

In his 2008 dissertation, Aki Järvinen introduces a specific form of analysis which he had, in an earlier paper (Järvinen, 2007), dubbed *applied ludology*, "a practical hands-on analysis and design methodology [which] complements theories of games as systems with psychological theories of cognition and emotions" (ibid., p. 134). Unlike Malliet's method, Järvinen does not explicitly describe his theory as content analysis, thus supporting the previous argument that qualitative content analysis, although corresponding to some of the methods used for studying digital games, is not well integrated within the theoretical domains of game studies.

Only one of the methods introduced in what Järvinen refers to as the RAM (Rapid Analysis Method) toolbox will be presented here, namely what he refers to as *a method for identifying and analysing game elements*. His research methods pertaining to game mechanics, player abilities, and emotional engagement are thus excluded, as these remain less relevant for the study at hand.

Serving as a starting point of his inquiry (Järvinen, 2008, p. 47), Järvinen's method, as we will see in the following, resembles to a great extent the pre-digital game scholar Avedon's (1971) categorisation of the structural elements of games. Avedon's study is based on the question of whether there are "certain structural elements that are common to all games, regardless of the differences in games or the purposes for which the games are used, or the culture in which they are used? Are there elements that are invariant under certain transformations?" (Avedon, 1971, p. 420). The attentive reader may immediately see the resemblance between the motivations of Avedon's study and the previously discussed morphological work on tales conducted by Propp. However, as opposed to Propp, Avedon's work is not (evidently) based on a structured analysis of a given set of games. Rather, it appears a result of engagement with other scholarly texts on the subject matter, combined with the author's general knowledge and experience with games. The conclusion that follows is that there are seven main elements in games, and three additional elements, the details of which are not of importance here. What remains important, however, is their influence on Järvinen's work and the fact that structuralist game studies predate digital game studies.

Järvinen's method for identifying and analysing game elements relies on a framework of "nine possible element categories that are found throughout the universe of games" (Järvinen, 2007, p. 135). It is unclear from the paper how these categories were identified, but according to his dissertation (Järvinen, 2008), they are a result of analytical engagement with more than 100 different game titles (ibid., p. 43). The nine categories are: *components*, *environment*, *ruleset*, *game mechanics*, *theme*, *information*, *interface*, *players*, and *context*.

Thus, the first task of the analyst is to identify the game elements of the game under scrutiny, following the nine categories. While the framework seems relatively simple, perhaps due to its resemblance to other game definitions and structural models, the extent of the task becomes apparent when analysing, for example, *environment elements*. While Järvinen uses only casual games to illustrate the applicability of the model (for which it may be very well suited, due to their often relatively simple design), it seems a challenging task to list all elements of the environment in, for example, an open-world game. The level of detail in the analysis called for in the method seems feasible primarily in specific types of study, where a high granular analysis of environment elements is in focus; or, conversely, in analyses of less content-heavy games, for example casual games. The name of the model – RAM (Rapid Analysis Model) – thus seems a little ironic.

This is also apparent in the next step of analysis, in which the analyst must identify to whom the elements belong – whether an element is "owned by self, other(s), or system" (Järvinen, 2007, p. 136). Other(s) remain relevant only in multiplayer games. The analyst ascribes ownership status to the elements identified using the nine categories above, and will see, according to Järvinen, that ownership status is subject to change. The dynamics of ownership status help guide the analysis from that of game elements to gameplay.

Emphasising the dynamic aspect of ownership status, Järvinen's (2007) model integrates within it the player's active role in relation to the game system's functions and processes, which is further expanded in the other methods of his framework. In the context of structural analysis methods, and compared to content analysis, however, it is not the player's status that makes the framework significant (his category of *component of self* is further explored in relation to Vella's (2016) *ludic subjectivities* in chapter 4). Rather, it is the level of detail called for in the analysis, where multiple types of elements are identified and used as categories for more in-depth analysis, which is relevant in applied ludology as a method. The model is not just a contribution as a methodological toolkit; it also offers detailed terminology to be utilised for systematic game analysis.

It thus seems that Järvinen's framework is a step towards an organised approach to directed content analysis of games where the analyst may be able to ensure a certain level of consistency in the codes, as called for in the more traditional and mixed-method dominant coding methodology.

Järvinen's study, as well as his concept of applied ludology, has many things in common with the present study. His thesis, through which the premise of applied ludology is developed, is based on the study of more than 100 different games (Järvinen, 2008, p. 43), rooted in a structuralist type of game studies (that which is described using the term *ludology*, but which is used in his study to also encompass the study of players, unlike the typical formalist-inspired ludology) (ibid., p. 24). The study is therefore situated between game studies and game design, with Järvinen describing it as research *for* design and research *through* design at the same time (ibid., p. 26).

Within the context of the present study, these similarities can be explored to potentially avoid problems identified in the RAM, according to the discussion above. For example, while Järvinen has conducted comprehensive analytical work on more than 100 games, the analytical process and the methodological considerations could be more clearly conveyed. This inspires me to explore and explain in depth the process involved in the analysis of the sample, the iterative coding of the data set, and the construction of the PO-VE model, to be able to better understand and argue for how empirically grounded game analysis projects can contribute to the development of a scholarly understanding of digital games. As research *for* design, Järvinen's study is an inspiration of how one can make analytical game studies relevant for game designers, a point that will be discussed later.

Another point of comparison is the integration of game design in otherwise analytical projects. For Järvinen, his background as a developer allows him to explore how research through design can be used for understanding the structure of games. For me, my background within software development and data analysis determines my approach to games as software systems that cannot just be explored as *ludic* systems, but also, alternatively, as modelled structures. While there may be terminological overlaps resulting from these two technical positions of the researchers, they differ significantly.

Järvinen actively designs games, and through the act of designing explores the different components considered in the structuring and implementation of the game. In contrast, I approach games through the specific framing of relational and functional software system (detailed in chapter 3 on virtual environment), which determines the study object and how this is approached, as well as the terminology used in the analysis, without it providing a specific research method. Both approaches to game analysis suffer from being dependent on observational data, as scholars rarely have access to the source code of the game and therefore cannot confirm the assumed structures and components of the game – unless, of course, you only analyse games you have developed yourself or to which you have access to the source code, which is not the case for Järvinen's framework, nor for mine.

The variety of methodologies utilised for studying digital games far exceeds what has been outlined in this section, in large part due to the multidisciplinary background of games researchers discussed in the first part of this chapter. The upcoming section outlines selected deductive and inductive game studies methods, leading up to the introduction of the method of this dissertation as well as an exposition of and discussion of the sample and the criteria for selection.

2.3 99 games and why

2.3.1 Deductive approaches

Despite the multiplicity of approaches to the analysis of digital games, most scholars have so far gravitated towards studying smaller selections of digital games or using games only as illustrative examples rather than as an empirical foundation from which theory is developed, even in studies that set out to map the fundamental components – the *ontology* – of digital games. Deductive reasoning dominates the attempts made towards understanding the basic configurations of digital games. In such studies, games are used as examples for explaining a suggested theory or framework, which can thus be understood as a 'top-down' approach, where theory is developed and presented and only then tested to ensure its legitimacy. When changes are made based on testing, the process becomes circular or iterative, depending on how many times the theory is put to the test and how many alterations are made accordingly, and the method is no longer purely deductive.

Examples of deductive games research include Consalvo and Dutton's (2006) methodological toolkit (where *The Sims* is used as an 'extended example', along with occasional mentions of "examples from different styles and genres of games" [ibid]), Elverdam and Aarseth's (2007) game classification model (which, in a similar fashion, mentions a wider selection of games as examples for each of their categories, without detailing whether these titles were used in any structured manner for the development of the model), and the more recent attempt from Larsen and Walther (2019) at developing an ontology of gameplay. In Larsen's and Walther's paper, the entirety of the theory of gameplay is developed based on theoretical concepts and meta-reviews of game studies literature, without incorporating game examples either in the development of the ontology or in an effort of exemplifying it in context.

2.3.2 Inductive approaches

Deductive reasoning is evidently useful when studying digital games, as has been proven by the many research endeavours utilising this approach successfully, and most of the terminology used when discussing and analysing games stem from such studies. Yet, I believe much is to be gained when rooting game studies efforts in gameplay, observations, documentation, and analysis – or, put differently, when advancing an approach that is (at least somewhat) inductive, where theoretical frameworks are empirically grounded. This has so far been done in a limited capacity. Björk et al. (2003) have identified more than 200 game design patterns, based on a method of "examining game mechanics and converting them to patterns" (ibid., p. 183). A complementary method in what they refer to as 'harvesting' of patterns is by 'brute force' analysis of existing games which "consists of five iterative steps: recognize, analyze, describe, test and evaluate" (ibid.). Thus, the resulting design patterns, which are structured hierarchically in relation to each other, are partly rooted in the analysis of an assumed wide variety of games (although the exact number of games studied is not disclosed).

A similar approach is found in The Game Ontology Project, presented as “a framework for describing, analyzing and studying games, by defining a hierarchy of concepts abstracted from an analysis of many specific games” (Zagal et al., 2005, p. 1). However, as discussed in relation to Järvinen’s applied ludology, which also qualifies as an example of more inductive game studies, the analysis and abstraction process of the Game Ontology Project is somewhat unclear. In the authors’ presentation of the hierarchical structure of their ontology, specific games are, once again, used only in an exemplifying manner, presented as either a strong or a weak example of a given entry.

Finally, Galloway’s (2006) collection of essays, *Gaming: Essays on Algorithmic Culture*, is, according to the blurb at the back of the book, based on “examples from more than fifty video games” (ibid.). While this is an impressive number of examples to incorporate, which also gives the book a rather descriptive nature, it is unclear how these examples have influenced the classification system proposed by Galloway and what methodology was involved in the research. Similarly, an attempt at defining gameplay (Djaouti et al., 2008), inspired by Propp’s work examined above, was conducted by a group of scholars who studied 588 different videogames (ibid, p. 1) according to a similar, yet more simplified version of Järvinen’s (2007) applied ludology. In their framework, the different games, consisting mostly of arcade games with simple rule structures, were indexed according to ten *game bricks* (i.e., rule structures identified), but like Galloway’s work, it is unclear whether the *game-brick*-based classification system resulted from the study of the 588 games or the other way around. The authors also state that their method is problematised by the lack of diversity in the games studied (Djaouti et al., 2008, p. 6), because arcade games reflect only a specific and simple design paradigm. The study seems somewhere between game design patterns and applied ludology, where the goal is to understand the specific design structures resulting in gameplay, rather than aiming at developing an analytical or theoretical framework.

The Game Ontology Project, game design patterns, applied ludology, the game-brick-based classification system, and Galloway’s study all have some things in common with the structuralist studies reviewed earlier. Some share with Propp the formalised presentation of findings (e.g., the hierarchical and morphology-like structures of both the Game Ontology Project and the game design patterns, the aspirations of the game-brick-based classifications system) and the careful examination of each individual study object (as is apparent in Järvinen's documentation). Others share with Campbell the seemingly less structured methodological approach that constitutes the study as guided by structuralist principles primarily in its resulting framework (as is the case for Galloway's study). The former examples thus appear more structuralist in method than the latter.

As was the case with literary structuralism, which was criticized for its rigidity and which may sometimes border on positivism, structuralist games research is but one approach to game analysis. It gives priority to empirical data and inductive methods, but is not always feasible, and can easily omit attention to borderline cases that may not fit into rigid, structured frameworks. This poses challenges to the selection criteria for games analysed, and the scholar may face difficulties in basing a formalist enquiry on observational data, which is subject to interpretation. A careful scholar may be able to avoid many such pitfalls simply by being mindful of them when undertaking the research project, and there may be much to be gained by experimenting with deductive and inductive approaches, both in isolation, but also in various types of combinations. However, some pitfalls may be almost inevitable, posing the question of whether formalist structuralism is compatible with the study of digital games. In the very existence of this dissertation lies the implied positive answer to the question above, and the following sections will outline a pragmatic approach to the formalist study of digital games, attempting to navigate and avoid the biggest pitfalls.

2.3.3 Black box analysis and the limits of observational data

The studies discussed above as more or less inductive all operate on a level of analysis where games are (assumably) studied based on observational data, i.e. the scholar's own experience with playing a game. They are therefore limited to what the scholar can observe about the functionality and structures of the game while playing. An alternative approach would involve investigations of the games' source code, which would allow for insights into the *actual* structures of the software system. As such, analyses based on observational data can be described as *black box analysis*, the contrast to *white box analysis.*

IEEE Standard Glossary of Software Engineering Terminology (1990) offers a definition of white box analysis as "(1) A system or component whose internal contents or implementation are known" or "(2) Pertaining to an approach that treats a system or component as in (1)" (IEEE, 1990, p. 36). This type of analysis stands in contrast to the system as a "black box", where the internal structure of the system is unknown. The observational data retrieved from black box analyses of digital games is thus limited in some capacity, as it does not always offer an accurate insight into what happens on a software system level. When evaluating functional relationships between components of a game system, the observational data may at times be misleading, as not all processes are (necessarily) represented through the observable system output, such as the audio-visual on-screen representation. Therefore, black box analysis poses two challenges to the study at hand:

1) To what extent is it possible to understand functional relationships between player objects and virtual environments based on observational data alone, and what aspects might be neglected in this type of analysis?

To answer this question, I must return to one of the definitions given in the introduction, to the object of study in the dissertation at hand. This study is situated primarily within the tradition of (analytical) game studies, and therefore the study object is defined as is typically done within this area of research, as a process (Aarseth, 2003), something which is only actualised through play. Functional relationships are therefore explored based on the analyst's experience with the game, including observations about causal relationships between input and output.

Black box analysis of this type, when focused on formal structures, is still miles away from falling under the category of *reverse engineering* or the more game-specific *theorycrafting*, which describes the process of using "statistical analysis and mathematical modelling" to seek out "the underlying formulae" governing the game (Paul, 2011). The analyses of this study are qualitative and, much like grounded theory, search to uncover patterns regarding different types of relationships between different components of the game. The resulting patterns, and the framework that these are developed into, do therefore not consider the actual structure of the software system or the code of the game, but rather how these are experienced through play.

This means that the analysis does not search to uncover the actual "underlying formulae", to use the words of Paul (2011). It also does not consider structures and functional relationships that are not apparent to the playing analyst when engaging with the game, whether this is due to the specific choices made in the game, or because some structures cannot be known without access to the code.

This does not make the findings of an analysis based on observational data alone invalid. It simply means that it should be considered within the specific research tradition of digital games as experiential processes. The relevance of this project to software studies is therefore reserved to the conceptual vocabulary for functional structures pertaining to the relationships between player objects and virtual environments, as the analysis does not dive into the source code itself. This is a natural limitation of most studies of AAA games, where only few developers have made their source code readable or accessible for players.

2) To what extent is *interpretation* involved when studying functional relationships based on observational data, and what does this mean for the study's claim to empiricism?

In 2.1.1, I criticised Propp's formalism for depending on interpretation in its application, as interpretation contradicts the empirical value of a formalist framework. Propp used a somewhat vague example in a list of many to be encompassed by a general description – a firebird stealing golden apples as an example of the function *the villain causes harm or injury to a member of a family* (Propp, 2015 [1968/1928], p. 30-32). The example is problematic because it refers to a part of a fairy tale used for developing the framework, rather than application of the framework in hindsight. Therefore, the issue of interpretation in Propp's formulaic structure highlights the difficulties of translating (patterns in) specific examples into a single form or expression. Such a process will always be one of reduction, and the more conceptual the reduction is, the less empirical it will be. Put differently, an analysis model is not in itself "empirical".

What lends this study its empirical quality is the observational data in the form of the content of 99 different digital games. Through an iterative coding process, described in detail in 2.5.2, this empirical foundation is altered into ideas that are continuously reworked into a theory of related concepts – a framework describing functional relationships, without detailing said relationships. The relationships are unique to each game, and the PO-VE framework therefore serves as a tool for making sense of observational data.

The observational data is the empirical evidence that forms the basis of the framework, which can thus be described as *a posteriori*. Yet, because the games are analysed as *experiential processes*, the empirical evidence (observational data) is subject to some inevitable level of interpretation of the playing analyst.

Functional elements of games are experienced as dynamic relationships between entities in a represented gameworld. Information about the weight of my vehicle in *Mario Kart 8 Deluxe* is accessible to me as I play and experience the force of bumping into another vehicle, as I assess the causal relationship between my chosen vehicle, my input into the system, the translation into action on the race track, and the effect of the action. When I start a new game, choose a different vehicle, and find that the AI opponents react differently when I bump into them, I conclude, based on my observations through experience, that a vehicle has a certain weight, and that this attribute influences my vehicle's relationship to other vehicles on the track in certain ways.

In this lies an inevitable amount of interpretation, as playing a game involves *real-time hermeneutics* (Aarseth, 2003, p. 5) (more on this in section 2.5.2). This is an inevitability of studying digital games. It means that the qualitative analysis of observational data will never meet the requirements for constituting empirical research within the scientific domain. However, since the observations are accounted for, and the interpretations are made accessible for the reader through extensive use of examples which function to secure transparency about the observations resulting in the conceptual framework, the method of this study can arguably be described a pragmatic approximation of a ‘game studies empiricism’. This form of empiricism differs from the more traditional understanding of empiricism because it is inevitably based on interpretations of experience rather than concrete examples from the game’s source code.

The example from Propp’s data thus serves a reminder to the playing analyst of clarifying the processes involved in translating the observational data into codes and further into (conceptual) models or frameworks. Interpretation may always be involved, but it is the responsibility of the analyst to secure logical coherence between data and theory, or as described as a principle of grounded theory, that “theories are always traceable to the data that gave rise to them” (Strauss & Corbin, 1994, p. 273). Therefore, the chapter in which I present the PO-VE model includes extensive examples from the sample, including borderline examples that bring attention to the interpretational issue of systematising and conceptualising observational data. Similarly, the analysis chapter explores a varied selection of games from the sample to bring attention to the points at which application of the model involves interpretation to an extent that may be considered problematic.

2.3.4 A novel *a posteriori* approach

While I have already illustrated some of the many varied methods used in the study of digital games, it should be noted that there is limited variation in the ontological game studies efforts that build on empirical data, what we might describe as studies in which epistemic justification is derived from experience (Russell, 2020). Such *a posteriori* approaches stand in contrast to the typically deductive methods used in the study of digital games. This project proposes and employs a novel approach that is perhaps best described as *a posteriori*, due to its foundation in observational data as described above. Yet, due to the selection methods of the games in the sample, referring to it as inductive proper would be misleading. The methodology can therefore be described as expanding beyond the typical, deductive and *a priori* methods of analytical game studies.

The study is rooted in the structural analysis of 99 different game titles. The sample size of 99 games is a somewhat arbitrary number, which could as easily have been 80 or 120. The number 99 allows for the inclusion of enough examples to get a better overview of the phenomena under investigation, across genres and platforms, resulting in a diverse sample, which represents more directly the actual content of the games, rather than just using the games as examples in defence of a theory. From an epistemological perspective, the specific number in a qualitative study such as this one is somewhat arbitrary. Diversity and saturation in the sample is of importance – not having an exact or persuasively even number.

To illustrate the empirical promise (and limitations) of the method, the selection criteria for inclusion and exclusion are discussed in the following section, where several *diversity labels* were put into use to secure diversity in the set. However, as the selection of the sample was done in early stages of the project and is characterised by a slightly naïve understanding of sampling techniques, it leaves something to be desired. The upcoming section is thus as much a presentation of the sampling method as it is an attempt to understand the ways in which it might be deficient and what this means for the analytical framework that is developed according to observational data derived from engagement with the games of the sample.

2.4 Game selection method

Using a nonprobability sampling technique (Kothari, 2004) where "subjective methods are used to decide which elements are included in the sample" (Etikan et al., 2016, p. 1), and building on a working definition of 'avatar-based games' that characterise the early ambitions of the study that were altered along the way, a selection of games considered more and less central to this working definition were chosen to form the sample of 99 digital single player games.

In addition to the method explored below, many games were excluded as potential candidates for the sample based on the demarcation of the study object, briefly discussed in the introduction. The study is limited to *digital games*, which encompasses digital products that are promoted as such, e.g., by online distribution platforms, thus also including smartphone games, walking simulators, and other digital products that need not be defined primarily according to *rules*, *challenges*, or other typical elements of game definitions. Moreover, the study is limited to games set in graphic virtual environments, as visual images and/or animations were assumed to offer ways of representing PO-VE relations that would likely differ significantly in, for example, text-based adventures or audio games.

Finally, the sample is also limited to games that do not accommodate multiple players in multiplayer configurations, either locally or online. The observational data governing the study is limited to what is experienced by the playing analyst. Multiplayer games involve multiple players, to whom significant information about the PO-VE relations may be revealed. However, without access to observational data from all players involved in a multiplayer game, mapping relations between player objects and the virtual environment of the analysed game would be difficult. What is more, it would be difficult (if not impossible) for the playing analyst to assess the *type of play* (more on this in 2.5.1) of other players, and in turn how this may influence the game. Multiplayer games often make use of some element of hidden information, and if the playing analyst has no access to this information, it becomes difficult to offer an adequate analysis.

Of course, the problems above could be considered in the study design, as it is by no means impossible to study digital multiplayer games. To secure some element of coherence in the data, however, and to make manageable the analytical task, it was decided to exclude multiplayer games from the sample.

The goal of the selection process, governed by the above criteria in addition to the working definition for avatar-based-games and some diversity labels, was to have a large sample of games where at least half of the sample fits into existing categories or definitions of avatars and player characters. This decision reflects the early state of the project, where the PO-VE terminology was not yet developed (as it is a direct result of the iterative analysis process) and where the project was generally framed around *avatars* in *gameworlds*, terms that guided the game selection method.

The following section will discuss the benefits and limitations of nonprobability sampling, outline the working definition of 'avatar-based games' utilised in the sampling, and explore the concepts of centrality and variability for estimating something resembling 'avatar-based-ness' of an individual game. These steps, along with the inclusion of diversity labels, were introduced to secure variety in the corpus while assuring relevant game titles for the specific focus of the research project. The consequences of the selection method and its influence on the PO-VE framework are discussed along the way.

2.4.1 Nonprobability sampling techniques

The corpus of this study is a selection of 99 different single player digital games – a *sample* of a specified group of games. As opposed to traditional probability sampling techniques where each element has a known probability of being in the sample under study (Kothari, 2004, p. 15), the 99 games were chosen using a nonprobability sampling technique, namely *purposive sampling,* which according to the definition proposed by Etikan et al. "is typically used in qualitative research to identify and select the information-rich cases for the most proper utilization of available resources" (Etikan et al., 2016, p. 2).

The game selection method might be best understood as building on ideas from what is referred to as *maximum variation sampling* and *homogeneous sampling*. While these two may at first appear as opposites, ideas from both methods are applied in the nonprobability sampling for this study. Considered a maximum variation sampling method, the use of diverse centrality gradience in relation to the working definition of an avatar-based game secures variety in the titles selected for the project. As a homogeneous sampling method, the working definition along with the factors of *digital, graphic virtual environments*, and *single player* are characteristics that form a homogenous group of elements in the sample from the wider and vaguer category of *games*.

The sampling method outlined in this chapter is best understood as purposive because the study, while being empirically grounded and iterative in nature, has a predefined area of focus (an avatar-based working definition), which also limits its claim to inductiveness – especially when the following sampling method is considered. I suggest no specific hypotheses about this subject matter beyond the assumed existence of structures that can be studied through the chosen method.

The data resulted from the coding process of the 99 game titles is qualitative rather than quantitative, a characteristic of the purposive sampling method (Etikan et al., 2016, p. 3). This places a primary emphasis on saturation (ibid., p. 4), which aligns with the considerations of sample size previously discussed. Convenience sampling and purposive sampling may be easy to confuse (ibid.), and at times, the sampling might have swerved more to the convenience method, due to availability at the Ludov Game Lab at Université de Montréal, where much of the analytical work took place. However, the process of collecting the data for the corpus was, to be frank, far from convenient, and each new game in the sample was continuously compared to the remaining sample, the working definition, and the diversity labels to secure relevance and not simply convenience. To secure that all games included were played on original platforms rather than run on emulators on a PC (albeit not always on the console for which the very first version of the game was released), and to secure historical diversity in the sample, it was necessary to visit an institution that had the facilities required for such a study, and the older games in the sample were thus limited by availability at the Ludov Game Lab.

Other terms are frequently used synonymously with purposive sampling, including *purposeful sampling* or *judgement sampling* (Marshall, 1996). The latter brings attention to an aspect that needs clarification in relation to the sampling for this project, as it emphasises how “the researcher actively selects the most productive sample to answer the research question” (ibid., p. 523).

Determining what constitutes the most productive sample in the context of this study involves a variety of factors. A productive sample is one that is relevant within the problem area of the research project, and hence the working definition of avatar-based games was used in the game selection. Similarly, I determined that historical diversity, including platform diversity, was important, assuming there might be historical trends in the PO-VE relations (or, as I phrased it in the early stages of the project, in *the relationships between avatars and gameworlds*), and that these relationships may differ according to platform and controller.

However, included in the considerations of what constitutes a productive sample were also considerations of prominent games within games research in general; games that have already been the subject of many analyses, and onto which this project and the resulting framework might shed a new light. Therefore, most games included in the sample are titles that the reader may have encountered before when engaging with (theoretical and analytical) game studies. This governing principle for inclusion, as well as the active role of the researcher in purposive sampling, results in a non-quantifiable data set that cannot be taken to represent a truth for *all* games. Some measures have been taken to secure diversity and variety in the sample, yet it remains that the sample is by default subject to some bias, as the games included were all handpicked by the author based on a variety of factors discussed here. Some of these factors must be further unpacked, to understand the specificities of the selection process, and this is done in the following sections.

2.4.2 Avatar-based: A working definition

In the early stages of the research project, where the project was still largely characterised by an interest in the two concepts of *avatars* and *gameworlds*, it was decided to develop a working definition of what constitutes an *avatar-based game* and let this definition guide the game selection, to make sure that at least parts of the sample were types of games that would be considered 'avatarial', in some sense of the word. It was thus decided that approximately half of the sample should consist of games that met the definition, whereas the other half of the sample should consist of games that met the definition only in varying degrees, ranging from 'close to avatar-based' to 'not avatar-based at all'. This decision ensured the inclusion of borderline and outlier examples, as these are typically valuable for demarcating theoretical as well as descriptive frameworks and definitions.

Chapter 4 goes in-depth with various approaches to and definitions of avatars and other terms and concepts that became relevant for the conception of the *player object* term. The following working definition, which came to govern the sampling process, is based on a short review of selected avatar theories (Bayliss, 2007; Blanchet, 2008; Kromand, 2007; Linderoth, 2005; Vella, 2015):

An avatar-based game is a game in which the player manipulates a single, concrete entity, which functions as the primary tool for playing the game.

I have already discussed the limitations of the *game* term, and how the study is focused on digital single player games with graphic virtual environments.

In various avatar-definitions, *manipulation* is described either explicitly as such (Bayliss, 2007; Blanchet, 2008), as *control* (Kromand, 2007; Linderoth, 2005; Vella, 2015), or as *agency* (also Linderoth, 2005). In the definition above, it refers to the handling of the input device (game controller, mouse and keyboard, etc.) leading to control of the in-game entity, facilitating interaction with the game. Thus, *manipulation* is meant here as a broad term describing the translation of a broader category of user inputs into effect in the game. This is typically done through a physical device, such as a mouse and keyboard combination or a dedicated controller, yet input may also include, for example, sound, as in *Racing Pitch* (Skinflake Games, 2006), a racing game where the player controls their car using their voice, having to mimic engine sounds to move the car along the track.

The avatar-based game is focused on controlling a *single entity* at any given time, rather than a multiplicity of entities. *Entity* is here understood as a functional, specific entity under the player's control. However, the player may be responsible for controlling both the entity as well as a virtual camera and additional items, e.g., resources. The individual entity is the *primary tool* for playing the game. Thus, games in which the player controls multiple entities do not qualify as avatar-based games following the working definition (as in *Brothers: A Tale of Two Sons* [Starbreeze Studios, 2013] in which the player controls two brothers using two distinct control schemes on the same controller/keyboard). Neither do games that allow the player to switch between the entity under control (as in *LEGO Marvel Super Heroes*, where the player has at their disposal multiple distinct characters in each level, each of which can perform unique actions needed to progress through the game, and which they can switch between at any given moment by pressing a dedicated button). As a borderline case to this notion of single vs. multiple entities are games in which the avatar's 'health' is condensed to a set of resources that is exhausted over time (e.g., *Wizard of Wor* [Dave Nutting Associates, 1983], where multiple Worriers are lined up along the side of the screen, almost as if they were pinballs in a flipper machine. Once the Worrier in play has been defeated, a new one enters the game, almost as if the distinct Worriers represent one 'life' out of many, as known from, for example, *Super Mario Bros.* [Nintendo R&D4, 1985]). The single entity is also a *concrete entity* that belongs functionally to the virtual environment of the game. This means that, for example, cursors and overlay menus cannot be understood as avatars in this more traditional sense, as they exist as a part of a WIMP (windows, icons, menus, pointer) (Chignell & Waterworth, 1991) interface.

2.4.3 Securing centrality and variety

The working definition was used to secure varying levels of 'avatar-based-ness' in the games selected for the sample. This was accomplished by accounting for each game's *centrality* and *centrality gradience*, terms borrowed from prototype theory (Lakoff, 1987), before the game was added to the set. Lakoff's terms are derived from Wittgenstein's idea of *family resemblance*, which has often been referenced when discussing whether and how one might define the general category of (digital) games (see e.g., Aarseth & Calleja, 2015; Arjoranta, 2014). In this study, the prototype concept of centrality gradience and the working definition help secure a diverse sample, and hence a diverse data set.

Whereas centrality gradience is typically used in relation to a specific prototype, the concept is here applied outside this typical use, and thus extended to account for the *extent to which a given game meets the working definition*. For this purpose, the centrality gradience was used according to the number of criteria (*single entity*, *concrete entity*, and *primary tool*) from the working definition that are met by the specific game. Each new game was thus assigned a centrality variance score of 0-3 (0 indicating it fits the working definition, 3 indicating it diverted from all three criteria), when assessing whether it was a fit for the sample.

Braid (Number None, 2009) serves as an example that fits the working definition of an avatar-based games: in it, the player controls a single entity, represented by the character Tim, in his search for his princess. Tim is a concrete entity and belongs functionally to the gameworld because he can act on and be acted upon by other entities in the game, including for example the enemy *monstars*. And finally, Tim is the primary tool with which the player plays the game. Therefore, *Braid* is assigned a centrality variance score of 0.

Image 2.3. Screenshot from *Braid* (Number None, 2009), an example that fits the working-definition of avatar-based games.

Fruit Ninja (Halfbrick Studios, 2010) (as played on a touchscreen device), on the other hand, diverts from the definition's criteria of having a *concrete entity*, as the player's single tool for interacting with the game is constituted by a blade that exists only when the player touches the screen, and which functions much like a mouse cursor that facilitates actions, but without being integrated within the gameworld in a way that allows other entities to act upon it. The blade is a single entity that functions as the player's primary tool for playing the game, but because of the blade's transcendent quality, the game is assigned a centrality variance score of 1, marking that it deviates from one of the criteria of an avatar-based game. A handful of games in the sample have a centrality variance score of 1 because the player control *multiple* entities, either one at a time as in *A Dinosaur's Tale* (Funcom, 1994), where some levels are played as a human child and others as a flying dinosaur, or multiple simultaneously, as previously described in *Brothers: A Tale of Two Sons*.

Games assigned the centrality variance score of 2 are relatively rare, as the criteria of the working definition often appear in one form, or three in combination. The sample does, however, include some examples, such as *Baldur's Gate II: Enhanced Edition* (Overhaul Games, 2013). In this game, the player controls a party of characters, one of them created by the player themselves before the game is launched. The game presents the gameworld through an isometric perspective, and it can be interacted with by marking whichever character the player wishes to control and then clicking on a section of the world they wish said character to navigate to or interact with. However, much of the game is played by clicking overlay menus to assign tasks and use and equip items. While it may be a matter of playstyle how much time is spent in the overlay menus, and how much time is spent clicking the characters around the map, I argue that the characters themselves do not serve as the primary tool for interacting with the game, as the menus play just as big, if not an even bigger role in the game. Thus, the game deviates from the working definition in two ways: the player controls *multiple* entities, and these do not constitute the *primary* tool for interacting with the game. They are, however, both *concrete* entities in the gameworld, while at the same time also represented in the multiple overlay menus at play. Therefore, the game is assigned a centrality variety score of 2.

Finally, the sample includes some games that do not meet the working definition at all, thus constituting examples that are not considered avatar-based in any way. One of such examples is *Cook, Serve, Delicious* (Vertigo Gaming, 2012), a restaurant simulation game, in which the player, through multiple mini-games requiring both speed and coordination, must run a restaurant. This involves, amongst other things, putting together the correct ingredients to form a dish, which is done by pressing the correct keys that, according to information on the screen, represent the required ingredients (see screenshot below).

Image 2.4. Screenshot from *Cook, Serve, Delicious* (Vertigo Gaming, 2012), in which the player must press the correct keys to fulfill the customer's order.

In *Cook, Serve, Delicious*, there is no specific entity used to play the game, nothing that can be discussed as more or less concrete, or accounted for as single or multiple. The primary tool for interacting with the game are the many varied 'recipes' that inform the player on how to use keyboard input to assemble the correct dish. Therefore, the game is not avatar-based in any way following the working definition and is thus assigned a centrality variance score of 3.

Thus, the purposive sampling of games for the study is guided in part by an initial analysis, evaluating the centrality of the specific example and comparing it with the existing corpus. This means that the game selection was an iterative and comparative process, based on continuous analysis and comparison to ensure variety in the centrality gradience of the titles chosen.

2.4.4 Diversity labels

As a final way of providing diversity across some factors in the sample, and in addition to the availability of the games, occurrence in other game studies research, and the centrality variance score based on the working definition of avatar-based games, four diversity labels were considered during the selection process: *country of production*, *release year*, *platform*, and finally *genre label*. These were applied as guiding principles for the selection, rather than as strict criteria for inclusion and exclusion.

For example, when adding a game to the sample, I made a conscious effort in selecting games across the various platforms available at the Ludov Game Lab, thus securing diversity in terms of release year as well as platform. From the library of games available for each platform, early sampling was conducted more randomly, guided mostly by availability, awareness of the available games' inclusion into scholarly work on digital games, and potential relevance in terms of presenting a particularly interesting or borderline example, for example by being playable using special controllers. By contrast, during later sampling, games were more purposively picked to secure the needed diversity in terms of centrality gradience. Whenever possible, I chose games of underrepresented genres in the sample at the time, to which I kept adding games until the saturation point of 99 titles was reached.

The diversity label *country of production* is based on the country in which the (primary) development studio or primary developer (for games developed independently of studios) is located. *Release year* refers to the year of release of the version played for the study. The *platform* label designates the platform on which the specific version of the game is played – efforts were made towards playing most games on the platform for which they were initially released, but this proved to not always be possible. Lastly, the *genre label* refers to the genre of the specific game listed on MobyGames.

While the whole concept of genre in games is problematic (Apperley, 2006), particularly when considered in relation to the formal qualities of the game object versus the player perception and market-based labels (ibid.), it remains meaningful to sort the games selected for this study according to *some* indication of their content and form. An alternative to the genre label could be a formal analysis of the whole game, for example by using categorisation tools such as Elverdam & Aarseth's (2007) game classification tool. However, the type of analysis required for such categorisation would be out of scope given the size of the data set, and furthermore would not help in labelling each game with simple identifiers. Therefore, the labels found on MobyGames are used solely for the purpose of making sure that the sample consists not only of games listed as a specific genre[3].

Yet, the sample illustrates that games that fall under the working definition of being avatar-based tend to be of a certain genre. Strategy and puzzle games qualify less frequently as avatar-based, since these typically involve controlling either multiple concrete entities, or no concrete entities at all. Therefore, the use of the working definition in the sampling process, and the decision to include a significant number of games that meet all three of the definition's criteria, resulted in a sample in which some genres are underrepresented, despite secondary selection criteria of the diversity labels.

2.4.5 Limitations of the sampling method

As I have already argued, this sampling method is a purposive one, but I must admit, also a flawed one. Letting the selection be guided by a working definition of avatar-based games was a decision made in the early stages of the research project. In hindsight, with the focus changing from avatars in gameworlds to the significantly different concepts of player objects in virtual environment, a different nonprobability sampling method could have provided a more justifiable basis on which to base the project, and ultimately the PO-VE framework.

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[3] The genre label is a measure to avoid unnecessary bias resulting from the judgement aspect of the purposive sampling method. Yet, because these labels are sometimes surprising or appear somewhat imprecise for each individual game, the genres will function as an indicator of diversity rather than be determining for the selection of each title. MobyGames lists 12 game genres, according to which their database is categorised. These are: Action; Adventure; Compilation; DLC/add-on; Educational; Puzzle; Racing/driving; Role-playing (RPG); Simulation; Special Edition; Sport; and Strategy/tactics. Sometimes, several genres are used for describing a game title and the way in which a game's genre is defined is unclear. Some of the genres from their list extend beyond what may be considered typical genres in game criticism and journalism, and it is thus easy to criticise the list as representing actual *genre*, as it is discussed in game studies literature (see e.g., Apperley, 2006). Thus, the genre label is used as only one of many indicators of diversity in the sample.

Some bias in the selection method, however, is inevitable, and could only possibly have been circumvented using a probability sampling method, in which case it would have been difficult to delimit the sample to consist of (primarily) of games configured according to the topic of the investigation. In hindsight, there would likely have been more straightforward ways of selecting games for the study and methods that would have resulted in a more limited bias, while securing a selection of relevance to the study. However, while I am now certain that there are better ways of selecting a sample for a study such as this one, the final sample *did* support the construction of a framework. When reversely applied to the games whose content formed the basis on which it was developed, which will be illustrated by the analysis in chapter 6, the model proved applicable to and relevant for analysing 78 out of 99 games.

The 21 games that were part of the empirical foundation leading to the PO-VE framework, but which ultimately did not meet the player object definition, were by no means 'useless' simply because they are not considered player object-based and therefore could not be included in the comprehensive analysis that takes up the first part of the analysis chapter. Quite the contrary, player objects and virtual environments were defined based on a data set of codes from the *entire* sample, and the 21 non-PO-VE games were thus essential for delineating the framework.

Choosing a different sampling method might have resulted in a much simpler (and arguably shorter) methodology chapter because it would have been easier to account for in terms of selection method bias. The final PO-VE model and the terminology of the framework is a direct result of the analysed content of the 99 games. Yet, I doubt the central terms and concepts of the framework would be considerably different had it been based on games selected through a less avatar-centric sampling method.

What must be considered a direct effect of the chosen sampling method, however, is the fact that I cannot properly claim the method to be inductive, as theory and thus predisposed understandings of avatars and gameworlds governed the sampling. While the theories involved in the sampling were not involved in the theory development itself, the observational data from which the theory is developed is a direct result of engagement with the sample, selected (in part) according to a theoretical understanding of avatar-based games. I believe the framework would have looked similar had other selection criteria been involved in the sampling, but this I have no way of confirming this. What I *can* confirm is the framework's applicability to games beyond the sample.

There are, similarly, consequences resulting from the scoping of the research object. Not considering, for example, multiplayer games or non-graphic virtual environments makes the applicability of the model more limited than had it also encompassed these forms. The choice of excluding multiplayer games has further consequences for the ability to adapt the PO-VE framework to virtual environments of other media, as some forms of virtual-environment-based media exist *only* in multiuser form – including online virtual worlds, such as *Second Life* (Linden, 2003).

The decision to exclude multiplayer games, as discussed earlier, was first and foremost a practical one, but one that also brings with it a certain focus in the PO-VE framework. Expanding the research object upon which the framework is based (for example, to include multiplayer games) would cause it to be less specific, as the terminology as well as the analysis model would have to be applicable to more diverse forms. While the scoping is thus a limitation, it also facilitates more in-depth explorations of the objects of study chosen.

In terms of diversity in the sample and hence in the data set, the four diversity labels *country of production*, *release year*, *platform*, and *genre label* secured awareness of these parameters during the selection process. The final sample (an overview of which can be found in the appendix) contains games published between 1978 and 2018, across 32 different platforms, developed in 17 different countries. There are types of diversity not accounted for with these variables, and even though I attempted to represent games developed across the world, the player object's representation as a Caucasian man dominates the sample. The general (lack of) diversity of representation within digital games, however, is beyond the scope of this project, yet something I deem necessary to point out as an unfortunate pattern, also in my own data.

2.5 Analysis methods

The data on which the study is based is the result of the application of a specific analysis method to the 99 games. Aarseth (2003) argues that "[a]ny theoretical approach to game aesthetics implies a methodology of play, which, if not declared, becomes suspect" (ibid., p. 1). To avoid such suspicion, and to secure thorough transparency into the construction of the empirical basis of the study at hand, this section outlines the process of developing the data set, from concrete, experiential interactions with the games to the actual codes that have formed the basis of the PO-VE framework,

2.5.1 Play sessions and documentation

The games of the study were played during the first two years of the dissertation work, between the winter of 2016 and the winter of 2018. All titles were played on original hardware rather than emulators – the platforms listed for each game in the ludography and gameplay log (appendix) are the ones on which the games were played. Many play sessions were carried out at the Ludov Lab at Université de Montréal, which has a collection of original consoles and games that would otherwise have been inaccessible to the project. The facilities at the Ludov Lab thus helped secure historical and platform diversity in the selection.

Play sessions took place primarily at the Ludov Lab and at my own home or office, except for some games played on handheld devices. All play sessions followed a similar structure, where keywords and other notes were written down during play. Therefore, the games sometimes had to be paused to secure proper documentation. The play sessions of some games resulted in extensive pages of notes, whereas others resulted in only a few paragraphs. This depended on the type of game and the extent of interesting and potentially relevant observations made, as well as the amount of time spent with each game in question. Some games were played over longer periods of time, thus spanning multiple play sessions, whereas others were engaged with only for a limited time in a single session.

For example, *Lazarian*, played on the Commodore 64 at the Ludov Game Lab was completed within approx. 15 min., and played repeatedly to achieve a certain level of familiarity with the game. In total, one hour was spent playing the game, as is apparent in the gameplay log (appendix). *The Legend of Zelda: Breath of the Wild* (Nintendo EPD, 2017b), on the other hand, was played for a total of 17 hours, although not completed. The 17 hours were spread across many play sessions on the Nintendo Switch handheld console. While spending more time with the game may have revealed more interesting functional relationships worth considering in the analysis, I had the impression that I had familiarised myself with the game well enough for it to contribute meaningfully to the study. 12 of the 99 games were completed in the play sessions; of course, those that were not completed may have interesting content that this study does not account for, as I did not make it to the given point of the game at which this content became manifested. For this very reason, I find it important to be straightforward and transparent with regards to the amount of time spent with each individual game – hence, the gameplay log.

Type of play

The amount of time spent on playing each game (including notetaking) was documented, along with an assessment of the *type of play* performed. Type of play refers to Aarseth's seven types of play, outlined in his suggested method for game analysis (adapted from Aarseth, 2003, p. 6):

- *Superficial play*. The analyst plays around with the game for only a few minutes to make a quick assessment and get a 'feel' of the game in question. They will not learn the interface commands or understand structural features.
- *Light play*. The analyst understands and learns enough about the game to make some meaningful progress but stops as soon as this progress is made.
- *Partial completion*. The analyst reaches a (series of) sub-goal(s) in the game, implying that they have a good understanding of both interface commands and structural features.
- *Total completion*. The analyst plays the game to the end. Aarseth does not specify if this includes all possible side missions/quests/content, or only the main parts of the game. Thus, the

type is, in the gameplay log, used to refer to games in which the main content is played to an end, reaching a defined ending.

- *Repeated play*. Usually follows completion, unless the analyst is familiar enough with the genre that no substantial learning is necessary.
- *Expert play*. Usually follows completion unless the analyst has great familiarity with the genre. The analyst is typically also the winner of the (type of) game.
- *Innovative play*. The analyst invents new strategies and plays to achieve goals by unrecognized means, rather than to win. This type of play seems rare among analysts.

Based on self-assessment, the type of play performed in the play sessions for each distinct title was documented. To secure thorough familiarity with the game selection, superficial play was avoided, as this type does not allow for proper analysis.

Gameplay log

As indicated above, the play sessions were documented through various means. This was done to secure transparency of the study's empirical, but also to support the iterative coding process and the development of the theoretical framework.

The gameplay log (found in the appendix) contains the 99 titles selected for the study, listed as *game title*. In addition, the *platform* on which each game was played is listed, along with the *type of controller*. The type of controller can be one of the following:

- *Controller* simply refers to the console's original controller, the type varying from console to console.
- *Keyboard* refers to a computer keyboard.
- *Mouse cursor* refers to a computer mouse.
- *Special controller* refers to a controller that is not the original controller for the console in question, but which is required to play the listed game (e.g., the plastic guitars needed for playing *Guitar Hero*).
- *Touch display* refers to the smartphone surface as a controller (as no games were played on a tablet).
- *+ motion* is added to those games for which the movement of the controller type in physical space functions as a type of input in its own right.

Following the controller type, the gameplay log contains details on the time spent playing each game title, indicated in hours and minutes. For most play sessions, the time was tracked using a timer, and thus includes the time during which the game was paused for notetaking. For titles played on the PC, through Steam, the time details are based on Steam's tracking. The time noted is rounded up to the nearest five minutes.

The gameplay log accounts only for the time spent with each game in the construction of the data set. Additional time was spent playing throughout the project as the PO-VE framework was developed and analyses were conducted. More on this in chapter 6. The last variable presented in the gameplay log is the *type of play*, based on Aarseth's descriptions, as presented in the previous section.

Visual and audial documentation

While hardware solutions exist for recording the audio and video from a game played on any type of console, this type of configuration is often very time consuming to set up and may cause delays in the feedback loop, especially for older consoles. It was therefore decided that the time required for such a set-up for all 99 titles would be too much trouble, and thus proper screenshots exist only for the games played on PC, Nintendo Switch, Android (smartphone), and PlayStation 4. No audio or video recordings were made.

While the original intent was to avoid emulators altogether, these have been necessary for documentation purposes in those cases where screenshots were required in the dissertation, to illustrate the visuals of the game in question. All screenshots are presented with a reference to the game from which they have been taken, and those obtained using emulators explicitly state so.

The final type of documentation from the play sessions is that of keywords and general notes, which formed the bases for the iterative coding process which will be presented in the following section.

2.5.2 Iterative coding

The development of the data set was an iterative process throughout; during the play sessions, initial keywords and notes were cross-checked with new entries to ensure cohesion in the observations made. For example, if notes from one play session explicated the ways in which the possible actions developed and changed during the game, all former notes would be revised to contain information on the development of possible actions, too. Thus, the notes were continuously revised as new keywords were entered. On few occasions, this involved incorporating additional play sessions to retrieve the necessary information about all games. This process resulted in an overwhelming amount and variety of notes that needed narrowing down, first into codes and categories, and then through continuous processes to secure more specific and mutually exclusive codes and categories.

The iterative coding process took place over the course of eight months, as the codes were compared, analysed, and discussed in relation to their potential use as a foundation for an analytical framework. As the codes were refined and rephrased, new themes emerged, and thus new codes were added as old ones were deleted, merged into more general codes, or separated into several more specific codes. The data set consisted of 167 codes after the initial coding process, and the set was further reduced, through several iterations, to 83 codes. These codes were condensed into an initial framework (Willumsen, 2020) consisting of 16 categories with 73 corresponding types across those categories, and finally condensed into the PO-VE model consisting of seven different categories with 23 different types across, presented in chapter 5. The steps from codes to model are discussed further in the chapter dedicated to the model.

Different levels of coding

The term *coding,* as it has been used throughout this chapter, requires some clarification. It refers to the noting down of observed content considered relevant for the study at hand and the further development of this data into codes. It is a qualitative analysis of the relevant content of the digital game as experienced through gameplay. This means that the object under scrutiny is the result of the real-time hermeneutic engagement, as is described in the following section. I have discussed this inherent difficulty of analysing games in the introduction and in earlier sections of the methodology, where I defended the inevitable interpretation involved in studying digital games.

Thus, it needs emphasising that *coding* in this study is not identical with the social science methodology of coding, where a code is understood as "a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (Saldaña, 2015, p. 4). The expansive notes from the observations resulting from a qualitative analysis of the games constitute in themselves the data, which is thus assigned essence-capturing words and phrases. As a result, the iterative coding process is, like the process of play, also *hermeneutic* at its core.

(Game) hermeneutics

Playing a game "requires analysis practiced as performance" and thus the very process of playing a game, even outside of a research context, involves *real-time hermeneutics* (Aarseth, 2003, p. 5). Arjoranta (2011), expanding on Aarseth's idea, states that the involvement of the real-time interpretive demands of games does not mean that there is "only one possible correct interpretation of the game itself, but that the game supports some and opposes some interpretations" (ibid., p. 6).

In addition, Arjoranta argues that procedural interaction, caused by the game's inherent temporal properties that differ from those of traditional, non-interactive media, can create "unforeseen results" which thus "differentiates games from other hermeneutic objects, which do not have changing intrinsic properties" (Arjoranta, 2011, p. 10).

The hermeneutic circle applies to the understanding of the digital games played in the sense that "the parts can only be understood from an understanding of the whole, but that the whole can only be understood from an understanding of the parts" (Schmidt, 2006, p. 4). Thus, understanding both details and the whole of a game depends on circular interpretation, a movement that is brought forward by the iterative structure of the project. For the individual play session, the real-time hermeneutics of digital games demand the circular interpretation as a part of gameplay and it is thus not performed as an analytical task, but rather as a necessity for engaging with the game.

2.6 From codes to model

The selection and analysis methods employed in the study of the 99 games have been presented and discussed above. Thus, what remains is to account for the process from codes to model – how the PO-VE model came to be, and the extent to which it builds on the observational data resulting from engagement with the 99 games of the sample. In this following section, I use terminology that will be clarified in chapters 3 and 4 – particularly regarding the specific definitions and understandings of the central concepts *virtual environment* and *player object*. The process of transforming the codes into the final PO-VE framework is a part of the methodology of the project and is therefore covered in this section of the dissertation. It may, however, be worthwhile returning to the two sections below after reading the theoretical chapters clarifying the central concepts.

2.6.1 Iterative compression and elimination

The iterative coding process was also a process of compression and elimination. Through the different iterations the number of codes was reduced from an initial 167 codes to 83 codes, which were further reduced into the first iteration of the PO-VE framework (Willumsen, 2020) consisting of 16 categories and 73 types. For each iteration, codes were cut or combined, making the codes and the resulting framework both more compressed but also more focused, with continuous elimination of elements that were considered less relevant for the goal of the study.

While this first iteration served a useful tool for securing a detailed analysis, it took the form of a descriptive framework with a wide array of categories, in contrast to the final PO-VE model which is developed with the specifically analytical purpose in mind. The PO-VE model functions as an analytical tool, somewhat removed from the empirical data through theorisation and conceptualisation of the observed and described details of the game objects. Put differently, it offers *depth* rather than *width*, and contains concepts developed to account for the observed trends and patterns within the data set in a compressed form, rather than categories and types presented in a less refined form.

2.6.2 Examples – from empirical data to conceptual model

Examples illustrate how the empirical data in the form of notes and codes were used for developing a more analytical framework. For example, one of the original, pre-code notes from *Brothers: A Tale of Two Sons* reads as follows: "Physical attributes of avatars determine some possible actions (e.g., younger brother can squeeze through narrow openings, older brother can pull lever/is stronger)", and a note from the *Undertale* (Fox, 2015) play session explains that "Visual representation + affordances of environment changes for each level/'world'". Both early notes, considered the very first step in constructing the data set, illustrate an approach to the game as a functional and relational system used as a conceptual frame for the final PO-VE model, and they both use terminology later integrated within the framework, notably the concepts of *affordances* and *attributes*.

Similarly, the notion of alterations and conversions, as well as the distinction between representation and functionality which is at the heart of the model, are apparent even in the early codes. One of the original notes from playing *Altered Beast* states that "Possible actions in beast mode varies, as well as visual representation (e.g., in one level it's a dragon)". In the third coding iteration this was generalised into the code *Avatar alteration*. Thus, while the conceptualisation of the codes makes the framework different from the more descriptive character of the earlier version (Willumsen, 2020), the final version presented in the PO-VE model in chapter 5 reflects the essence of those codes deemed most interesting and relevant for understanding player objects and their integration in the virtual environment.

2.6 Methodological challenges and limitations

2.6.1 Epistemological reflections

The non-quantifiable nature of most of the research conducted within the humanities does not entail that such research is invalid, not useful, or somehow worth less than quantitative, generalisable studies. Every research method will produce its own type of data and some types of studies are better at answering some questions than others. The idea that "the problem under investigation properly dictates the methods of investigation" (Trow, 1957, p. 33), however, is perhaps ignorant of the fact that one problem can be approached with a multiplicity of methods and that each of these methods may yield interesting results for the problem in question. While Bryman (1984) warns against considering quantitative and qualitative methodologies as epistemologically distinct (ibid., p. 85), it seems that each specific research method – not just quantitative and qualitative, but all respective methods encompassed by these terms, including hermeneutic interpretation – will face its own variety of epistemological challenges. Those posed in this study include general considerations of structuralist philosophy of science, the issue of interpretation in formalist work, reflections on the nature of the research method in general, but also more specific aspects such as the size and scope of the data set and the variety within it, which can be condensed to the major epistemological question: *how do we know that we know?*

Certain criteria can help guide a thorough research method. For this study, these criteria include securing some diversity in the 99 games through a game selection method accounted for in detail, the empirical ground covered through 99 examples, and the careful considerations of inevitable subjectivity of the hermeneutic method. However, all methods will have disadvantages, in part through their epistemological challenges, but also in large part due to practical limitations. The limitations of the sampling method were discussed in 2.4.5, as were the implications for the PO-VE framework developed according to the observational data and resulting codes derived from this sample.

2.6.2 Methodological reflections

The notes and codes resulting from the observations and experiences made with the 99 games are not generalisable in the same way as quantitative data. The method does not result in quantifiable measures of games, but this is not the intention and therefore it is not considered a problem. Instead, the study, much like the structuralist investigations of Propp and others discussed earlier, is based on a comprehensive overview of many different digital games, and the resulting framework is based on the structures observed in these many and vastly different games – an approach I refer to as *a posteriori*, but not *inductive* proper, due to the theoretical influences on the sampling method.

The complete method of the study combines established analysis methods with empirical data and thus attempts to expand and explore the possibilities of basing the study of game structures in empirically rooted work. This is an alternative to the deductive methods where models are based on the researchers' diachronically developed knowledge of games, presented through some illustrative examples. It is not the first study to incorporate a wide selection of different games – this has already been done by Järvinen (2007), Galloway (2006), Björk et al. (2003), and Djaouti et al. (2008) – but it is the first one to do so in a way that combines the explicit structuralist approach, an *a posteriori* method, and a theory development agenda.

The iterative coding of the 99 games presents an alternative to existing approaches, guided by the structuralist three-part structure from *content analysis* to *theory*, encompassed in a general framework consisting of terminology and theory, and which is finally summarised in a *model*. At the same time, the study's structure shares many similarities with grounded theory. The sample, however, is not guaranteed to account for all interesting, or even typically occurring patterns related to player objects in virtual environments. This would be the case regardless of sampling method, due to the great variety in digital games that could not be assumed covered even with a probability sampling method with a corpus "limited to" 99 games. Borderline cases and games that do not fall under the categories developed based on the sample are included as I introduce the PO-VE model and apply it in the analyses of 10 different games from the sample.

A limitation that bears mentioning in relation to the specifics of the data collection has to do with the time spent with each of the games in the corpus. As specified earlier and detailed in the gameplay log (appendix), some games were played for a significantly shorter time than others, and the games were engaged with on different levels of depth and types of play (according to Aarseth's [2003] types). An alternative approach could have been to standardize the play sessions following a specific protocol. This was done by Therrien et al. (2019): when analysing games through their HACS framework (discussed further in chapter 4), the analysis was based on "1-hr-per-game encoding procedure" (ibid., p. 8). In the context of this study, this would have resulted in more direct congruence between the codes from each game. However, since the games presented phenomena relevant for the topic of the overall research project in quite different capacities, and because the corpus consists of games of such different nature that it is impossible to assess a specific time frame after which one can assume to have a general understanding of their configuration, it was decided to engage with the games through various types of play, and thus through various degrees of time investment.

There are limitations and potential problems with the method that have not been discussed here. This will always be the case for any methodology; the path chosen excludes all other potential paths, and so the methodological choices exclude many other opportunities for collecting and analysing data for the study at hand. The novelty of the method also means that it is not yet 'fully polished' – I shall be the first to admit to some of its flaws, in particular those pertaining to the sampling method.

Yet, as will be presented throughout the dissertation, the results from the content analysis and coding process proved extremely useful in uncovering the structures of player objects in virtual environments. The method exposed aspects of the PO-VE relations that I would have never thought of myself had it not been for the empirical basis of the method. This is a crucial outcome, one that confirms the method's advantages and further potential.

2.7 Summary and conclusions

This chapter has introduced the various steps in the methodology of the present study, considered in comparison to other research methods, both game-specific and not. Primary connections were drawn to the structuralist study of Propp (and the less structuralist Campbell), while significant similarities were identified in relation to Järvinen's (2007) applied ludology, and to some extent with the game design patterns project (Björk et al., 2003) and The Game Ontology Project (Zagal et al., 2005).

Much like the traditional structuralist studies of literature, this study is a three-part project, which builds on qualitative content analysis to develop a theory, which is illustrated through a model. Taken together, these three elements constitute what is referred to as *the framework*. This structure, and in particular the empirical foundation of this project, also shares many similarities with grounded theory.

This chapter also involved a critical discussion of the role of interpretation in formalist studies, as well as a reflection on the limitations of observational data, in particular in a study that focuses on functionality, structures, and relationships in a system.

The framework is developed based on the method described throughout this chapter, where theory is developed through the study of empirical data. However, it cannot properly be described as *inductive*, since an initial hypothesis – an understanding that there are structures to be explored and mapped in relation to the subject matter studied – influenced and determined the methods employed.

Following the discussion of existing methods, the chapter presented the idea of a corpus built from the analysis of 99 different digital single player games. The data set itself was introduced as a result of a qualitative content analysis structured as a specific iterative coding process. It consists of the codes resulting from engagement with the sample. I presented how the 99 games were selected using a working definition and principles from prototype theory, along with various diversity labels. The analysis method was introduced, along with the gameplay log (appendix), accounting for the engagement with the 99 different games.

Some final, and more general limitations of the method were discussed at the end of the chapter, although major concerns regarding specificities of the method were approached throughout the chapter. The more general reflection includes criticism towards structuralist approaches, practicalities of play sessions and documentation, and real-time hermeneutics as they are an inevitable part of playing a game. This puts extra demands on the development and testing of the theoretical framework, in order to ensure relevance across games, as well as critical reflection on the potential uses and applications of the resulting framework.

3. Virtual Environment

3.1 Chapter Introduction

If I say the words *virtual environment*, you might think of a rich and detailed fictional world which you can interact with through a character belonging to said world – Link moving through the valleys of Hyrule, or Mario fighting Bowser and his minions in the Mushroom Kingdom. You might think of the social and ethical rules and guidelines one needs to consider before interacting with other people in *Second Life*. Or perhaps you are thinking of the map of one specific capture-the-flag game of *Quake Live* (id Software, 2010), and how memorising every detail of the layout might benefit your next game and lead to victory for you and your friends…

Virtual environment is one of those terms that can mean many different things, both to players and scholars. It is a term which is frequently encountered in academic literature, but which is rarely defined. This puts pressure on the scholar who wishes to use the term in their research; careful inquiries into existing works are needed to offer a suitable definition. This is the goal of this chapter: to review existing approaches to the virtual environment, related terms and phenomena, and based on these reviews propose a specific definition that will structure and guide the study moving forward. Player objects can only be experienced in the virtual environment and understanding the relationship between the two thus depends on a thorough approach and definition of both.

This chapter situates the virtual environment within discussions of game spaces, fictional worlds, virtual worlds, landscape structures, and game ecologies. What is more, it reviews different uses of the term *virtual* to pinpoint what this means in a digital games context. I propose a functional definition of the virtual environment that allows us to explore its objects in terms of their integration within it. This is critical for the understanding of player objects as integrated objects within the virtual environment.

3.2 Alternative approaches

3.2.1 Digital games and space

The definition of the virtual environment, as the term is used in this study, is related to conceptions of spatial configurations and topography. To be able to discuss how the definition of virtual environment and the general PO-VE framework and model relates to scholarly work on video game spaces, this section is dedicated to the presentation and discussion of a few selected approaches.

Since many scholars have theorised space as a defining quality of digital games (e.g., Aarseth, 2000; Murray, 1997; Nitsche, 2008), it is no surprise that the body of literature on the subject is both vast and complicated. The literature covered here thus presents only parts of the research conducted in relation to space and games, focused on aspects that are considered particularly relevant when discussing the definition of virtual environment as applied here, but also for the overall discussion of player objects and their integration within an environment that we can think of as a *space*.

What is *space* in a digital games context? According to Nitsche (2008), it is impossible to reduce a holistic principle such as space to a single concept (ibid., p. 8). As a solution, he suggests five different conceptual planes for analysing game spaces: the rule-based space, the mediated space, the fictional space, the play space, and the social (ibid., p. 16). These are involved in the project in varying extent, but do not directly relate to spatiality as it is otherwise explored within this chapter.

The rule-based space is defined by mathematical rules that determines, amongst other things, physics, sounds, and level architecture in the digital game. Thus, the space is not limited to the ludic game rules, but the functional rules of the game system. Through his inclusion of the example of 'level architecture' it thus becomes apparent that the rule-based space is perhaps a term somewhat equivalent to *functionality* as it is used throughout the study, in the conception of the virtual environment as a relational system as will be presented throughout this chapter.

The observational data resulting from the experience with the game 'as executed' inevitably involves Nitsche's mediated space, defined by the game's audio-visual presentation, because the rule-based space is known only through feedback loops in which the analyst gains information about the functionality of the system through the presentation of the virtual environment and its objects on screen. Because the mediated space is the only truly accessible space to the analyst who does not have access to the game's source code (or other technical documentation), the analysis of the rule-based space, and thus the functional analysis of games, is almost a type of second-order analyses. In this analysis, the mediated space is decoded to uncover the relationships between the software objects and their representation. The analysis of the rule-based space is therefore inherently connected to the mediated space, and in fact, neither is the true study object of the project at hand – rather, the unison of the two constitutes the virtual environment and its objects as they are approached through the observational data.

The play space, however, is also inherently involved, and in fact unavoidable in any analysis, although often disregarded. While it is defined by both the physical space of play not explored in this study, *and* the hardware, the latter is of particular importance in the PO-VE framework. Games are historically developed for the hardware available at the time, and thus limited by the computing power and potential in contemporary gaming consoles. Throughout the dissertation a pattern is revealed pertaining to this historical technological advancement and how it can be observed in the increasing complexity of PO-VE relations. What is more, the study also illustrates the importance of considering the input hardware in the PO-VE analysis, as the specificities of the controller are relevant for understanding the details of the types of control and how this can be more or less simulative of the represented action on screen. As such, the play space serves as a way of connecting the PO-VE relations to the player, and therefore lies at the border of the framework.

The represented action on screen are inevitably involved in the close readings in the analysis chapter. In this chapter, the representation extends beyond the mere mediation of the software system and moved into the territory of the fictional space, something which will become particularly visible in certain game examples, including *The Witcher 3: Wild Hunt* and *ZombiU*.

Finally, the social space of play in the dissertation is consciously left out of the dissertation – for multiple reasons, many of which are covered in the discussion of why I decided to limit the study to single player games. Involving other people would potentially pose analytical challenges. While I attempt to be transparent about the type of engagement with each individual game (documented in the appendix), one factor that is almost impossible to account for is the social space of each of the games played. Most games were played in isolation or with only staff at the Ludov Game Lab in the vicinity of the playing analyst. But I believe the social space extends beyond this, including for example academic as well as non-academic discussions I have had with friends colleagues and friends about the games studied, before engaging in gameplay and analysis for the project. Therefore, the social space is inevitably involved, too, due to the ever-present social interactions about games that are the reality of most people working professionally with games.

Whereas Nitsche explores space and games through various lenses as presented above, which highlights the multiple perspectives involved in the study of PO-VE relations, Murray focuses more narrowly on a particular dimension of games that makes spatiality a defining characteristic of digital games:

> The computer's spatial quality is created by the interactive process of *navigation*. We know that we are in a particular location because when we enter a keyboard or mouse command the (text or graphic) screen displays changes appropriately. We can verify the relation of one virtual space to another by retracing our steps. (Murray, 1997, p. 80, my italics)

Thus, she argues that our spatial comprehension and the spatial quality of games depend on some type of navigation within the virtual environment. It also means that games' spatial quality does not depend on the visual rendition of a 2D or 3D environment, but rather, as Murray states, on the "navigational creation of space" (ibid., p. 80), which is thus also present in text-based games like *Zork* (Infocom, 2011 [1977]).

The navigational focus – sometimes at least partially covered by related concepts such as *movement* (e.g., Aarseth, 2000; Nitsche, 2008), *travel* (Fuller & Jenkins, 1995), or *traversal* – brings attention to how the space concept is innately connected to one or more entities or objects whose location within the virtual environment is altered as a part of the navigational act. In Nitsche's study, this is articulated as the *player positioning*: "'You' are not directly projected into the fictional world of a video game space. Instead, you get access to distinct elements (e.g., an avatar) within it and from that a feeling of presence can emerge" (Nitsche, 2008, p. 209). This underlines the strong relationship between the player object and virtual environment – or, in Nitsche's terms, the player positioning and the video game space – as something which deserves special analytical attention. Thus, Murray's and Nitsche's approaches to space and navigation in digital games, not to mention Fuller and Jenkins' (1995) analysis of digital games as a special type of travel narrative, underscore the need for studies that attempt to uncover the relationship between what they conceive of as the game space and the way in which the player-controlled entity is positioned within it.

3.2.1 Spatial configurations and topography

Various analytical frameworks have been developed for better understanding the spatial configurations and topographies of digital games. As central examples, the following section will present Fernández-Vara et al.'s (2005) mapping of spatial configurations in digital games and sections of Aarseth's (2005) quest theory, as the two studies have been influential in how space in digital games is discussed in game studies in general. Moreover, the terminology presented through the two theories is useful for defining the virtual environment and will be applied in later discussions.

Spatial configurations

Based on terminology developed as a part of the Game Ontology Project, Fernández-Vara et al. (2005) present a framework for understanding spatial configurations in games based on three basic features: *cardinality of gameplay*, *cardinality of gameworld*, and *representation*.

The cardinality of gameplay determines how the player can "move around the gameworld" (Fernández-Vara et al., 2005, p. 2) and is defined by the number of axes – X, Y, and Z – according to which the player can move entities around (ibid.). The authors point out that the cardinality of gameplay refers only to *movement* and not to other actions that can be performed in other dimensions. Thus, the cardinality of gameplay can be categorised into *one-dimensional gameplay*, with movement along a single axis (X or Y); *two-dimensional gameplay*, with movement along two axes (X and Y or X and Z); and *three-dimensional gameplay*, with movement along all three axes (X, Y, and Z).

The cardinality of the gameworld is much like that of gameplay, which is "related to, though different from, cardinality of the gameworld, which refers to the way in which the player can navigate the space" (Fernández-Vara et al., 2005, p. 2). The cardinality of gameworld is thus understood to refer to the options for movement within the space, which is complicated by configurations such as a wraparound, used "to represent a two-dimensional space wrapping around in a cylinder" (ibid., p. 5). As an illustrative example of the differences between cardinality of gameplay and gameworld, Fernández-Vara et al. present the case of *Doom* (id Software, 1993). Here, the cardinality of gameplay is two-dimensional, as the player cannot jump. However, levels are designed along several floors, and thus the physics allow for 'falls' onto lower levels. The movement performed (cardinality of gameplay) does not expand into the Y-axis, but the structure of space in the level (cardinality of gameworld) does. The act of 'falling' is not one which is actively performed.

Finally, representation, in the context of spatial configurations, refers to how the space is (visually) represented. This includes whether the cardinality of the gameworld is two or three-dimensional, as well as a distinction between *discrete* and *continuous* space – "whether the gameworld is encompassed within a single screen, or extends beyond its limits" (Fernández-Vara et al., 2005, p. 3). Discrete segmentation refers to games where the screen contains only a fragment of the gameworld. When the player object is moved to the limit of the fragment, the screen is refreshed to another fragment of that space. In continuous representations of space, "the screen is showing with a scroll" (ibid.), and space is not clearly demarcated and separated into fragments.

Based on these various features, one can analyse the spatial configuration of a digital game and the framework is exemplified using an array of game titles. The distinctions put forward by the authors are very useful for understanding space in games. However, some of the terms (not) used illustrate a need for expanding on this framework: Fernández-Vara et al. talk of a *gameworld* without defining exactly what is comprehended by this term. They speak of player actions in the gameworld, without specifying whether these actions are performed through an overlay or an integrated object. Without a closer inspection of the configuration between player actions, player object, and its integration within the virtual environment, it becomes difficult to understand central parts of the acts of movement, how to tell apart movement from other actions, and how this influences the conception of the virtual environment as a space. This study will address some of these issues.

Quests and landscapes

Another aspect that the framework of spatial configurations leaves room for other scholars to elaborate upon is some of the typically encountered spatial structures of digital games. This is explored in Aarseth's (2005) quest theory.

In general, the quest is closely related to spatial thinking, both in narrative terms, such as Joseph Campbell's (2008 [1949]) monomyth or 'hero's journey', and in game specific settings, where movement or navigation seems a central characteristic. In fact, Aarseth's (2005) "minimal definition" poses that a quest game can be defined simply as "a game which depends on mere movement from position A to position B" (Aarseth, 2005, p. 2).

Aarseth states that "[q]uest and space are intrinsically linked" (Aarseth, 2005, p. 4) and thus that level design of quest games is structured according to the quests in question. In Aarseth's terminology, this means that there are three fundamental *quest game landscapes*: the linear corridor, the semi-open hub, and the open landscape. These constitute the spatial structures typically encountered in quest games and thus establish a mini-typology of quest-game topographies.

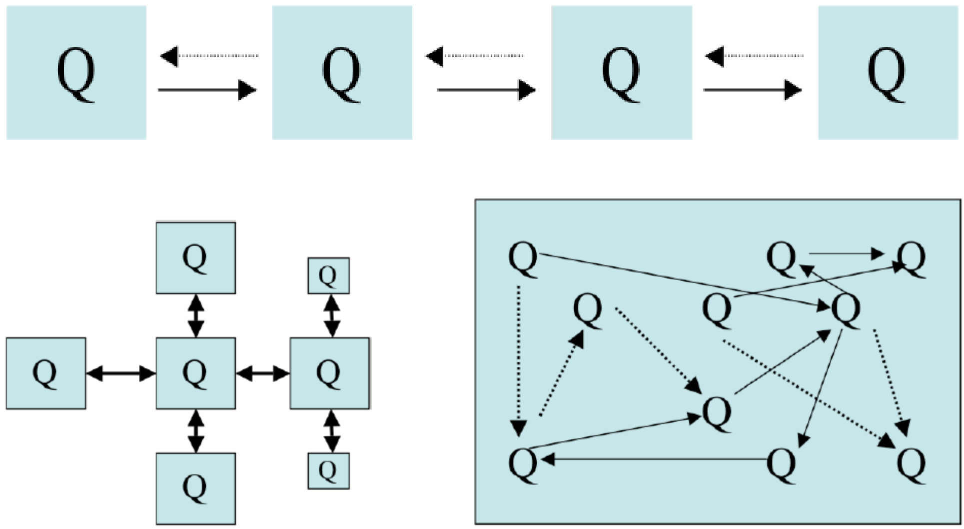


Image 3.1. Aarseth's basic quest landscapes: The linear corridor (top), the semi-open hub (bottom left), and the open landscape (bottom right) (Aarseth, 2005, p. 5).

The landscape structure defines how the space can be navigated; therefore, the linear structure is typically used in games emphasising narrative aspects, as it forces upon the gameplay experience a certain structure through spatial restrictions. This "unicursal labyrinth", as Aarseth calls it, is not itself a narrative device (ibid., p. 9), but its sequential structure can "easily be ornamented with story-like elements: other characters, causes and effects, descriptive passages in meaningful, orderly sequences" (ibid., p. 9). Yet, Aarseth states that it is the quest itself that serves as the strongest narrative device, as it situates the player as a participant in the gameworld through direction, action, and resolution. It is a structuring device that can guide the player's movement even in open landscapes, insofar they remain focused and interested in the quest at hand and do not become distracted by freedom offered by the lack of forced spatial structure.

The three landscape structures outlined above can be used for understanding basic spatial structures of games and thus how the design of the virtual environment directly determines gameplay as well as how this may aid designers in embedding their games with story content. The spatial quest landscapes as strong, narrative devices emphasises the connections between game-specific understandings of spatiality, storytelling, and the construction of 'worlds'.

3.2.2 Worlds and narratology

Space is often discussed in relation to ideas of the game projecting a *world*. For example, in both the study of spatial configurations and the typology of quest landscapes the terms *gameworld* or *game world* are used repeatedly. Similarly, many other scholars studying game spaces make use of the world-term. Juul (2011[2005], p. 131) categorises games according to the type of fictional world they project. Calleja (2011) and Jørgensen (2013) talk of gameworlds as habitable environments and ecologies. Aarseth (2006 [2004], p. 48) speaks of the material and semiotic system of games as the gameworld. Newman (2013 [2004]) talks of how digital games "create 'worlds', 'lands' or 'environments' for players to explore, traverse, conquer and even dynamically manipulate and transform in some cases" (ibid., p. 105). The list goes on.

The world-term is applied in various contexts to account for a variety of phenomena and content of digital games, ranging from fictional worlds to manipulable environments. This section is dedicated to an exposition of different world-terms as they are applied in the context of digital game studies. I will focus on *fictional worlds* and *virtual worlds*, as they have been discussed in relation to games. Outlining these approaches will ease the process of defining and situating the virtual environment in relation to existing discourses, as is the overarching theme of this chapter. What is more, understanding the relationship between theories on game spaces and world concepts will illustrate the most fundamental ways in which the research project at hand, with its focus on functionality over representation, differs from some and overlaps with other canonical game studies approaches. Reviewing this literature also illustrates some of the inherent connections between world-conceptions and representations, thus exemplifying the difficulties of speaking of the functionality of a virtual environment without diving into representation, or more specifically signification, meaning-making, and narratology.

Fictional worlds

The literary background of many game scholars has influenced the theories and methods that have been used for studying games. Therefore, it is perhaps not surprising that the concept of fictional worlds has been applied in attempts at understanding the narrative aspects or storytelling potential of digital games. The idea of games projecting fictional worlds was proposed already in 1985 by Buckles, who in her dissertation *Interactive Fiction: The Computer Storygame Adventure* analyses the game *Colossal Cave Adventure* (Crowther & Woods, 1977) and speaks of its world as both fictional and imaginary, while at the same time being interactive (Buckles, 1985, p. 15).

In literary theory, Palmer and Herman share the idea that storyworlds are "mental models of a special sort" (Herman, 2002, p. 17), which function to support narrative understanding, but nonetheless are constructed in the minds of the readers rather than being defined solely by the textual representation. Many of such reader-centric approaches consider *action* at the heart of characterisation or world-construction, as a reconstruction practice performed as the reader engages with the text. Juul applies this line of thinking to games: "the reader performs much work in order to imagine a fictional world, and consequently different readers and game players will imagine a fictional world differently" (Juul, 2011[2005], p. 122). This, he states, is because fictional worlds are incomplete – an argument already put forward by many literary scholars (e.g., Iser, 1980; Palmer, 2004; Pavel, 1986; Ryan, 1991).

Games, Juul elaborates, can project fictional worlds to varying extent, but not all games do so. Based on the investigation of the fictional worlds projected by games, he offers a typology of games in which some types are more relevant for the discussions of fictional worlds, namely *incoherent world games*, with a fictional world which contradicts itself or where some game events cannot be explained, such as *Donkey Kong* (Nintendo EAD, 1994) and Mario's three lives therein and *coherent world games*, where nothing prevents players from imagining the fictional worlds in any detail (Juul, 2011[2005], p. 132).

Not all games present fictional worlds, and those which do, do so in different ways. While fictional worlds are often defined by their gaps or incompleteness, games offer special cases of inconsistencies, and it is by convention that the player is aware that "it is optional to imagine the fictional world of the game" (Juul, 2011[2005], p. 141).

Therefore, fictional worlds (or storyworlds, heterocosms, fictive worlds, and diegeses) are perhaps best understood as the mental models of the players, resulting from interaction with a game that contains elements that trigger this imagination. This is at least one way of understanding the term, one which, in a digital games context, makes it simple to distinguish functionality of the game from the less tangible mental models of the game's fictional world.

While it has been argued that even abstract games can represent worlds[4], Juul illustrates that some games provide more material for the construction of fictional worlds, and that some of these worlds are sometimes at odds with the game's rules, hindering the player from understanding parts of the game system as a part of the fictional world. Consequently, we see the discrepancy between game space and fictional world, as well as between fictional world and game system, distinctions that become central when defining the virtual environment.

Virtual worlds

Much like *fictional world*, the term *virtual world* is one which has been frequently used in game studies. While scholars often use it vaguely, similarly to how the *gameworld* term is used without being defined (e.g., Ashmore & Nitsche, 2007, p. 505; Calleja, 2011, p. 75; Gualeni, 2019), seemingly as a metaphor for *the game itself*, or some aspect of the game space or virtual environment, it is primarily used to refer to a special kind of structure of multi-user media: "Essentially, a virtual world is an automated, shared, persistent environment with and through which people can interact in real time by means of a virtual self." (Klastrup, 2010, p. 24).

[4] See e.g., Murray's (1997) analysis of *Tetris* (Pajitnov, 1984).

Virtual worlds are therefore not particularly relevant for the investigation at hand. The term is used primarily with reference to *shared* environments and not those of digital single-player games and game modes.

Gameworld (or sometimes *game world*) has been used by some scholars to approach digital games in a holistic manner, and in the following I explore one such *ecological* approach to gameworlds and system information, through which the notion of *integration* – a primary principle of the virtual environment – is introduced.

3.2.3 Ecology and integration

In her book, *Gameworld Interfaces*, Jørgensen (2013) argues that "what the idea of game space does not cover is the idea of an ecology – an environment that behaves in a way that takes player activities into account" (ibid., p. 70). When seen through an ecological frame, the underlying technical and functional structure of the game and the information conveyed about its status (the *system information*, in Jørgensen's terminology) is something which exists *inside* the gameworld ecology. It is something which "has the ability to affect or be affected by the events or objects in the gameworld's ecology" (ibid., p. 148). Information represented as ecological thus "exists as a part of a gameworld's ecosystem" which "corresponds to how information exists in the real, physical environment. It is represented as natural to the gameworld in the sense that it exists in a harmonic and dynamic relationships with its surroundings" (ibid., p. 79).

Jørgensen presents ecological information on a continuum, opposite to *emphatic* information, which "highlights, emphasizes, or adds new information to something that already has the status of ecological in the reality of the gameworld" (ibid., p. 148). These two types of information are intricately connected to two additional continuums, both with polar types, that when combined, gives a more holistic view on system information in relation to the idea of an ecology.

The second continuum on which system information may be considered describes *superimposed* information, "added as a 2D screen overlay typically exemplified by traditional WIMP features", which stands in contrast to *integrated* information –

“placed inside the geometry of the game environment, regardless of whether it is represented as floating symbols or color filters, or as a part of the fictional reality” (Jørgensen. 2013, p. 23). This understanding of integration thus relates not to the framing of the ecology, but to whether specific information is integrated in the *geometry* or not.

The final two polar forms explain whether system information is framed “to give it the status of a *fictional* reality and in this way make it fictionally coherent or to give it a *ludic* status and thus see it as motivated by the game system” (ibid., p. 148).

Based on these polar values of how system information is presented, Jørgensen illustrates different types through their eight different possible combinations (ibid., p. 150-157). In this, the types that combine integrated and ecological information come closest to what will later be defined as integration for the context of this study. Information of this type is integrated within the *geometry* as well as *internal to the ecology* as something which “exists in a harmonic and dynamic relationships with its surroundings” (ibid., p. 79). Exclamation points floating above the head of quest-giving NPCs – a common sights in many games of the RPG genre – are therefore not considered in this information type. They are, according to Jørgensen (ibid, p. 80) integrated in the geometry, but they cannot be affected by the gameworld.

From a functional perspective, however, it is difficult to pinpoint the exact nature of such *harmonic and dynamic* relationships. To make sure that the integration concept needed for understanding PO-VE relations is as specific as possible, it is worthwhile to get a further understanding of the ecology concept by turning to the more common application of the term within a natural science context.

In the natural sciences, *ecology* is used to refer to the science of the living beings as members of the whole of nature (Friederichs, 1958). These ‘members’ in a ‘whole’ are typically described as organisms in an environment, where their interrelations are studied (ibid.). While both are considered holistic perspectives, game ecologies and biological ecologies seem to differ in that the content of their respective worlds exist on various ontological levels. In the biological environment, the ecology encompasses organisms and environments as they appear in nature and thus in physical environments.

Biological ecologies are studied to understand how different organisms relate, physically and functionally, to each other. In games, however, there are no physical environments and not all games contain virtual, navigable game spaces.

Jørgensen argues that system information can exists in the overlay plane (being *superimposed*) or be presented as a part of the geometry that represents a physical environment (*integrated*), and that both types of information can take an ecological form (Jørgensen, 2013, p. 150-157). The integrated information of the geometry is integrated visually in the geometry and functionally in the game system but is not integrated functionally in the virtual environment. This seems to be the role of the ecological frame, although only vaguely specified in its "ability to affect or be affected by the events or objects in the gameworld's ecology" (ibid., p. 148). These distinctions, while perhaps difficult to grasp, are essential for understanding PO-VE relations as they depend on a specific understanding of integration, as integration in PO-VE involves what Jørgensen describes as integrated *as well as* what she explores as having the 'ability to affect/be affected'. The *virtuality* concept will help clarify some of the differences between Jørgensen's gameworld ecology and her integration concept therein, and integration as understood as a central premise of the PO-VE framework.

3.3 What is virtuality?

Virtuality is a complex concept, discussed in various disciplines and applied in different contexts to mean different things. Lengthy books dedicated to the topic, such as *The Oxford Handbook of Virtuality* (Grimshaw, 2014), illustrate not only its various uses and applications, but also how comprehensive the topic of virtuality is. In game studies, virtuality, which is sometimes used synonymously with the concept of simulation, has been discussed in contrast to fictionality, a trend expanding beyond discussions of games in recent publications by, for example, Chalmers (2017) and Juul (2019). The following section presents a selection of theories of virtuality, which is in large part defined in contrast to *fictionality* – and in some cases, to *reality*.

Framing virtuality through the discussion of fictionality entails an exclusion of some of the popular discourse uses of the former term. Calleja explains:

> Thanks to the joint efforts of techno-fetishist theorists of the late eighties and the ever-hungry mass media, the presence of the virtual within the popular imagination has become largely unrelated to its technical and philosophical roots, gravitating instead towards the novel and liberating powers of new technologies. (Calleja, 2007, p. 47)

It is worth acknowledging this presence of the term outside of academic contexts and be aware of the ways in which it has fused into the language used in popular media with seemingly little awareness of its technical and philosophical meanings. Awareness of the different uses of the term is particularly important when communicating academic research and findings through popular media, but not directly relevant for defining the virtual environment for the study at hand. Virtuality in the context of this study does *not* refer to the popular understanding of its novelty, but rather focused on its technical roots.

3.3.1 The virtual, fictional, and real in games

In his 2007 paper, Aarseth argues that, within game studies, the term fiction is used "without qualification, nor seen in need of redefinition or reassessment" (Aarseth, 2007, p. 35). Despite this criticism of the works of others, he questionably grounds his inquiry in a dictionary definition, which posits that fiction is "invented phenomena" (ibid., p. 38), and uses a similarly vague definition of 'reality' based on "Phillip K. Dick's expert definition: 'Reality is that which, when you stop believing in it, doesn't go away'" (ibid., p. 36). Meaning no offense to the authorship of Phillip K. Dick, this 'expert definition' is difficult to situate within academic discussions of the fictional and the real.

Regardless of the problematic nature of these definitions, some of Aarseth's arguments about the ontological status of various types of game content are relevant to explore, as they situate the virtual as something distinct from the fictional worlds of literature and cinema. He tells apart a fictional dragon as presented in a literary work from a dragon in a digital game:

> One is made solely of signs, the other of signs and a dynamic model, that will specify its behaviour and respond to our input. It is this model behaviour that makes it different from a fiction since we can get to know the simulation much more intimately that [sic] we come to know the fiction. (Aarseth, 2007, p. 37)

The dynamic model of the digital game dragon is a real computational process brought into existence through the execution of code, which can be interacted with by the player. This makes it qualify as *virtual*, situated "somewhere between fiction and our world" (ibid., p. 38), neither *real* nor *not real*.

Here, some clarification is needed as to what constitutes *signs* and *dynamic models*, and what sets the two apart. Aarseth is clear in his statement that the two are quite different but does not specify exactly what is meant by either.

Aarseth's use of the term *sign* appears to refer to the semiotic sign, perhaps in particular to Pierce's concept of the sign as "anything which is so determined by something else, called its Object, and so determines an effect upon a person, which effect I call its Interpretant, that the latter is thereby mediately determined by the former" (Peirce, 1998, p. 478). The sign in this theory is thus a representation which stands for something else (the Object), interpreted by an Interpretant to invoke the mental image of that Object. Peirce's sign has different signifying elements and the logical connection between sign and object is typically divided into three primary categories of signs: icons, indices, and symbols.

In the case of Aarseth's argument that the literary dragon is made solely of signs, he refers to written language in which the alphabet consists of symbolic signs. It is necessary for the reader to know the structure of the language and the alphabet to decode the meanings of the word, interpret the sign, and understand the object represented. Similarly, a dragon in a movie can be said to consist of signs, only these signs are of a different type. As icons, the visual representation of a dragon looks like that which it refers to – the sign and the object represented look the same. Both the literary and the filmic dragon can have behaviours: we can read about or observe the dragon's movement, and thus understand how it acts. But we cannot interact with the signs, and we cannot ask questions to the book or movie (or, at least, we cannot not expect them to answer). If the text does not reveal to us how a dragon might react if we throw rocks at it – if this information is not embedded in the work – we can only theorise about such questions, based on what other information has been provided by the text.

The virtual dragon, however, is different. When playing a digital game, the player is still an interpretant of a semiotic system of signs, and the dragon they are fighting still consists of signs – icons or symbols, depending on whether the game is text-based or not. In addition to these signs, which represent the software object ‘dragon’, there is also an underlying system and functionality that determine the dragon’s behaviour. The dragon is a coded object, and the game designer can write, for example, various types of movement and reactions into the code, depending on how they want the dragon to react to the player’s input. This is presumably what Aarseth refers to as the *dynamic model*, that which “will specify its behaviour and respond to our input. It is this model behaviour that makes it different from a fiction since we can get to know the simulation much more intimately that we come to know the fiction” (Aarseth, 2007, p. 37). As opposed to the fictional dragons found in books and movies, we *can* ask questions about the virtual dragon and some of them can be answered through observations of its reactions to our input. While we do not have access to the details on the coded object (unless we happen to play an open-source game and know how to access and read the code), we conduct a real-time black box analysis (involving the previously discussed *real-time hermeneutics*), to get as close as possible to an understanding of the coded object. Our understanding of the dragon’s *functionality* improve over time as we get to test and observe its behaviour and reactions to our input.

Aarseth argues that digital games contain *both* virtual and fictional objects. Virtual objects are, in Aarseth’s words, *simulated*, which does not contribute any additional theoretical characterisation of the objects, but instead serves as a synonym for the virtual (Aarseth, 2007, p. 42). Following the discussion of signs and dynamic models, virtual objects can be interacted with and can be defined according to their functionality, whereas fictional objects are merely representations or signs.

Aarseth’s titular example are doors: many doors in games are nothing but textures on the walls and their function is exclusively decorative. They cannot be interacted with, thus qualifying them as fictional. Some doors, however, can be opened and closed – they behave in "a door-like manner" (ibid., p. 42), which constitutes them as simulated[5] or virtual objects, different from real doors, yet not purely fictional. Doors have real-life correspondents and dragons do not, but this does not, in Aarseth's theory, alter their ontological status, which depends on whether the objects are merely decorative or have a dynamic model that determines their behaviours: "Simulations allow us to test their limits, comprehend causalities, establish strategies, and effect changes, in ways clearly denied us by fictions, but quite like in reality" (ibid., p. 37).

3.3.2 Virtuality, fictionality, and philosophy

Virtuality has often been juxtaposed with reality as something which is 'fake', and which has historically been associated with optical illusions (Ryan, 2001). Accounting for the historical development of the term, Ryan distinguishes between two poles on a continuum; the conception of the *virtual as fake* in contrast to the *virtual as potential*, which she identifies in the works of Lévy and Deleuze (for further discussion see Calleja, 2007, p. 47). The two poles appear to represent two vastly different understandings of the term virtual in relation to the reality status of the subject matter discussed. This is a discussion that has recently resurfaced between Chalmers and Juul.

In a recent paper discussing the reality status of VR, Chalmers argues that "every VR environment involves a digital world, while only some of them involve an associated fictional world" (Chalmers, 2017, p. 334). This resonates with the argument made by

[5] It is here worth taking a short detour to focus on Aarseth's terminology, above all the way in which he uses the terms *virtual* and *simulation* to refer to one and the same thing. Games as simulations has been a wide topic of discussion (see e.g., Frasca, 2003; Salen & Zimmerman, 2004; Juul, 2005; Möring, 2012; Elliot, 2017), and Juul has argued against the common belief that simulations need to be realistic and detailed. He states that they can differ strongly from their original, tend to be stylized and thus highlight certain aspects of that which is simulated while concealing others, and that they are inevitably simplified (Juul, 2005, p 170). Much like fictional worlds, simulations are incomplete. However, a simulation is incomplete when considered in relation to its referent, the object which it is simulating. This object may not always exist in our physical reality, as with Aarseth's dragon example, in which case we may speak of simulacra rather than simulation (Elliot, 2017). Nonetheless, the concept of the simulation relates the given simulation to whichever object, fictional or not, is simulated – and, in the case of interactive digital games, modelled. A virtual object, on the other hand, does not inherently compare to any other object than itself. We may, of course, speak of its representation as simulating other objects, but this need for assessing its qualities based on some referent does not lie in the understanding of the virtual object. I thus propose careful attention to the use of these two different terms. Contrary to Aarseth (2007), I do not believe virtual and simulated mean one and the same thing. Thus, henceforth, the term *virtual* is not to be understood as synonymous with simulation, the latter of which is outside the scope of this project.

Juul, through his typology fictional worlds in digital games, that not all digital games contain fictional worlds. Those which do involve a fictional world can, according to Chalmers, contain two different types of fictional content: *specific* fictional content, such as specific physical spatial location, times, or individuals, and *generic* fictional content – "the representation of objects as occupying physical space and as having shapes, sizes and relative positions, along with other primary and secondary qualities such as colours and perhaps masses and sounds" (ibid., p. 335).

Specific fictional content is optional in virtual worlds, whereas generic fictional content can be found in all virtual worlds involving a three-dimensional environment. This is a result of Chalmers's definition of generic fictional content, which is described as the representation of *anything* in space, ultimately meaning that *all* digital games set in environments with *any* type of content (i.e., all games) have fictional content. He elaborates that "the invocation of a fictional world depends entirely on the interpretation of the user, and in many cases that interpretation will not be present at all" (Chalmers, 2017, p. 335). Put differently, the presence of generic fictional content does not necessarily make a virtual world a fictional one.

Like Juul (2011[2005]), Chalmers believes that fictional worlds depend on interpretation, and while most virtual worlds *can* be interpreted as fictional, it is unlikely that all will. It takes a certain amount and type of fictional content for a user to interpret a virtual world as fictional.

Juul (2019) is happy to accept the inevitable fictional status of virtual objects, which he uses to "describe the fact that games and VR contain worlds seen as distinct from the regular world" (ibid., p. 2). He emphasises the importance of understanding virtual objects as designed for specific and limited types of interactions, and that "the aspects of an object that are irrelevant to these interactions will usually be left out; they will be purely fictional" (ibid., p. 5). This broadly aligns with Aarseth's theory that objects lacking a dynamic model are fictional as opposed to their virtual counterparts but addresses the matter on a more granular level – to Juul, aspects of the individual object that are not modelled are fictional, meaning that each object can be virtual *and* fictional at the same time, or at least have properties described as such. Virtual objects are never full simulations of their physical counterparts (when these exist), and therefore they are inevitably incomplete, just like fictional worlds[6].

While it seems at first that Aarseth, Juul, and Chalmers disagree on the ontological status of the fictional, virtual, and real, there are surprising overlaps between the theories. These identified overlaps are central to the way in which the virtual environment is approached in the present study. To Aarseth, Juul, and Chalmers, the fictional is something which does not facilitate interaction by virtue of lacking an underlying dynamic model, and which in turn depends on interpretation. Virtuality, on the other hand, refers to that which *does* have an underlying dynamic model. In the context of this study, this means, that the *virtual* environment is understood as a dynamic model in its own right – albeit one that contains virtual as well as fictional elements.

Virtual and fictional are not inherently connected, though both forms appear in virtual environments as experienced in digital games and VR. Virtual and fictional do not exclude one another, as illustrated by Juul's investigation of game objects as *half-real*. The discussion of the reality status of the virtual is here less important. What matters is that the virtual object, as stated by Aarseth, consists of signs *and* a dynamic model, whereas the fictional (parts of the) object consists of signs alone. Or, in PO-VE terminology: the virtual object (in the virtual environment) involves functionality *and* representation, but the PO-VE framework is developed for exploring the former.

This explains why the term *virtual environment* is chosen over other similar or related terms, such as for example *computer-generated environment*. Simply because something is generated by a computer does not necessarily mean that it has an underlying relational and functional model, a structure determining the relationships between its component parts. An image can be computer generated and consist of signs only, thus qualifying as fictional in Aarseth's (2007) terms. The virtuality status of the

[6] In this approach, it is important to call attention to Juul's use of fictional: "I do not use the term fiction as a negative label; I am referring to the theory of fictional worlds (Pavel, 1986) to describe worlds we see as distinct from the regular one" (Juul, 2019, p. 9).

environment emphasises its functional nature, while also implicitly referring to the more analytically peripheral status of representation in the project.

At the same time, *virtual environment* as opposed to simply *environment*, brings attention to this virtual status of the integrated objects. This sets the virtual environment apart from a more general understanding of *environments*, where also interface components are considered part of the environment (in contrast to, for example, Jørgensen's (2013) understanding of the gameworld environment).

3.4 VE – the virtual environment

Up until this point, this chapter has been dedicated to reviewing existing approaches that share similarities with the way in which the virtual environment is defined in the present study. Without an understanding of these different approaches, it would be impossible to clearly define and delimit what is meant both by *virtual*, *environment*, and the combination of the two terms into a single concept. Furthermore, the above theory review allows me to contextualise the *virtual environment* as it is defined here within the broader discussion of game spaces, gameworlds, and virtuality and games.

While referencing the previous uses of related terms secures one step in this direction, this chapter further explicates how the conceptualisations of the codes from the data set and the resulting terminology is inspired by object-oriented analysis and design (henceforth OOA/D). The object-oriented framing of the virtual environment ensures a focus on the relational structure of the environment and its component parts, rather than (sometimes abstract) game-specific content such as rules and goals. As presented already in the dissertation's first chapter, this *functional* perspective (rather than a *ludic* one) sets apart the study and the resulting theory from much game studies theory.

This framing has the consequence of making direct application of existing definitions counterproductive. For example, I am not the first to speak of a virtual environment in a digital games context. For the study at hand, however, the way in which the virtual environment is understood in a digital games context is problematic, as such conceptions often emphasise player behaviour and experience, for example by equating the existence of a virtual world with the player's ability to exert agency, which is central to Calleja's (2007) take on the virtual environment. Similarly, Jørgensen's (2013) holistic gameworld concept, which also includes (as the title of her book implies) the overlay interface, is useful when considering all aspects of a game and how they influence the players' experiences of it, but this is not the goal of this research project. This upcoming section is thus dedicated to clarifying the framing of the virtual environment as a relational system through the OOA/D-inspired approach.

3.4.1 Object-oriented analysis and design

Object-oriented analysis and design, or OOA/D, is a technical approach to analysing and designing systems, specifically software systems. Its central purpose is "finding and describing the objects—or concepts—in the problem domain" (Larman, 2002, p. 7), hence its name, which is focused on the *objects* of the system. In this context, objects refer to software objects that are made up of attributes and methods. The task of the analyst is to map out the software system through the systematic identification of its objects. When an object has been identified, it is described based on its properties and what it can do within the system to which it belongs, which can only be understood by considering the object in relation to other objects.

In OOA/D, an attribute is a "logical data value of an object" (Larman, 2002, p. 167), which is an integrated part of the presentation of software systems in a variety of diagrams and models. The attribute is typically presented as a part of a given object with its name as well as its datatype (e.g., *Boolean*, *Date*, *Number*, *String*, etc.). As a rule of thumb, an object's attributes are those which can be described as something that that object *has*. For example, an object *has* a title, an author, and an ISBN number, all of which are thus considered its attributes.

In games, objects typically have an animation or a sprite that constitute its visual presentation. In many cases, the attribute of the object does not involve the details of its visual presentation, but rather how it is presented, i.e., an object presented by a sprite will have the attribute *sprite*, and not all the colours apparent in the sprite.

In contrast, methods – or *affordances*, as is the term that will be used throughout the project – refers to what an object can *do*. Combining various terms from OOA/D – methods, associations, and responsibilities – means that affordances become a broader concept that combines better with more game design concepts, such as *actions*, *agency*, and *possibility space*. Affordances are, unlike attributes, not of a certain datatype, but rather describe a (possible) behaviour of an object in the software system in question. Affordances from an OOA/D perspective thus differ from Norman's (2013) approach to the term from a design-centric perspective, which states that affordances are relationships between properties of an object and capabilities of an agent which determine the object's possible uses (Norman, 2013, p. 11). While affordances as methods determine the relationships between objects in a system, they describe the possible behaviour of each individually programmed object (or class of objects), in relation to the system of which it is a part. They thus constitute relationships as well as possible uses but are considered properties of the objects themselves.

One way of approaching an object-oriented analysis is through a domain model, a "visual representation of conceptual classes or real-world objects in a domain of interest" (Larman, 2002, p. 128). As a part of the construction of a domain model, which may vary in complexity depending on the chosen UML (Unified Modelling Language) model and its level of detail, the various classes of objects (e.g., *book* in a library system) are listed as a part of the general software system (e.g., *library*). Each object class presents an example of a specific software object, listing its attributes (for the *book* class this could be *title*, *ISBN*, *author*, etc.) and its methods, which define the objects behaviour within the class and the given system (e.g., the *librarian* object class in the *library* would contain the method of *checkingInLoan* and *checkingOutLoan*). The class diagram is completed by relating the various object classes and describing their relationships.

The study is inspired by the OOA/D approach to software systems by the way in which a system is thought of as containing several object classes, each of which contain attributes and affordances, as well as relationships to other object classes. The actual visualisation of the UML model outlined above is not relevant, but the specific way of thinking system-structures based on objects is. This object-oriented structure will aid and influence the way in which the virtual environment is defined below.

The study is only *inspired* by the OOA/D approach, as there are limitations to the amount of information about the software system that the analyst can access through black box analysis (with no access to the source code). The limitations of this type of analysis are discussed elsewhere (in 2.3.3).

3.4.2 Definition

Building on elements of the many theories discussed throughout the chapter, I use the term *virtual environment* to refer to the part of the software system of a digital game that is typically presented to the player through audio-visual means as a navigable space. This spatial structure, as argued by Murray (1997), need not be presented through 2D or 3D graphics, but rather exists as a navigable model. For scoping-reasons, however, this project studies only graphical virtual environments. Thus, for the context of the PO-VE framework, the virtual environment is a visually represented, navigable geometry–a computational, relational model that represents the relative positions and functions of objects within it.

Inspired by the basic principles of OOA/D, one can think of the virtual environment as containing multiple objects and object classes, such as player object and opponents, as well as objects that help presenting the environment as a physical environment, including, for example, topography and nature. It has a relational structure which is emphasised in the natural science understanding of ecology, but the virtual environment as a navigable geometry does not encompass objects that are not located within this geometry, such as those in an overlay (e.g. menus), those that are not functionally related to other objects in the environment (e.g. exclamation points floating over the heads of quest-giving NPCs), and it is not considered with specific regards to non-environment-specific methods or rules, thus setting it apart from Jørgensen's understanding of the gameworld.

Integration, as the term is applied here, is therefore different from Jørgensen's (2013) use of the term. Within the PO-VE framework, integration refers to an object located within the geometry (corresponding to Jørgensen's idea of integrated system information) and situated within the relational model that structures relationships between itself and other objects contained within the virtual environment. This means that integrated objects will always have a relative position to other objects within the environment. These relationships facilitate affordances between the various objects (thus corresponding in part to Jørgensen's idea of ecological system information).

When considering the virtual environment from Nitsche's perspective of the different conceptual planes of the game space, it lies somewhere between the rule-based space and the mediated space. The virtual environment can only be comprehended by the player through its representation or mediation. Without direct access to the source code, we do not know the details of the rule-based structure and underlying processes[7]. Rather, we experience these processes only by interacting with the environment and interpreting the feedback to our actions as they are represented – and thus mediated, much like Aarseth's description of the dynamic model of the signified dragon. At the same time, the way in which we experience the virtual environment is through interaction facilitated by the game's hardware, and therefore the specific input-method (e.g., controller, mouse and keyboard, motion controller, touchscreen, etc.) and hence Nitsche's idea of the physical space is also at play when engaging with the virtual environment.

The representation of the environment system and its objects are not discussed as *fictional*, despite the agreement between Aarseth (2007), Chalmers (2017), and Juul (2019) that many game objects are. The environment and its objects are discussed as virtual where this term applies – when they are representations of a computerised process and have an underlying dynamic model. When this is not the case, their ontological status does not matter as they are beyond the scope of the study that deals

[7] The source code is not necessarily helpful when studying the virtual environment. Technically, the game designer can place objects within the environment that are visually perceived as being in overlay, thus making the code itself useless for understanding which objects are integrated. The code itself, the executed game, and the way in which this is perceived and theorized by the analyst may differ significantly, and code is not always indicative of the experienced structure of the system.

only with virtual objects integrated within the virtual environment, and thus only with on-line (Newman, 2002) sections of games.

However, most virtual environments consist of a plethora of virtual objects, all of which may be represented (primarily through visual presentation) in ways that may cue the player to interpret the virtual environment as something more than mere representations of entities in a system.

Whether a virtual object contributes to the player's mental construction of a fictional world or not is not relevant for the definition of the virtual environment and its objects. Thus, a virtual object *wall* is considered a single object, regardless of whether it is visually presented as having doors and picture frames on it. Only if these have their own attributes and affordances do they constitute distinct virtual objects. Topographies, for example, may in some games be constituted by a single or few objects (a whole, bare mountain range, a single playing field), whereas other game topographies are made up of multiple individual parts (a forest with individual trees, a neighbourhood with individual houses). These examples clearly illustrate how an analysis of the game-as-played differs from a reading of the game's source code. In the latter case, individual objects would be defined according to the specific implementation and not the experienced virtuality status in the executed game.

Based on the statements above, the virtual environment in this project is defined as follows:

A virtual environment is a navigable geometry constituted by a computational, relational model. The virtual environment as a spatial structure represents the relative positions of objects that can be described as integrated by virtue of being both spatially and functionally related to other objects within the virtual environment.

Following the definition above, a game like *Alan Wake* (Remedy Entertainment, 2010) – a 3D, third-person action/horror game, where the player controls the player object characterised as Alan as he explores dark and mysterious areas, such as a forest – can be considered set in a virtual environment. The game has a navigable geometry that is represented as a spatial structure (in Aarseth's terms a unicursal labyrinth), and one of the primary tasks of the player is to navigate the player object through this space. The player object (Alan) is integrated within this virtual environment, which similarly contains other objects (trees, rocks, cabins, as well as markers such as flashlights and guns, etc.), all of which are spatially and functionally related.

80 Days (Inkle, 2014), on the other hand, is an example of a digital game that does not contain a virtual environment according to this definition. The game, which for this study was played on a touchscreen device (Android smartphone), is a hybrid-format adventure game (see Image 3.2 below for examples) containing mostly text-based sections in various formats, but also some icon-based resource management. While some video sections of the game visualises the journey around the earth, and while the very premise of the game is to *travel* around the earth within the time-limit of 80 days, there is no navigable geometry, no spatial structure containing integrated objects, and no *object* for the player to control. For this reason, *80 Days* constitute one of the sample's 21 games that are *not* considered player-object based according to the definitions of the central concepts – including *virtual environment*.

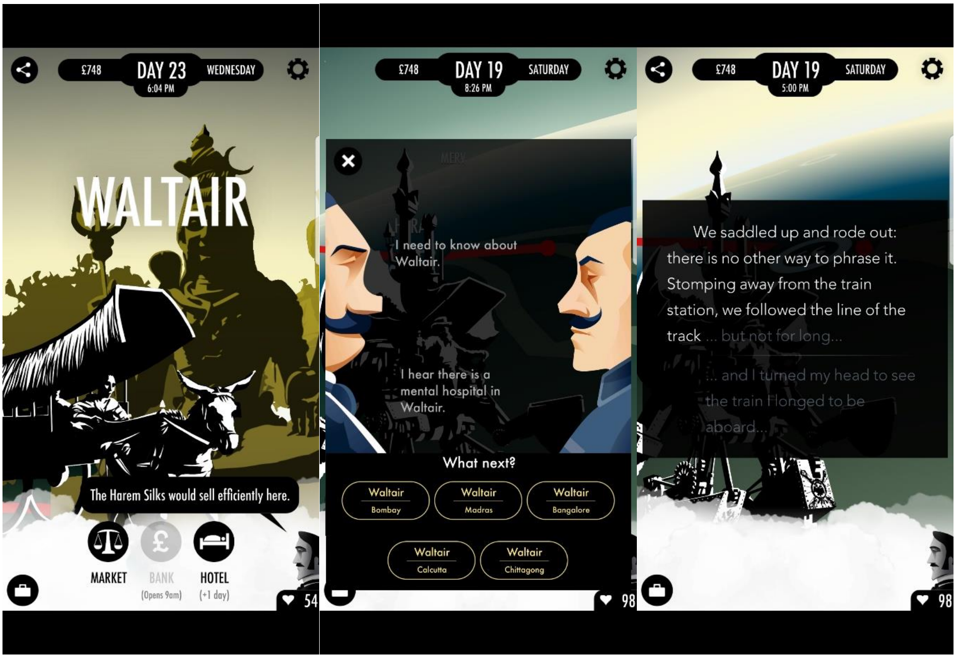


Image 3.2. Three screenshots from *80 Days* (Inkle, 2014), illustrating the game's lack of a virtual environment as defined within the PO-VE framework.

A virtual environment can often be interacted with through a dedicated *player object*, as were the case for the *Alan Wake* example. The player object is a special type of object that allows the player to input data into the system, which thus responds accordingly. The player object is explored in depth in the next chapter, but first, the two constituent parts of the virtual environment are discussed below.

3.5 The environment is made of…

All virtual environments of digital games contain objects that can either be interacted with or that otherwise influence movement and navigation within the virtual space. Whether represented as natural or geographic objects, such as grass, trees, and rocks, or architectural landscape structures consisting of hills and buildings and populated by various creatures, virtual environments are filled with objects[8].

The term *object* here refers not just to things that can be interacted with, or those with a procedural *behaviour*, but to anything that exists in the virtual environment as a relational system. In this system, an object is defined by virtue of its integration in the geometry *and* its relationship that results in affordance between itself and other objects. This means that various landscape structures found in games, such as the ones discussed in Aarseth's quest theory, are typically brought about by the placement of objects, some of which limit possible navigation. In fact, the landscape structure itself can be considered one or several object, depending on the specific game and its design. Hills, mountains, rivers, as well as ledges, blocks, and walls all fall under the category of virtual objects. Thus, objects serve the purpose of directing navigation, facilitating interaction, and sometimes making the environment resemble a physical space, for example by visually projecting a natural environment.

In this study, objects can be divided into three primary types: *player objects*, *objects*, and *markers*. This is not to say that these are the only types of objects in digital games, nor that this is the best way of typologising game objects in general. The categories are a pragmatic tool which will come in handy when theorising player objects in virtual environments, and they result from patterns in the codes, where the differences between objects and markers were repeatedly noticed and documented. As I will also illustrate through examples in the following, the object types have their limitations, and while being sufficient for describing most game content, the sample does contain examples that illustrate the limitations of the distinction between objects and markers, as they are presented in the following. Player objects are explored in depth in their dedicated chapter 4.

[8] One can, of course, imagine an 'empty box' type of virtual environment, where there are no objects. However, these games must contain either a player-controlled object (constituting an object in the environment, which is thus no longer empty) or other objects that facilitate a type of interaction.

3.5.1 Objects

Objects are entities in the virtual environment defined by their integration in the geometry. As opposed to markers, objects are persistent, meaning that they are permanently integrated in the virtual environment. Their manifestation in the geometry remains permanent regardless of how they are interacted with. They do not 'disappear' from the environment upon interaction, as is the case for markers, for example when picked up.

In most games, typical environmental or natural objects, such as trees, grass, rocks, and mountains, are persistent. They may be interacted with, but only in ways that allow them to remain within the virtual environment. For example, games like *The Legend of Zelda: Breath of the Wild* and *The Elder Scrolls V: Skyrim* (Bethesda Game Studios, 2017) contain mountains that can be climbed by the player object and which remain, like most landscape objects, permanently in the environment. In *Goat Simulator* (Coffee Stain Studios, 2014), the player may stumble upon a bike or a skateboard which can be ridden by the player object, but which remains in the environment both before, during, and after use. And in *Mario Kart 8 Deluxe*, all vehicles get a boost when crossing certain surfaces, *dash panels*, that remain persistent in the environment and thus serve the same function for all competing drivers. All of these are examples of *objects* in the virtual environment. They are manifested in the geometry, have functional relationships to other objects, and are thus integrated – and remain integrated when interacted with.

There are, however, exceptions to this rule. In some games, objects that are otherwise persistent can be removed from the environment, for example by destruction. While typical examples of this involve boxes and barrels, a game like *The Witcher 3: Wild Hunt* allows you to destroy for example furniture. The objects' ability to be destroyed does not negate their status as *objects*, but rather their functional status within the world. That is, an object is not *static*, as it can cease existing, for example by being destroyed, but it cannot be 'picked up', 'used' only to disappear, or kept in an inventory. In the furniture example from *The Witcher 3: Wild Hunt* there is even motivation for destroying for example furniture, as lootable items may sometimes hide behind these objects.

It is not always the case that "natural" objects are persistent. Some games allow the player to treat environmental and natural objects as resources. For example, in *Don't Starve* (Klei Entertainment, 2013), the player may dig up berry bushes, keep them in their inventory, and replant them at a new location. In this case, the bush is not considered an object but rather a *marker*.

3.5.2 Markers

Markers are a special type of objects that have non-permanent manifestations in the environment. Their status as objects depends on their initial integration within the virtual environment, but during the game this status may change. When interacted with, markers can be 'picked up' or 'used' and seemingly disappear from the environment, instead appearing in an inventory or as a marker of a value associated with the player object.

An example is the previously used case of the berry bush in *Don't Starve*, or the typical health pack, which upon pick up or contact ceases to exist in the virtual environment and instead appears as health point attributes of the player object or in their inventory. In the moment where the marker is no longer integrated within the virtual environment, it is no longer considered an object, as the definition of objects is contingent on their integration.

Other types of markers typically found in digital games include objects colloquially referred to as 'items' or 'loot'; objects that can be kept in an inventory. Such objects serve a primary function of marking attributes that have game-specific significance, and thus their function is actualised as the marker ceases to exist as an object and is instead translated into attributes in the form of, for example, health points.

Some markers, such as most items and loot, can disappear and reappear as integrated when picked up and dropped by the player object, or when equipped from the inventory. As such, markers function much like objects, but their flexible integration makes them fundamentally different from regular and persistent objects.

In some games, markers that are ‘picked up’ from the environment can be stored *within* other objects in the virtual environment. For example, in *Don’t Starve*, the player can use the mob Chester as a kind of ‘mobile chest’ in which they can store items from their inventory. In *ZombiU*, the player object’s backpack (and inventory) is accessed on the secondary screen of the Wii U controller, and similarly functions as nested type of storage. The two examples have quite different functions from a gameplay perspective, the latter increasing both the tension and difficulty of the game, as the player object is susceptible to zombie attacks every time an item is retrieved while also forcing the player to focus their attention on the controller’s secondary screen. Yet, both are examples of how markers may not only transcend the border between virtual environment and overlay interface, but also extent the player’s access to nested inventories. Yet, simply because Chester is represented as a distinct object in the virtual environment, this does not alter the markers contained therein, neither does it alter his functional status as an object. As for the case of the backpack in *ZombiU*, it functions neither as an object nor a marker, but rather as a visually represented part of the player object’s 3D-model that also serves the function of making the inventory intradiegetic, while posing an additional challenge by being accessible only on the Wii U controller. Items that can be contained within it and taken out or consumed when needed are still *markers*.

Just like the nature objects in *Don’t Starve* are in fact markers, as they are transformed into resources kept in the overlay inventory (and perhaps inside Chester), some small parts of some of the mountains in *The Legend of Zelda: Breath of the Wild* are markers, too. These parts can be considered distinct marker objects as they are clearly distinguishable from the rest of the mountain, making apparent to the player that the object can be mined (i.e., attacked repeatedly with a weapon, or exploded using a bomb). Once mined, the small part of the mountain disappears, and instead a seemingly random selection of mineral resources appear. Thus, while I claimed them to be *objects* proper, the mountains of *The Legend of Zelda: Breath of the Wild* are in fact made up of large objects and smaller markers, the latter functioning much like the markers of *Don’t Starve*.

3.5.3 Virtual objects and 'pure representations'

While the distinction between virtuality and fictionality is not explicitly integrated in the definition of the virtual environment, it plays a large role in the specific conception of the environment, especially when considering the distinction between functionality and representation of objects. Returning to Aarseth's discussion of virtuality and fictionality (2007) in games, I thus wish to make a final point about objects as they are understood within the PO-VE framework.

An object that cannot be interacted with by the player object, but which nonetheless is integrated according to the principles of integration discussed earlier, is considered just as virtual as any other object in the virtual environment. The integrated object in the virtual environment is one with a relative position *and* function in relation to other objects. According to this logic, purely decorative objects are virtual if they have a relative position and if their presence within the environment is functionally related to other objects. If not, they are not considered objects in the virtual environment.

For example, a door that opens is considered a virtual object. A door that does not open but that nonetheless serves the function of blocking whichever space it takes up – much like a wall – is considered a part of the wall object. A painting on a wall, however, will rarely be functionally related to other objects or have a dedicated position within the geometry. In most cases, paintings on walls in digital games consist solely of signs and cannot be thought of as independent objects within the virtual environment. Whether such representations are fictional or not, I will leave for other scholars to discuss – Aarseth (2007) would certainly argue that this is the case. For this study, it will suffice to state that such purely representational and non-functional entities are *not* virtual objects.

3.6 Chapter summary and conclusion

This chapter has introduced various theoretical concepts and terms needed for situating the definition of the virtual environment within existing discourses. A discussion of these theories resulted in a definition of the virtual environment as *a navigable geometry constituted by a computational, relational model. The virtual environment as a spatial structure represents the relative positions of objects that can be described as integrated by virtue of being both spatially and functionally related to other objects within the virtual environment.*

The virtual environment was then described as containing various types of objects categorised into three types: player objects, objects, and markers.

Drawing inspiration from some of the central principles of OOA/D, the virtual environment was presented as a relational system containing different objects. This resulted in a revised take on the meaning of integration, discussed in relation to Jørgensen's distinction between *superimposed* and *integrated* information as well as her concept of *ecological* information. I argue that objects can be described as integrated within the virtual environment only when they can be described as located spatially *and* functionally within the navigable geometry of the virtual environment.

The virtual environment is described as *virtual*, in contrast to *fictional*, *real*, or *simulated*, terms that were discussed in relation to arguments put forward by Aarseth (2007), Chalmers (2017), and Juul (2019). Based on a review of these discussions, virtuality is taken to simply mean that virtual objects consist of signs *and* a dynamic model. The computational processes of the objects determine their behaviour in the game as a software system. The virtual environment is experienced as a space by virtue of its integrated virtual objects and their representations which facilitate an interpretation of the environment as a navigable landscape or a world. A fictional world can be cued by various signs across various modalities and different sign types, but it is not an inherent feature of the virtual environment.

The different types of objects found in the virtual environment can exist in various relationships with each other. Objects and markers were presented as differing according to their integration within the environment. Objects are persistent, whereas marker can cease existing when their status as integrated is altered, only to be (potentially) re-established, for example when an item is put into an inventory and then dropped again or equipped on the player object. The defining characteristics of player objects and their integration within the virtual environment is the topic of the next chapter.

4. Player Objects

4.1 Chapter introduction

Digital games present captivating virtual environments for players to navigate and act in, some of which are abstract spaces while others are represented as rich, fictional worlds. What makes these environments particularly inviting is the fact that players can act inside them using a dedicated object, oftentimes presented as a character. Within the context of this study, this object that functions as the player's point of control within the virtual environment will be referred to as the *player object.*

As a facilitator of agency and a primary tool for interacting with and being acted upon by other objects in the environment, the player object and its integration within the virtual environment is at the heart of this dissertation. The previous chapter presented and defined the virtual environment in relation to game-specific theories on space and virtuality. This chapter will present the player object, ranging from its most simple form to a more complex form. The simple form is defined according to two defining characteristics, *integration* and *movement*, and the more complex form involve the characteristics of *dynamics*, *visual framing*, and more elaborate movement, that I will refer to as *navigation*. The defining characteristics and additional characteristics of more complex player object further the understanding of virtual environments as relational systems in which player objects are integrated and distinct objects that, according to the player's input, interact with other objects and markers of the environment. The chapter is thus dedicated to the unpacking of these concepts, using examples from the sample.

It has been the interest of many scholars to explore the various ways in which games facilitate interaction through, for example, avatars. The theory of player objects shares similarities with some of the many theories that can be categorised under the rather vast umbrella term *avatar theory.* Avatar theory covers studies and theories from a wealth of different disciplines that explore, for example, notions of engagement, identification, embodiment, and characterisation, all of which are outside the domain of the concept of player objects. Those relevant for the study at hand represent a narrower tradition of avatar theory that builds on the concept of embodiment and player positioning within gameworlds, for example through analysis of the functions of the avatar and its influence on the player's perspective upon the virtual environment.

Therefore, it is necessary to present and discuss selected theories that will help clarify and situate the player object within existing discourses, before defining the characteristics of player objects within the PO-VE framework. The primary theoretical domains that influence the conception of the player object are discussed under the general title *alternative approaches*. The section explores the notion of agency in digital games and zooms in on avatar theory, separated into the two sub-categories of *ludic avatar theory* and *phenomenological avatar theory*. Next, three frameworks (The Game Ontology Project, applied ludology, and the Historical-Analytical Comparative System) are studied to understand how player control and avatar-related concepts have been integrated within broader analysis models and ontologies.

Subsequently, I propose the characteristics of player objects, building on a functionality-centric perspective. Various types of simpler as well as more complex player objects are explored through a multitude of examples from the sample. Finally, I discuss the (defining and non-defining) characteristics of player objects in relation to the theories presented in the first section of the chapter, which helps to contextualise the player object while exploring the ways in which it is fundamentally different from the other game studies terms and concepts, including the avatar.

4.2 Alternative approaches

4.2.1 Agency

Many definitions and conceptualisations of avatars and related terms build on ideas of control or agency. Agency is a tricky concept which deserves its own dissertation to be accounted for in detail. Therefore, the summary that follows represents only a few, canonical points in the discussion and definitions of the term within a more analytical game studies context.

One of the first scholars to discuss the notion of agency in relation to digital games is Laurel, who in her book *Computers as Theatre* defines agency in a software system context simply as "the ability to *do* something" (Laurel, 1993[1991], p. 116) and "the power to take action" (ibid., p. 117), ultimately as something constituted by an experienced feeling in the individual interacting with the system in question. Expanding on this discussion, Murray (1997) defines agency as "the satisfying power to take meaningful action and see the results of our decisions and choices" (ibid., p. 126). Exactly what is considered by the term *meaningful* in this definition is unclear and has been criticised for being "a vague term, requiring us to define the context against which an action is judged to be 'meaningful'" (Vella, 2015, p. 158).

Murray considers spatiality a defining characteristic of digital games and she lists spatial navigation as a prime example of agency in digital environments (ibid., p. 129). While the ability to navigate a virtual environment can give a sense of agency insofar that movement is considered a meaningful action by the player, agency is, according to Wardrip-Fruin et al. (2009), best understood when considered in relation to both player *and* game. They define agency as "a phenomenon, involving both the game and the player, that occurs when the actions players desire are among those they can take *as supported by an underlying computational model*" (ibid., p. 7). The definition put forward by Wardrup-Fruin et al. speaks to a more design-centric discourse, where agency has been discussed as something which can be expanded or restrained through design, and which ultimately defines what actions can be performed in the game, thus defining the game itself (Sicart, 2008). Wardrip-Fruin et al. deviate further from Laurel's and Murray's definitions by defining agency directly in relation to the game system described as a computational model – an approach that resonates with the design-centric discourse, but which situates the object of study as a computational model rather than the experienced game.

The avatar functions as a bridge between player and gameworld (Buerkle, 2008) and the agency concept can therefore be used to describe various perspectives upon the avatar, emphasising both or either side of the bridge: player and game. While seemingly used in as many variations as the avatar term, agency is nonetheless a something to keep notice of in the theories to come, as it is influential in different types of avatar and avatar-related conceptualisations.

4.2.2 Avatar theory

Originating in Hinduism, where the direct translation is *below* and *crossing*, i.e., "the 'crossing-down' of a god to free humanity from evil" (Mukherjee, 2012), the avatar term is by some considered cultural appropriation, one which describes the experience of gaming as an "'other' to mundane everyday experience" (de Wildt et al., 2019, p. 5). Perhaps without considering its post colonialist implications, both developers, gamers, and scholars alike have used the term eagerly to describe various manifestations of the player's representation or point of control or action within a digital game.

The term *avatar* has been used to describe a wide variety of objects of study and phenomena both within and beyond game studies, which makes it difficult to apply as a tangible, analytical concept. It can be used to refer to the player's highly customisable and role-playable characters in MMORPGs (e.g., "I just participated in a raid in *World of Warcraft* [Blizzard Entertainment, 2004] and looted some sweet gear for my avatar!"), to speak of a predefined character that the player controls as a primary way of interacting with a game (e.g., "Stupid Aloy, why can't this avatar jump higher?!"), to refer to any kind of representation of a user in a digital environment (e.g., "I designed my avatar in *Second Life* to look somewhere between myself and Scarlett Johansson")… At the same time, many related terms, such as *player character*, *player figure*, or *agent* are applied in more specific analyses and theoretical contributions within the general domain of avatar theory. This indicates that some scholars avoid the term due to its multiple meanings, in order to offer more specific and clearly defined concepts that aid structured game analysis.

Within the domain of theoretical game studies, the avatar has been defined as a prosthetic extension of the player (Klevjer, 2006), the locus of manipulation embodied by the player (Bayliss, 2007), a puppet manipulated by the player (Blanchet, 2008; Georges, 2012; Westecott, 2009), and a game component under the player's direct control in the “game-as-system” (Vella, 2015). Klevjer and Vella’s definitions integrate theories from phenomenology, something which seems a developing trend within avatar theory (see also Kania, 2017), whereas the puppet metaphor has been repeated by various scholars, expanding beyond the term avatar[9].

A specific group of avatar definitions emphasises the player’s creative control in the construction of the avatar (Boudreau, 2012, p. 73) and its function of representing the player, with no perceivable identity of its own (Tronstad, 2008, p. 258). This is the avatar typically associated with MMORPGs, which is sometimes contrasted with the notion of *character*, for example when Boudreau argues that “avatars are found largely in videogames that offer the player the opportunity to create their avatar” (as in the *World of Warcraft* example above) contrasted with “what is often referred to as a player-character, which is typically a pre-created, scripted character that the player controls within the structured confines of a videogame narrative” (Boudreau, 2012, p. 73) (as in the Aloy from *Horizon Zero Dawn* (Guerrilla Games, 2017) example above).

Many of the elements of the various avatar definitions overlap, and it is according to these similarities that some selected theories will be discussed below as belonging to one of two primary categories of avatar theory: the ludic tradition and the phenomenological tradition. It should be noted that the distinction made between the two is not one explicitly presented by the authors whose work is labelled under either of the two categories.

4.2.3 The ludic tradition of avatar theory

The ludic tradition of avatar theory is (as ludic was defined in 1.2 not as emphasising the *playful* quality of a game, but rather its rules) one that prioritises the game rules and the game system’s structure in the analysis, wherein the avatar has a primary function of facilitating gameplay by extending the player’s agency within the digital game. A ludic analysis is thus occupied primarily with the rules and gameplay aspects of the

[9] For example, Westecott (2009) speaks of player characters rather than avatars, a term which will be discussed later.

game, whereas the material or semiotic system presented as a gameworld is of less interest (Aarseth, (2006 [2004]), p. 48). This viewpoint is expressed in Aarseth's often-contested statement that, when navigating the environment in *Tomb Raider* by controlling the protagonist Lara Croft, "I don't even see her body, but see through it and past it" (ibid., p. 48). The distinction aligns with his conception of game objects as consisting of mechanics (game system) and semiotics (gameworld) (Aarseth, 2011), a distinction that resonates with this project's understanding of functionality in contrast to representation.

While Aarseth, whose contribution to avatar theory is limited to the very statement above, draws a strong line between the representation of the avatar as a character and its function in facilitating gameplay, it is typically the case that ludic avatar theories refer also to the way in which the avatar is represented as a character in a narrative. For example, this is apparent in the use of variations on the *character* term (e.g., *player character*, *player-character*, or simply *character*), which is often used in the analysis of the ludic avatar.

On-line and off-line characters

In one of the earliest works within the tradition of ludic conceptions of avatars and related notions, Newman (2002) argues that *characters* (not avatars) in digital games differ significantly in their *on-line* and *off-line* manifestations. On-line refers to "the state of ergodic participation that we would, in a commonsense manner, think of as 'playing the game'" and off-line is used to describe "periods where no registered input control is received from the player" (Newman, 2002).

Games, according to Newman, consist of various sections, some of which are on-line (those during which input from the player is received and the system corresponds accordingly) and some of which are off-line (for example cutscenes, in which the player's input does not result in any response). In this, we might consider on-line sections of interest in the ludic tradition, whereas off-line sections deal more explicitly with characterisation. However, Newman also points out that these distinctions are not as clear-cut as they otherwise might seem. Quick-time events, for example, challenge an understanding of on-line/off-line as binaries, as "ergodic punctuations can interrupt and break up otherwise Off-Line sections and effectively lend the whole scenario a sense of enhanced participatory involvement" (ibid.). Thus, rather than thinking of them as binaries, "On-Line and Off-Line engagement should be thought of as the polar extremes of an experiential or ergodic continuum" (ibid.).

The two polar extremes are useful to Newman for understanding some of the basic qualities of characters as they are presented in digital games. In on-line engagement, what matters is not the *representation* of the character, i.e., the combination of signs that relay information about the character to the player, but rather its functionality (its properties and behaviours within the game system that facilitate player agency), thus contradicting the term as it is used in the study of other media. Newman explains:

> I want to suggest that, for the controlling player during gameplay sequences, the notion of "character" is inappropriate. Here, the "character" is better considered as a suite of characteristics or equipment utilised and embodied by the controlling player. The primary-player-character relationship is one of vehicular embodiment. In suggesting this model, I seek to challenge the notion of identification and empathy in the primary-player-character relationship and, consequently, the privileging of the visual and of representation-oriented approaches. (Newman, 2002)

We see that Newman's conception of the on-line character starts to resemble the way in which avatars are theorised elsewhere:

> Characters On-Line are embodied as sets of available capabilities and capacities. They are equipment to be utilised in the gameworld by the player. They are vehicles. This is easier to come to terms with when we think of a racing game like Gran Turismo where we drive a literal vehicle, but I am suggesting that, despite their representational traits, we can think of all videogame characters in this manner. On-Line, Lara Croft is defined less by appearance than by the fact that "she" allows the player to jump distance x, while the ravine in front of us is larger than that, so we better start thinking of a new way round… (Newman, 2002)

Newman stresses the ergodic aspects as central for understanding the on-line nature of the character, which differs from approaches that emphasise the representational nature of the character, such as those put forward by Tronstad (2008) and Boudreau (2012). This means that Newman's inquiry can be situated within what I have described as a ‘ludic analysis tradition’, where function and system are prioritised over representation and characterisation. The conception of the on-line character emphasises a notion of direct control, thus relating his theory directly to the phenomenological tradition and Klevjer’s notion of direct control. Similarly, the statement about the on-line character as “equipment to be utilised in the gameworld by the player” situates Newman’s theory as one which emphasises agency and frames avatars as *tools*.

The avatar as a tool

Much work within the ludic tradition of avatar theory has described avatars as tools that facilitate play by constituting a point of action (Thon, 2009) for the player within the given game. Conversely, proponents of the phenomenological tradition have strongly opposed the view that the avatar can be condensed to a tool or “a mediator of agency or ‘interactivity’ in a general sense” (Klevjer, 2006, p. 10). Newman was one of the first to describe the avatar’s tool-like qualities, but others have followed, and it is not unusual to see the avatar term equated with the notions of agency, framed through the metaphor of the tool.

One of the scholars advocating for this type of avatar is Linderoth (2003), who has identified three layers to the avatar: as a *role*, it presents a character that the player can pretend to be; as a *tool*, it extends the player’s agency within the activity of playing the game; and as a *prop*, the avatar can be used as a part of the player’s presentation of self (ibid.). Linderoth explains:

> When the avatar becomes a tool for the player, an extension of her or his agency, the term ‘I’ refers to the player – avatar unit. This is not a phenomenon which is unique for the gaming activity, it occurs in other cases when our ability to act in a certain activity systems [sic] is mediated by a tool. (Linderoth, 2003)

While the avatar can be conceptualised as something distinct from the represented character, it is inevitably tied to both its representation and the environment in which it exists, and is ultimately under the power of the player, whose imagination is outside the bounds of the game designer’s intentions and the game object itself. As Buerkle states: “The player’s embodiment can only be explained as negotiating between character and observer, caught somewhere in-between and fulfilling both roles simultaneously" (Buerkle, 2008, p. 287).

Avatar categorisation

The fluctuation of the player's embodiment articulated by Buerkle has not stopped scholars from attempting to develop analytical frameworks and models for the study of avatars that go more in-depth than the more general observations and statements of Newman (2002) and Aarseth (2006). One of such contributions is presented by Kromand's avatar categorisation.

To Kromand, an avatar is "a game unit that is under the player's control" (Kromand, 2007, p. 400), wherein *unit* refers to its being "characterized by a clear marking of its individuality and of its physical presence in space" and *control* means that "the avatar has to be causally aligned to the player and act under the player's operations within the game system" (ibid., p. 400). Thus, an avatar is any spatially confined object of which the player has control: "An avatar will be any game-unit that has action possibilities and that answers to the player" (ibid., p. 400).

His model consists of four primary *archetypes* plotted along two continuums (see image 4.1 below). The first is based on the player's identification with the avatar and their ability to alter the attributes of the avatar before and/or during play – its open or closedness (Kromand, 2007, p. 402).

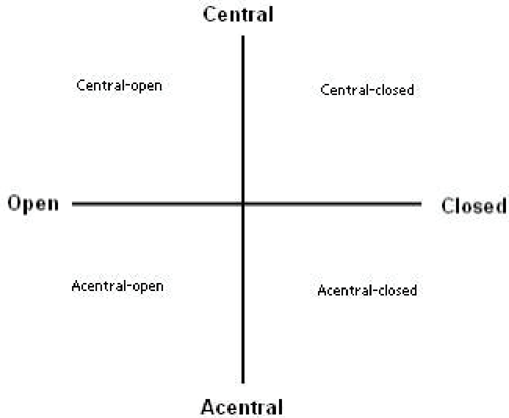


Image 4.1. Kromand's grid of avatar categorisation (Kromand, 2007, p. 402).

Kromand suggests that *closed avatars* are those which have "a complete personality from the beginning of the game, although parts of it may be secluded from the player or changed through the course of the game" (ibid., p. 401). This stands in contrast to the *open avatar*, which "has no personality traits without the involvement of the player" and which "starts the game as a blank slate and gains its personality through player choices" (ibid.). Or, put differently, closed avatars are clearly represented as (perhaps at times autonomous) characters, whereas open avatars are less characterised. From the sample, Geralt of Rivia from *The Witcher 3: Wild Hunt*, Alan from *Alan Wake*, or Juliet from *Lollipop Chainsaw* (Grasshopper Manufacture, 2012) are all strong examples of the former type of avatar, and the player-created avatars of *The Elder Scrolls V: Skyrim* or *Baldur's Gate II: Enhanced Edition* are strong examples of the latter.

For his second continuum, Kromand draws on theories developed for understanding movie audiences' emotional engagement with characters portrayed in cinema to establish the concepts of *central* and *acentral* avatars. The concepts, however, deal less with the actual emotional engagement of players and more with the player's perspective of the gameworld – whether constituted as a first-person perspective, third-person perspective (which he describes as more 'detached'), or an omniscient 'godlike' view of the virtual environment. The perspective, Kromand argues, relates directly to the type of control the player has over the avatar, and he states that the "acentral identification requires a separation of the player and the avatar" (Kromand, 2007, p. 401). Examples from the sample of central avatars are *Homefront: The Revolution* (Dambuster Studios, 2016), *Metroid Prime* (Retro Studios, 2002), and *Unreal Tournament* (Epic Games, 2000), all of which can be described as having first-person perspectives upon the virtual environment. Acentral avatars can be found in for example *XCOM 2* (Firaxis Games, 2016) and *Baldur's Gate II: Enhanced Edition*.

Based on the two continua, Kromand identifies four archetypes of avatars that constitute his typology: the *central-open* avatar, the *central-closed* avatar, the *acentral-open* avatar, and the *acentral-closed* avatar.

The central-open avatar is described as typical for role-playing games, where the player controls the development of the avatar in terms of its skills, "the emotional aspects of the possible world" (assumed to refer to the characterisation of the avatar) (ibid., p. 403), and its visual appearance. The central-closed avatar has a predetermined set of abilities and has (relatively) static aesthetics which makes it more easily recognisable. "The central-closed avatar is a single character and can be given a name" (ibid., p. 403), resembling Boudreau's concept of *player-character.* The acentral-open avatar is exemplified in games such as *The Sims* (Maxis, 2000), where Kromand states that it is "oriented towards organizing a string of actions to maximize the avatar's well-being" and the player must "assess success in the overall sum and not only in the isolated actions" (Kromand, 2007, p. 404). Finally, the acentral-closed avatar is seemingly not present in games, and is instead found in non-interactive media, with Kromand admitting that the "avatar category hardly seems useable [sic] because of the ergodic weaknesses" (ibid., p. 404).

Whereas the distinction between the customisable central-open avatar that allows the player to choose and develop its represented character and the predefined character of the central-closed avatar is perhaps a useful one, similar to Boudreau's (2012) distinction between avatars and player-characters, Kromand's acentral archetypes makes apparent some flaws in the framework. *The Sims* positions the player as an omnipresent (Elverdam & Aarseth, 2007) force with great control over the environment itself, control which is exerted through overlay menus and only in part as symbolic interfaces that allow for interaction with specific objects within the environment. Only parts of the gameplay of *The Sims* revolves around integrated objects in the form of human-like beings, whose autonomy may overrule the player's input at any time. If Kromand's avatar is "a game unit that is under the player's control" (Kromand, 2007, p. 400), then Sims (the human-like beings) are not true avatars, as these are guided rather than controlled by player input and will ultimately act on their own volition if the player fails to play according to their needs and wishes. While most avatars may be autonomous to some extent (Willumsen, 2018b), Sims (along with the Tamagotchi digital toy, another example of an acentral-open avatar proposed by Kromand) are ultimately not *controlled* as they are not 'causally aligned' to the player and will often refuse to "act under the player's operations within the game system" (Kromand, 2007, p. 400).

Kromand's theory points to a need for terminological precision when developing the concept of player objects as an alternative to his understanding of the avatar. The openness continuum is a significant contribution to the ludic tradition of avatar theory and relevant for the study at hand, as it allows the analyst to assess the extent to which the avatar represents a diegetic character (although phrased by Kromand as *personality*), thus implicitly arguing that the characterisation of the avatar is not an inherent or defining quality. The centrality continuum highlights the importance of considering visual framing in studies of avatars as well as player objects.

4.2.4 The phenomenological tradition of avatar theory

The theories categorised under the label of the phenomenological tradition of avatar theory include those incorporating philosophical theories of phenomenology as a premise, but also those which in general conceive of the avatar in terms of its *being-in-the-gameworld*. The approach to avatars as beings-in-a-world is not merely spatial – it also involves a notion of embodiment that purely spatial perspectives do not cover. Rather, theories categorised under the phenomenological tradition of avatar theory explore games as experiential, emphasising embodiment through an avatar as a facilitator of the subjective sensation of *being there*, in the tradition of Heidegger's

(2010[1927]) philosophy and his concept of *Dasein* (e.g., in *Being and Time* [ibid.]). This category of avatar theories is therefore not solely reserved for philosophical phenomenology, but instead for those avatar theories that ground themselves in broadly existential, philosophical traditions. Many of the theoretical contributions to this tradition build and expand upon the theories of what I have referred to as the ludic tradition.

Direct/embodied/tangible control

As a step towards demarcating and theorising his research object of avatar-based worlds, Klevjer suggests a model for assessing "degrees of avatarhood in terms of embodied interaction; from the indirect interaction of symbolic interfaces to the direct interaction of tangible interfaces" (Klevjer, 2006, p. 132). The two are defined in opposition to each other as follows:

> 'Tangibility' in this context does not refer to that which can be physically touched and felt (although this dimension may also be implemented in various ways), but that which can be interacted with in a manner that simulates physical interaction. Indirect or informational manipulation, on the other hand, is when we control or influence elements in the environment through symbolic action, via language or other means of information that explain and designate behaviours and actions. (Klevjer, 2006, p. 118)

Klevjer lists the point-and-click interface as an example of a symbolic interface, different from the direct interaction through tangible interfaces. The tangible interface arguably "simulates physical interaction" (Klevjer, 2006, p. 118). It offers the player a sense of *real-time control* which is different from *real-time interaction* (ibid., p. 134).

Klevjer's terminology – the distinction between direct and indirect manipulation – originates from HCI (Human-Computer Interaction). In Shneiderman's (1982) original use of the term, *direct manipulation* refers to "visibility of the object of interest, rapid reversible actions and replacement of complex command language syntax by direct manipulation of the object of interest – hence the term 'direct manipulation'" (ibid, p. 246). To truly understand the meaning of direct manipulation, we must consider the context in which Shneiderman suggested the term – a technological past where interactions between humans and computers were much different from what we are used to today. Therefore, Schneiderman's vision of a system where complex command language syntax is replaced by a more direct type of manipulation seemed almost utopian, and indeed he admits himself: "No single system has all the attributes or design features that I admire" (ibid, p. 246).

Regardless, Shneiderman explores video games as a successful application of the concepts involved in direct manipulation, where "the commands are physical actions such as button presses, joystick motions or knob rotations whose results are shown immediately on the screen" (Shneiderman, 1982, p. 249). Mentioning, among other games *Asteroids* (Atari, 1981), which is also in the sample of this study, Shneiderman draws attention to additional principles that makes digital games special examples of direct manipulation: they provide a field of action that is an abstraction of reality, and therefore simple to understand; the player need not remember syntax, and there are therefore no syntax-error messages, nor other error messages, as results of actions are obvious and easily reversed; they keep a continuous score that the player can use to measure their progress; and they depend on hand-eye coordination, unlike non-game applications (ibid, p. 249).

Using examples from multiple application types, Shneiderman constructs the following "integrated portrait of direct manipulation" (ibid, p. 251):

1. Continuous representation of the object of interest
2. Physical actions or labelled button presses instead of complex syntax
3. Rapid incremental reversible operations whose impact on the object of interest is immediately visible

It thus becomes apparent why many digital games are such excellent examples of Shneiderman's direct manipulation, as *Asteroids* (to stick with an example he uses himself) obeys to all three dimensions of the portrait above: (1) the player object represented as a small spaceship is continuously represented on the screen monitor, and input is immediately represented visually on screen – through change in location upon movement input or shots fired. The game offers real-time control and real-time feedback. (2) When played on the Atari 2600, the player utilises a joystick to manipulate their player object, thus performing physical actions, i.e., pulling the joystick in the intended direction for movement and button pressing for shooting, rather than inputting textual data following a given syntax. (3) If the player moves to the right and instead wishes to move to the left, they may do so immediately, by moving the joystick in the intended direction – their actions are reversible and new input is immediately visible in the representation of the player object on screen.

With direct manipulation defined according to the principles above, *indirect manipulation* is taken to mean the opposite: non-continuous representation, input through syntax, and inability to reverse operations and observe immediate impact.

Klevjer (2006) specifically notes a difference in Shneiderman's HCI-tradition of the term and his own phenomenology-inspired application wherein the avatar is explored as an instrumental extension. In Klevjer's use of *direct manipulation* "emphasis is on the simulation of a direct physical relationship rather than trying to account for in systematic terms how this directness is constructed from the point of view of interface design" (ibid, p. 119). It thus expands on Shneiderman's second principle and involves an examination of how the physical controller-action that replaces syntax-input simulates the physical actions visually represented as the input is translated into action of the player object in the virtual environment.

This alternative use of HCI-terminology makes Klevjer's theory not only distinct from other avatar definitions. It also makes it very relevant for studying PO-VE relations, as the extent to which player object-control simulates a physical relationship (through direct manipulation) or transpire through manipulation of symbolic interfaces (through indirect manipulation) may determine how player object integration within the virtual environment is perceived. Moreover, it draws attention to the specificities of the controller, and its role in the manipulation of the player object. For this reason, the PO-VE model contains a category dedicated to whether a player object is controlled through direct or indirect manipulation, and in the section in which this part of the model is introduced (5.3.2), I rely on Klevjer's take on the HCI-terminology, which includes Shneiderman's original definition but also involves an emphasis on whether and how the physical actions performed by the player in their manipulation of the player object simulates the represented actions in the virtual environment. As such, the phenomenological angle does not make its way into the project at hand, but the simulative aspect of direct/indirect manipulation emphasised in Klevjer's exploration of the avatar as an instrumental extension of the player remains.

The game ego

While many definitions of avatars and related terms focus on agency as manifested through an individual or several beings in the gameworld, Wilhelmsson offers an alternative approach: the game ego. The game ego is "a part of the player that is acting within the game environment. It is a motor part and an extension of his or her sensory motor system" (Wilhelmsson, 2008, p. 61). While Vella has criticised this concept for lacking "the rigour and specificity required to offer a cogent definition of the formal entity that the player is in the gameworld" (Vella, 2015, p. 2), it offers something else: a broader concept under which the avatar is considered a sub-category, independent of its representation or characterisation. Moreover, like Klevjer's 'prosthetic avatar', the game ego is an extension of the player themselves.

According to Wilhelmsson (2008), "the Game Ego function as such might be a visible character that the game player can control on the screen, an avatar within the game, but this is not necessary" (ibid., p. 63). Only through a visual manifestation (the details of which are unclear) is the game ego considered an avatar (ibid., p. 67). This means that games such as *Tetris* and *Zork* (which differ, each in its own way, from games typically considered avatar-based) can be analysed through the lens of the game ego.

Whereas others have argued that the avatar is the link establishing a bridge between player and gameworld (Buerkle, 2008; Kromand, 2007), the game ego "serves as an anchoring force within the system of the game and provides a key element in the process of engaging the player and providing a sense of being within the fictional space time of the game through the possibility of exerting force upon the environment" (Wilhelmsson, 2008, p. 64). Illustrating the scope of the game ego concept with an analysis of *Tetris*, Wilhelmsson states that the "Game Ego is that function, the agency within the game that manifests the player's presences allowing him or her to perform actions. The visual form it takes is not as important as its functional schemas" (ibid., p. 63).

As noted in Vella's (2015) criticism, it appears that the game ego is an alternative to the notion of agency, specified in relation to its connection to the gameworld and its environment. The game ego is perhaps too vague to be practically utilised in analysis, but it serves an example of an approach that combines the perspectives of the ludic tradition and the phenomenological tradition of avatar theory. As an extension of the player's sensory motor system, it also incorporates elements explored in Shneiderman's direct manipulation.

Ludic subject-positioning

Building on Klevjer's (2006) avatar, Wilhelmsson's (2008) game ego, and the phenomenology of Husserl, Heidegger, Sartre and Merleau-Ponty, Vella's 2015 dissertation develops a detailed theory of ludic subjectivity that is perhaps the most substantial contribution to date to the phenomenological tradition of avatar theory. Based on parts of this dissertation, his 2016 paper aims to identify "the various forms taken by the 'I' the player identifies as herself in a digital game" (Vella, 2016, p. 1), referred to as *types of ludic subject-positioning*. As opposed to the typically applied terminology of *avatar* and *character*, Vella uses the terms *ludic subject-positioning, ludic subject,* and *playable figure* to refer to his objects of study. The categories of embodied and transcendent ludic subject-positions govern not only the structure of Vella's argument but also the typology developed throughout the paper.

Embodiment and the playable figure

Embodiment is constituted by a series of formal aspects belonging to the *playable figure*. The playable figure, in turn, is defined as the embodiment through which the player engages with the gameworld (Vella, 2016, p. 3). The term transcendence refers to situations where "the player's subjective standpoint towards the gameworld does not relate to any single figure within that domain" (ibid., p. 3). The aspects of the playable figure that contribute to embodiment are *spatial standpoint*, the figure's *capabilities and limitations*, *goal orientation*, and *passion*; these can thus be read as defining characteristics of the playable figure. Based on these aspects, Vella builds a typology of ludic subjectivities, featuring three possible types: embodied ludic subjectivities, distributed ludic subjectivity, and transcendent ludic subjectivity.

Embodied ludic subjectivities

The embodied ludic subject-position can take various forms, thus expanding on the two simple categories of the embodied and the transcendent ludic subject positions. The subjectivities that result from the embodied ludic subject-position are *singular embodied ludic subjectivity* and *multiple embodied ludic subjectivity*, each of which includes various special and borderline cases, depending on the specific configuration.

The singular embodied ludic subjectivity is the simplest and most common form, which describes situations where engagement with a single playable figure structures the player's engagement with the gameworld (Vella, 2016, p. 5). Consequently, "this is the mode of embodied ludic subject-positioning which adheres most closely to the phenomenology of the body" (ibid., p. 5). The embodied ludic subject-position, however, does not depend on direct control (in Klevjer's [2006] terms) – it can "operate both through a tangible and an indirect mode of control" (Vella, 2016, p. 6). As a result, the singular embodied ludic subjectivity can be used to describe an array of games, ranging from *The Secret of Monkey Island* (Lucasfilm Games, 1990) to *Tomb Raider* (Vella, 2016, p. 6).

As an alternative to the singular embodied ludic subjectivity, the game may offer multiple playable figures for the player to control. Only one can be controlled at a time, but since the player can switch between controlling different playable figures "in the same scene" (Vella, 2016, p. 6), this is termed *multiple embodied ludic subjectivity*. One of these playable figures may be a *privileged figure*, i.e., "the player's central 'I' in the gameworld" (ibid., p. 7), whose death may cause an immediate *game over*. Games containing such figures can still be thought of as employing multiple embodied ludic subject-positions[10]. Compared to the single embodied ludic subjectivity, this subjectivity complicates the player's phenomenological relation to the gameworld as it is influenced by the knowledge of other possibilities for action associated with other playable figures – "the capabilities of the other playable figures remain at every moment present in suspension" (ibid., p. 7).

Distributed ludic subjectivity

In contrast to the embodied ludic subject-position that gives the player control of only one figure, this subject-position describes situations where the player controls multiple playable figures simultaneously. Most examples of distributed ludic subjectivity allow the player to control each playable figure at a time, thus resembling the embodied subjectivity. The difference lies in whether the player can also control multiple figures at once or not.

Games typically referred to as party-based, such as *Baldur's Gate II: Enhanced Edition* from the sample, fall under this category. Here, the player may have a privileged figure, or control various playable figures independently, but they can also mark and move all playable figures all at once. The resulting effect is "to further decentre the embodied ludic subject-position" (Vella, 2016, p. 8) causing the player's standpoint to become distinct from the playable figures, paving the way for the final type of ludic subjectivity which is attached to no playable figure(s): the transcendent ludic subjectivity.

Transcendent ludic subjectivity

The transcendent ludic subjectivity is present in the gameworld "only in the form of actions taken directly upon entities within it" (Vella, 2016, p. 10). The *point of view* and

[10] There are, however, two important forms that resemble the multiple embodied ludic subjectivity, but which nonetheless must be considered as distinct from it. One is found in games where the player controls a single playable figure that has the capability of issuing orders to other secondary figures, where these figures are not directly controlled by the player. The other form is that of games in which the player, through the course of the game and without their active choice of changing playable figure, is moved from one playable figure to the next, through a "sequence of singular embodied ludic subject-positions" (ibid., p. 8). This, Vella states, is fundamentally different from the multiple embodied ludic subjectivity as "[t]he player does not have the experience of having the instrumental complex of a singular embodied ludic subject-position either extended or multiplied" (ibid., p. 8).

auditory standpoint function only to limit the information communicated to the player to less than that of the totality of the gameworld and the player has no spatial standpoint as is the case for the subjectivities involving a playable figure.

A distinction can be made between two forms of transcendent ludic subject-positions: the *semi-transcendent ludic subject-position* and the *pure transcendent ludic subject-position*. The former refers to situations "in which the player can act upon the gameworld through one or more playable figures and act directly upon certain existents in the gameworld" (Vella, 2016, p. 11), and the latter to situations "in which the player possesses no playable figures as components of self, meaning that she can only interact directly with existents in the gameworld" (ibid., p. 11).

In games facilitating this type of pure transcendence, the player's actions are described as *direct actions*[11], as they are performed on the gameworld directly, and not through the manipulation of a playable figure. This illustrates how the theory of ludic subjectivities is rooted in phenomenology, most prominently in the notion of embodiment and the player's experienced sense of being-in-the-gameworld.

Vella is not the first or only scholar to categorise the player's position in relation to the game. For example, there are similarities between Vella's typology and Nitsche's (2008) notion of *player position*. Nitsche explores the player's access to the game "not only on the level of the mediated plane but also for the rule-based, fictional, and social ones" (Nitsche, 2008, p. 209). In this, he argues for three primary models of positioning the player in relation to the game: through *no role*, mentioning ARGs (augmented reality games) as a primary example in which "player do not have to identify with a fictional actor, but can act as themselves in fictional settings (ibid., p. 210); through *one role*, which "allows the user to step into the spatial world of the action itself through the filtering eyes of the virtual camera" and which has them "step into a dramatic role in relation to the game space" (ibid., p. 212); and through *multiple roles*, a positioning which "widens the player's comprehension of the game world and adds more layers to it" (ibid., p. 220) as they utilise multiple characters as "different windows to the game

[11] Note that *direct* is here used to account for a different type of action than Klevjer's (2006) direct or tangible interfaces, discussed in 4.2.2.

world" (ibid.). Nitsche emphasises what he refers to as the "dramatic positioning", based on Laurel's (1993) study of games as theatrical performances, where the analysis is conducted through a filter of the game-as-diegesis.

Thus, we return to a point made earlier: most avatar theories inevitably accept the representation of a fictional world and its characters as an integral part of the avatar and the way in which it is studied. This study will attempt to circumvent the problem while maintaining a focus on the game object through the framing of the functionality of the game. The concept of the *player object* is developed to accomplish this goal. Before turning to the definition of the player object, let us take a brief tour through some of the more comprehensive analytical frameworks and ontologies developed in a digital game studies context, to understand how agency and avatars are understood as components within the larger game system, thus revealing them to be objects in a relational system.

4.2.5 The avatar in context

The previous section explored theories specifically focused on avatars and related terms. While most discussions of research on this topic are rooted in these theories and inquiries, it is useful to explore how this area of study has been incorporated into more comprehensive analytical frameworks and ontologies. This can reveal not only the comparative significance of the avatar-like concepts in relation to other objects of study in each framework, but also how it can be thought of as a computational and functional object situated in relation to other system components. This line of inquiry can further the understanding of player objects as component parts of the virtual environment as a relational system.

This section is intentionally kept short, as the frameworks-as-wholes are not directly related to the study at hand. Three frameworks – the Game Ontology Project (Zagal et al., 2005), the HACS framework (Therrien, 2017), and the applied ludology framework (Järvinen, 2007) – will be briefly introduced with special focus on their conceptualisation and categorisation of entity manipulation, agents, and components-of-self, as ways of introducing avatar-thinking into broader frameworks.

Entity manipulation in the Game Ontology Project

The Game Ontology Project (GOP) was previously introduced as "a framework for describing, analyzing and studying games, by defining a hierarchy of concepts abstracted from an analysis of many specific games" (Zagal et al., 2005, p. 1). The top level of the ontology consists of five elements: *interface*, *rules*, *goals*, *entities*, and *entity manipulation* (ibid., p. 4)[12]. Of these five elements, three are particularly relevant in relation to avatar theory: interface, entities, and entity manipulation.

In the GOP, the *interface* is described as "where the player and game meet, the mapping between the embodied reactions of the player and the manipulation of game entities" (Zagal et al., 2005, p. 4). While the game entities are put at one side of the equation, this conception of the interface resembles Buerkle's (2008) conception of the avatar as a bridge between player and game, only it acknowledges an additional layer between the avatar and the player. Calling attention to this layer stresses the importance and analytical value of considering both input devices and methods, emphasising the often-overlooked study of digital game hardware.

Closer to the idea of the avatar and the way in which objects are considered in the virtual environment (using the terminology developed in the previous chapter) are the *entities*. Constituting "the objects that make up the reality of the game world" (Zagal et al., 2005, p. 8), there is little difference between the objects of the virtual environment and the entities of the GOP. Being defined primarily in terms of how they can be manipulated, the element of *entities* is intricately connected to *entity manipulation* (ibid.). Each entity can have abilities and attributes. Abilities are "the "verbs" of entities, that is, the actions that entities are able to perform" (ibid., p. 8), and entities without abilities are described as *static* (obstacles and platforms are listed as examples). Attributes are "the

[12] The article states that of the five elements, the least developed one is that of *entities*, which would explain why it does not appear on the GOP's wiki (Game Ontology Wiki, 2015) and is therefore not integrated as a primary element in the latest version of the ontology. Since no articles have been published on the development of the GOP since the 2007 presentation of the framework, the following discussion is based on the ontology presented in the paper, and not the one accessible on the wiki. The wiki is not subject to peer review in the same way as an article in a conference proceeding, which is why the paper version (despite it not being up to date) was chosen as a primary reference.

"adjectives" of entities" which are "altered by abilities. For example, the ability to move changes an entity's location attribute" (ibid., p. 8).

Entity manipulation does not describe an object in the virtual environment, but rather the alteration of attributes and abilities of entities in the game world (to stick with the GOP terminology). This makes entities dynamic in the sense that their attributes and/or abilities are continuously altered (except for static entities). While entity manipulation refers to the manipulation of any type and number of entities within the gameworld, the framing of *the locus of manipulation* (Zagal et al., 2005, p. 10) specifies whether the player manipulates single or multiple entities. Single entity manipulation can be considered the GOP framework's version of the concept of (singular) avatar.

In addition, the input device considered under the *interface* element comes into play when assessing whether the player performs direct or indirect manipulation of an entity: *direct manipulation* is exemplified with a game in which "a player controls a spaceship and presses the "left" button on the controller, the spaceship moves left" (ibid., p. 10). This differs from *indirect manipulation*, "where the player selects the actions he wants his avatar to perform from a menu" (ibid., p. 10).

By having to draw on three out of five fundamental elements of a game in order to explain only briefly the structure of single entity manipulation, the GOP illustrates the complexity of formalising an analytical concept that corresponds to the ideas of the avatar.

Agents in the Historical-Analytical Comparative System

This complexity is made even more apparent in Therrien's (2017) Historical-Analytical Comparative System (henceforth HACS). While the author states that the analytical system was "not designed with any intention to produce strong ontological claims" (ibid., p. 6), it is presented as a rather broad system that allows for comparative analysis of games according to five conceptual categories: *interactive figures*, *manipulation interface*, *mapping*, *feedback*, and *mode of engagement*.

In this rather complex system, facets of what we might consider relevant under the label of avatar theory are present in three out of five categories. For example, the *interactive figures* include the act of *navigation*, described as "moving an entity in the virtual space" (Therrien, 2017, p. 6), the *manipulation interface* describes the input device and method, and *mapping* explains the mapping of the input method into the game system and the corresponding virtual actions. While none of the categories explicitly refer to avatars or entity manipulation in a way directly comparable to the theories discussed previously in this chapter, we see significant overlaps between navigation in HACS and theories emphasising space and movement in relation to agency and avatars as beings in a gameworld. A similar overlap can be seen between the manipulation interface and (in particular) *mapping* and theories of embodiment, in particular Klevjer's (2006) prosthetic avatar and the puppet metaphor put forward by Westecott (2009) and Blanchet (2008).

Whereas the GOP refers explicitly to entities, their manipulation, and the locus of manipulation that determines the way in which they are manipulated (during which an entity is specifically referred to as an avatar [Zagal et al., 2005, p. 10]), HACS does not offer terminology specifically for the entities or objects in the game, nor the way in which they are controlled or manipulated. HACS therefore appears more conceptual, whereas GOP describes the observable content of a designed object. Regardless, both examples illustrate that avatars relate to a multiplicity of game concepts and design patterns, which might explain the difficulties of developing a tangible, analytical model for the avatar.

Components-of-self in Applied Ludology

The final framework that will be discussed here is Järvinen's applied ludology (henceforth AL), previously discussed in the methodology in relation to his framework as a research method for studying digital games. As a part of the framework, AL offers concrete terminology to describe *components* and their *ownership*.

As one out of nine possible element categories, Järvinen defines components as the "resources for play; what is being moved or modified – physically, virtually, in transactions – in the game, between players and the system. Tokens, tiles, balls, characters, points, vehicles are common examples of game components" (Järvinen, 2007, p. 135). Components, like the eight other possible elements, have *ownership*, indicating not what the component owns, but who owns it. This means that a specific component is *owned by* either *self* (referring to the player of the game from whose perspective the analysis is conducted), *other(s)* (other players in multiplayer games), or *system* (the computer system, also including AI opponents) (ibid., p. 136).

When analysing the ownership of components, we see that many components are owned by the self, thus termed by Järvinen *components-of-self*. From the analysis of a casual game, he lists the cursor, arrow tiles, and points as components-of-self. *Components* thus expand beyond the notion of *objects* (as they are conceived of in the virtual environment) because components are not bound by their integration in an environment and include anything which is "moved or modified" during play (Järvinen, 2007, p. 135) – including even points, as they are accumulated or lost during a game. This makes components-of-self quite distinct from any conception of avatars, as it encompasses *any* game resource owned and moved or modified by the player.

All three frameworks discussed above emphasise the ludic aspects in the structuralist analysis of games as systems, a focus quite different from the *functional* one, as the ludic aspects, in particular the game's rules, are at the centre of the frameworks. Despite the differences between these two ontological framings of digital games, GOP, HACS, and AL illustrate very well how avatars are not stand-alone entities that are easily isolated in ontologies and frameworks accounting for the general structure of games. Quite on the contrary, the avatar as discussed in the sections on avatar theory (ludic as well as phenomenological) is not presented in the same form in these comprehensive frameworks, but rather condensed to tangible ontological elements of *entity manipulation*, *mapping*, and *components-of-self* that appear to describe a different, typically narrower domain within games than the more conceptual avatar.

This is, presumably, in large part due to the scope of GOP, HACS, and AL, respectively, as none of the frameworks are focused on avatars or related concepts, but rather on mapping the general structure of game systems. Perhaps it is difficult to understand in detail avatars or related concepts in a structural and formalist manner matching the specificity of the frameworks discussed above. It is nonetheless the mission of this study. The next section will present the definition of *player objects* as an alternative to avatars and player characters, entity manipulation, mapping, and components-of-self.

4.3. The Player Object

In chapter 3, I introduced the concept of the virtual environment, framed through a functional perspective upon the game as a relational system. Through this frame, I identified various types of objects integrated in the virtual environment: *objects*, *markers*, and *player objects*. The two former types of objects were defined not only in relation to the virtual environment, but also in large part in relation to the player object.

This is due to the framing of the virtual environment as a *relational* system. The entities of the system – the objects – are defined in part based on their relationships to other objects. This means that the study and definition of player objects relies on the study and definition of the virtual environment and its other objects.

As we will see in the definition of player objects below, as well as in the more comprehensive approach to player objects in the PO-VE model in chapter 5, the specific framing and the resulting terminology makes the player object distinct from what is typically encompassed by the avatar and related terms.

4.3.1 Defining characteristics of player objects

In their simplest forms, player objects are defined according to two defining characteristics: *integration* and *movement*. They can thus be described in the following sentence: player objects are *integrated, moveable objects within the virtual environment that function as the player's point of control*. I will in the following unpack exactly what is meant by *integration* and *movement*, drawing extensively on examples from the sample.

Integration

Much like objects, defined in 3.5.1 as entities in the virtual environment, whose integration is persistent, player objects are integrated objects in the virtual environment. Think of Mario, as he climbs up ladders and avoids barrels being tossed in *Donkey Kong*. The car (and a – the player's – human body, if we follow the logic of the game's first-person cutscenes) racing through the streets of Palmont City in *Need for Speed: Carbon* (EA Black Box, 2006), avoiding capture by the police. Or the little square that players navigate from screen to screen in a quest to defeat the dangerous dragon and make it through the complicated labyrinth in *Adventure* (Robinett, 1980). In all these games, the player controls an object that is integrated within the environment, which allows the player object to act on and be acted upon by other objects in the virtual environment: Mario can lose a life to a rolling barrel, but also equip a hammer to destroy the barrels himself. The racing car can accidentally bump into obstacles which slows it down momentarily or forces it to stop completely, but some obstacles can be used strategically, and when bumped into, they can block the way for police cars. The square can equip a key to unlock a gate or equip a sword and defeat the dragon, but if the wrong item is equipped at the wrong time, the dragon may defeat the player object.

Put differently, player objects have relationships to the other objects of the virtual environment which in turn determine their respective affordances. Affordances describe possible actions, what the player can and cannot do. Attributes, the other constituent of objects in virtual environments, including the player object, describe properties of an object, and the integrated player object's attributes and/or affordances may be subject to alterations caused by other objects in the virtual environment. Returning to the *Donkey Kong* example above, Mario's affordances can be described as running, jumping, and climbing. When close to a hammer-marker, he can also equip this item, thus altering his affordances, allowing him to beat up barrels and enemies. Mario's attributes are speed, size, jump height, and when the hammer is equipped, he also has a hammer-movement speed.

Integration, however, does not necessitate direct manipulation or a tangible mode of control. There are two primary ways in which the player object can be controlled:

directly (through a tangible interface, where the player's control of the player object and the way in which actions are performed in the virtual environment to some extent simulate physical interaction), or indirectly (through symbolic actions, where the player object is controlled in the virtual environment for example through point-and-click commands).

While I have previously stated that I follow Klevjer's (2006, p. 118) use of the terms *direct* and *indirect control*, there is some unpacking to be done of these concepts to properly understand how the two are distinguished from each other within the context of the study, as even point-and-click commands involve direct control of the mouse-cursor (at least in the HCI-tradition of the term).

Direct is used to refer to manipulation of the player object where the input device(s) (such as the controller or mouse and keyboard) is directly mapped to the player object, thus simulating (although sometimes this term seems a stretch) the actions as they are visualised on screen. Examples of direct manipulation are found in many games played on platforms using controllers, where dedicated directional buttons or joystick-directions, once pushed, pulled, or otherwise activated, result in immediate movement of the player object on screen. The same is the case for action input, where for example a mouse click or a button press translates into immediate action in the virtual environment, such as shooting, jumping, or taking cover. This needs not take place in 'real-time', although many games involving direct mapping between controller and player object are, by convention, designed to give the player real-time control over the player object.

Indirect manipulation in games take quite a different form from what Shneiderman (1982) introduced direct manipulation as an alternative to. Very few digital games depend on syntax-input, and those that do are not encompassed by the PO-VE framework, as they are not set in graphic virtual environment because they are text-based. Instead, indirect manipulation in the PO-VE context refers to a type of control that is not directly mapped between input-device and integrated player object, but which is instead mediated through a non-integrated overlay, such as a represented action-menu in a point-and-click adventure game. Therefore, a point-and-click game such as *The*

Secret of Monkey Island (see image 4.2 below) is considered offering indirect manipulation of the player object. Even though the mouse curser is moved in real time, as a result of the player's hand movements, the player object controls are not mapped directly to the mouse curser or any other input device, but rather responds to the clicking on certain commands, either as chosen from the text-based menu or by marking a location in the virtual environment. This type of indirect control can perhaps also be described as 'second-order control'.

Image 4.2. Screenshot from *The Secret of Monkey Island* (Lucasfilm Games, 1990) illustrating one type of point-and-click interface.

Most games, however, combine direct and indirect manipulation, as movement within the virtual environment is mapped directly to for example movement buttons on the controller, but item-handling occurs through a symbolic interface. In *Don't Starve*, for example, as played on a Windows PC, the player object is moved around the environment using the WASD-buttons of the keyboard, responding immediately to the input. Cooking a meal in a crock pot, however, involves navigating the player object in the virtual environment to the crock pot in question and then using the mouse curser to drag and drop ingredients from the overlay inventory to the dedicated inventory of the crock pot, actions that are performed on symbolic representations rather than within the virtual environment itself. Thus, we see that *direct manipulation* is directly related to the concept of *integration*, but also that games need not depend exclusively on direct or indirect manipulation. In fact, many games involve both.

Movement

Central to the notion of integration is *movement*. Movement describes the player object's ability to change location within the virtual environment. To account for the complexities of spatial traversal in virtual environments, movement is, in the context of this study, reserved for location change along a single axis. It is thus equivalent to single-axis cardinality of gameplay presented by Fernández-Vara et al. (2005) and discussed in 3.2.1. I use movement to refer to the act of *moving* the player object, not to other possible actions, but consider for example jumping as movement, as it alters the player object's location within the virtual environment. However, actions such as shooting do not alter the player object's location. If the player object can change location within two or more axes, I refer to it as *navigation* rather than *movement*, and while navigation is a characteristic of many player object-based games, it is not a defining one.

Games from the sample that categorise as player object-based and involve movement (but not navigation) are limited to *Alien Invaders Plus!* (Magnavox, 1978), *Breakout* (Atari, 1978), and *Space Attack*. In these three games, the player can use a joystick or controller to move the player object along a single axis at the bottom of the screen and press a button to shoot along another axis. Following the terminology proposed by Fernández-Vara et al. (2005), the cardinality of gameplay is thus singular (hence qualifying as movement, not navigation), but the cardinality of the gameworld consist of two axes.

One of the games in the sample presents a particularly interesting borderline case. In *QWOP* (Foddy, 2008), the player controls individual limbs of a runner – thighs being controlled using the Q and W buttons on the keyboard, and O and P controlling the calves. The player object is represented as a single human runner, and while it makes sense to think of this runner as an individual object within the virtual environment, the mapping of the controllers gives the impression that the player is controlling four distinct objects. When speaking of the location change of the runner as a single player object, it would be easy to label the game as one with movement but no navigation, as the goal of the game is to move the runner as far along an x-axis, represented as a track, as possible. However, if the control of the four limbs is examined, it becomes apparent that they are in fact controlled along two axes, which contributes to the surprising difficulty of the game. *QWOP* is a game that appears as a borderline case throughout this dissertation, and within the context of movement and navigation, it illustrates how complex axis-assessment may be for unusual player object.

4.3.2 Non-defining characteristics of player objects

In most games, player objects expand beyond what is encompassed by the defining characteristics. While all non-defining characteristics would expand way beyond what can be encompassed here, I have observed three principles that are repeated in many games in the sample, all of which are relevant for understanding PO-VE relations, and all of which are integrated within the PO-VE model. These three principles are *navigation*, *dynamics*, and *visual framing*.

Navigation

As stated above, *navigation* is the more complex counterpart to *movement*. Whereas movement was defined as location change along a single axis, navigation refers to location change along multiple axes. The term navigation was chosen because multi-axis movement in virtual environments is typically represented as spatial traversal through a (oftentimes hazardous) environment, with a specific goal in mind – hence, *navigation*. The freedom of navigating the virtual environment across multiple axes adds a level of complexity to the player object.

Yet, the complexity or size of a virtual environment is not a prerequisite for navigation. Some arcade-style games, such as the single-frame game *Frogger* (Konami Industry, 1983), in which various objects such as racing cars serve as challenges to the player object's upwards movement towards a specific location, involves movement across to axes and thus navigation, despite it being both a simple and small game.

Because jumping, too, is considered a location alteration of the player object, many 2D side-scrolling games, including titles from the sample such as *Wonder Boy* (Westone Bit Entertainment, 1987) and the run-and-gun *Cuphead* (StudioMDHR Entertainment, 2017) qualify as facilitating navigation and not just movement. The same is the case for 2D fighting games, exemplified in the sample by *Eternal Champions* (Sega Interactive Development Division, 1993). Although the player only actively moves the player object back and forth in these games, the ability to jump adds an additional axis to the movement, thus qualifying it as navigation.

This illustrates how navigation is not always about spatial traversal. While space is indeed traversed in *Wonder Boy*, boss fights in *Cuphead* and general gameplay in *Eternal Champions* happens within a confined space. The player objects ability to move across multiple axes, however, functions as a strategy toward defeating opponents, and mastering player object location in two dimensions in relation to the enemies attack is key to game progress.

In many 3D games in which the player object can also move along three axes, the virtual environment and its many distinct locations tends to be at the heart of gameplay. For example, in many (more or less) open world role-playing games, such as the sample's *The Witcher 3: Wild Hunt*, *The Elder Scrolls V: Skyrim*, or *Horizon Zero Dawn*, many game objectives revolve around spatial traversal, and thus navigating the virtual environment using whatever means available in the specific game – maps, scans, and other information – is a central part of the game experience.

While not a defining characteristic, the above examples illustrate well the differences between movement and navigation, but also the various ways in which PO-VE relations may vary according to the specific type of navigation involved in the game under scrutiny.

What has not, however, been encompassed by the discussion above, are those games in which navigation is semi-automated, i.e., where the player is not responsible for all player object location changes, but where some are performed automatically. While many games have this in 'light' version, as player objects are transported around a map, or between levels, after reaching a certain point, these cases are not encompassed by this notion of semi-automated navigation. What I mean by semi-automated navigation is best described through some examples from the sample.

The semi-automated form of navigation is encountered in, for example, the genre colloquially referred to as *rail shooters*, the name of which implies that the player object is transported as if 'on rails'. *Sin & Punishment: Star Successor* (Treasure, 2010), a game associated with this genre and found in the sample, is an example of this type of automatised player object navigation. In this game, the player controls the player object along two dimensions, but the virtual environment is a three-dimensional space, and movement along the z-axis is automated by the game. The same is the case in 'endless runner'-games, such as *Subway Surfers*, where forward movement is automated.

Dynamics

Like other objects in the virtual environment, player objects have attributes and affordances, and in most player-object-based games, these are changed and altered during play. In other words, the player object is *dynamic*.

Dynamics are involved in even the simplest interactions, such as an attack from an enemy object that alters the player object's attributes of health. However, the complexity of the dynamics can be described according to *alterations* and *conversions* explained in-depth in 4.3.3. These concepts are integrated in the PO-VE model and thus central in understanding the intricacies of the PO-VE relations.

Some games in the sample contain non-dynamic player objects, which explains why it is not a defining characteristic. *Breakout* serves an example of a such game, as its player object's affordances and attributes are not altered during the game. The fail state of the game depends not on the depletion of the paddle's health or any other attributes, but occurs immediately if the player fails 'catch' the ball with the paddle, before it reaches the bottom of the screen.

Visual framing

Finally, due to the study's focus on graphic virtual environments, player objects can be visually framed in a variety of ways while also determining the visual framing of the virtual environment. The visual framing of the player object positions the player in a dual-relationship with both player object and virtual environment, as discussed in Kromand's (2007) continuum of centrality and Vella's (2016) notion of ludic subject-positioning and point of view. Whereas this framing reveals relatively little information about the player object itself, it determines in large part the player's information access to the virtual environment, and hence the player's knowledge of the player object's affordances. This is the case for multiple perspectives, including the colloquially termed *first-person*, *third-person*, and in some cases *godlike* visual framings. The most prominent exception are single-screen games such as *N++* (Metanet Software, 2018) or *Lazarian* (Midway Games, 1983), in which the visual framing is not bound to the player object itself.

The visual framing has been a point of interest to Klevjer (2006), who explores *the navigable camera* in the player-avatar relation. He discusses the importance of distinguishing between cameras that can be manipulated as somewhat distinct from the avatar itself in *dual-locus configurations* (ibid., p. 149), and those *avatarial cameras* that simply 'tag along' (ibid., p. 149) with the avatar. The intricacies of the camera-avatar relationship are relevant in Klevjer's study because the he explores the notion of embodiment, which is somehow complicated in the dual-locus configurations. In this study, however, I do not focus on how a virtual camera may be controlled as a more or less independent point, but simply on whether or not the visual framing is connected to the player object's location within the virtual environment. The navigable camera is not itself a player object, as it is not integrated in the virtual environment. It would be possible and interesting to dive deeper into the camera as an additional point of player control (as Kromand [2007] points out, the relationship between camera and player object may alter the player's [emotional] relationship to the player object), but this is beyond the scope of the study.

4.3.3 Alterations and conversions, variants and versions

As encompassed by *dynamics* in the extended definition, almost all player objects can be *altered* or *converted* during play, causing changes that constitute either new *variants* or *versions* of them. *Conversions* involves *alterations* – changes to the *attributes* and *affordances* of the player object – but not all alterations are conversions. The following section will introduce these concepts using examples from the sample.

Alterations describe changes to the attributes or affordances of the player object that consequentially constitute new *variants*, and throughout the course of most games, the player will experience hundreds if not thousands of variants. This is because something as simple as consuming a healing item (which alters the health attribute of the player object) or equipping an item that allows the player to perform an attack (thus altering its affordances) are categorised as alterations that result in a new variant of the player object. To understand exactly how frequently new variants of player objects are constituted through play, let us consider the first 30 seconds of gameplay in *Virtual Boy Wario Land* (Nintendo R&D1, 1995b):

A first possible alteration may occur if the player fails to move the player object, represented as the character Wario, successfully past moving obstacles (objects). If the player object touches a harmful obstacle or enemy, it changes size and thus constitutes a new variant, and if another obstacle is hit in this form, the player object loses 'a life', marked as a value in the overlay interface. If the player object is successfully navigated past enemies for some distance, it will encounter blocks that can be bumped into from below, thus destroying them and revealing hidden treasures (such as coins and hearts, but also power-items that further alter Wario). When a certain marker item is 'picked up', the player object is once again altered. For example, when encountering the game's first helmet-marker, Wario is represented as wearing a helmet with horns and he can perform a new type of ground pound-attack, thus constituting a new variant with altered affordances.

As can be seen from the example above, new variants of the player object are constituted continuously throughout the game, and in some games alterations and thus new variants may be brought about by the mere passing of time or reaching specific ludic goals, which cannot similarly be accounted for using the terminology of the PO-VE framework, as such alterations are not brought about by the player object's relationship to the virtual environment.

Conversions occur much less frequently than alterations, and whereas alterations resulted (continuously and repeatedly) in new *variants*, conversions are processes that result in a different *version* of a player object. Conversions expand beyond alterations of attributes or affordances as they also involve a significant change in the *visual representation* of the player object. The conversion-involved changes to the player object's attributes, affordances, and visualisation result in an altered *designation*. This is best illustrated through the following example.

An alteration caused through the consumption of a healing item or the equipment of armour will not change how the player object is identified. If Lara Croft uses a medipack in *Tomb Raider*, she is still *Lara Croft*. While Wario's visual representation is altered when a new helmet is equipped, he remains Wario, simply with new headgear. New variants do not change how we would refer to the player object – Lara and Wario remain Lara and Wario.

A conversion changes how a player object is experienced with reference to its visualisation and representation within the virtual environment. It thus illustrates the difficulties of focusing solely on the functionality aspect of PO-VE relations and relies on an analysis of the visualisation of the player object. Only through functional alterations to attributes and affordances *and* a radical change in the visual representation of the player object may it be considered a new version. Therefore, a new version also changes the player object's *designation*. For example, if a player object mounts a vehicle or mount, the designation we might give it would be *character name and mount*, for example *Link and horse*, unified as a single player object with altered attributes, affordances, visualisation, and designation.

This is even more apparent in games in which the single player object represents different characters at different points in the game, as is the case in *Batman: Arkham City*. In this game, conversions involve not only functional and visual alterations, but also distinct characterisation, and thus designations, translating into the perceived switch between the characters Batman and Catwoman. The primary differences between this conversion and the one involving Link and his horse is the changed characterisation brought about in the Batman game, as well as the involvement of a dynamic object in *The Legend of Zelda: Breath of the Wild* (the horse, which remains semi-autonomous even when a part of the player object).

Some types of conversions, such as the Batman/Catwoman example above, may appear more obvious than other types of conversions. On the list of such “obvious” conversions that are easily interpreted as such, because the player experiences a differently characterised player object, are also *A Dinosaur’s Tale*, wherein all levels are played with a single player object, in some levels visually represented as a human child and in others as a flying dinosaur (and functional alterations to attributes and affordances follow); *Everything* (O'Reilly, 2017), where the player object has the affordance of transforming into – as the title indicates – *everything*, or at least every object within the virtual environment, ranging from a rock to a deer to a planet; and *The Witcher 3: Wild Hunt*, where the player object is represented as Geralt of Rivia through most of the games, but in some sequences as the much younger, female character Ciri. Because of the obvious changes to the visual representation, the significant functional alterations, and the fact that we perceive the various versions in the examples above as different characters (or at the very least very different beings) with unique designations (child/dinosaur, rock/deer/planet, Geralt/Ciri), they are more easily identified as conversions.

However, some conversions are trickier to distinguish from simple alterations. It is especially the alterations involving marker items equipped by the player object that can be confused with conversions involving mounts or vehicles, such as the previous

Link/horse example from *The Legend of Zelda: Breath of the Wild*. To this list, we may also add using bikes or skateboards in *Goat Simulator* and throwing the cap (represented as a distinct character, Cappy, but integrated in the single player object) to "capture", i.e., transform into certain objects in the virtual environment in *Super Mario Odyssey* (Nintendo EPD, 2017a).

The Link/horse and Goat/skateboard examples are functionally almost identical – the player object is functionally and visually altered as an object in the virtual environment is mounted. As opposed to the use of typical game objects, such as armour or health objects, the horse or skateboard remains integrated within the virtual environment, but is, for a time being, merged with the player object, into a single object, controlled by the player. This merge constitutes a new version of the player object, that may be designated *Link on horse* or *goat on skateboard*. Yet, it is only because of the objects' prominent status in the visual representation of the player object on screen, that the designation changes. In fact, the above examples are very similar to equipping a sword in *The Elder Scrolls V: Skyrim*, which similarly alters the player objects attributes and affordances. However, I argue that mounts and vehicles cause such significant changes to how the player object are perceived, both functionally and visually, that these examples are best referred to as *conversions*, whereas equipping a sword would be considered an *alteration*.

In general, alterations occur on a moment-to-moment basis, repeatedly through a game, as illustrated by the *Virtual Boy Wario Land* example. Conversions, on the other hand, are much rarer, and can only be properly identified when considering not only the functionality but also the representation of the player object. As such, the distinction between the two technically extend beyond the scope of the PO-VE framework, but as the analyses of chapter 6 will reveal, these distinctions add depth to analyses based on the PO-VE framework, even though the analysis process is somewhat complicated in this specific category pertaining to conversions. What is more, some conversions occur as a result of the player's actions whereas others are scripted.

Some games stand out because of frequent conversions, and thus challenge the general pattern described above. Two of such games have already been mentioned as examples of conversions: *Everything* and *Super Mario Odyssey*. In both games, the player object has as a default affordance the ability to transform into other objects in the virtual environment. In *Everything*, this encompasses everything, whereas in *Super Mario Odyssey*, only special objects can be used for this purpose. Because gameplay in *Super Mario Odyssey* involves transforming in and out of different objects and hence forms, conversions occur repeatedly, almost on a moment-to-moment basis as is typically the case for alterations. Similarly, the player of *Everything* may 'zap' between objects, thus triggering conversions at a pace unusual for other games. Both of these examples are outliers, but it is worthwhile to consider that some games may involve conversions as a central game mechanic, thus making it a more common occurrence that player objects exist in new versions than in, for example, the pre-scripted character-conversions in *Batman: Arkham City* or *The Witcher 3: Wild Hunt.*

Conversions can have different causes and effects, and they can be pre-scripted or player-controlled. Alterations can similarly have different causes, and they exist in so many different forms that it is worthwhile to consider in the analysis of PO-VE relations the types of alteration involved in a game and the cause of the alteration. First, we can make a distinction between whether an alteration is caused to the attributes or the affordances of the player object. For example, when Lara Croft uses a medipack, the attributes of the player object are altered. Similarly, if a wolf attacks her, she may lose health, and the player object attribute of health is thus altered. When Mario picks up a hammer in *Donkey Kong*, the affordances of the player object are altered. As also becomes apparent from these examples, both markers and objects in the virtual environment may cause such alterations. Being aware of the cause of alterations is worthwhile as it allows us to understand the relationship between player object and virtual environment in more nuance. Both aspects are incorporated in the PO-VE model's category *player object alterations*.

Associations

In a grey area between alterations and conversions are *associations*. In an association, an object enters an extended relationship with the player object, in which said object becomes associated with the player object. As opposed to the conversion, the association does not alter affordances and attributes of the player object (although it is sometimes the case that the association brings with it an increase of certain attributes for its entire duration), but instead constitutes an extension of the player object because the associated object 'follows' the player object in its navigation of the virtual environment. As an illustration, let us take a closer look at *Ico* (Team Ico, 2001). Early in the game, the dynamic object characterised as Yorda becomes associated with the player object. The player has no direct control of Yorda as they do of the player object but can control Yorda's movement *through* the movement of the player object, calling for her to come closer when needed, to solve one of the game's many spatial puzzles. Similar associations can be found in other games in the set, for example in *Undertale* and *VVVVVV* (Cavanagh, 2010). In the latter example, dynamic objects represented as crew members enter this association-relationship with the player object during the traversal of a path through the virtual environment (see image 4.3 below). When a given location is reached, the association adjourns.

Image 4.3. Screenshot from *VVVVVV* (Cavanagh, 2010) illustrating an example of an association between the primary player object (above) and the object with which it enters an association (below).

Associations are relatively rare, and instead of including them in a separate category within the PO-VE model, they should be considered in close-readings when analysing alterations, as they do not qualify as conversions proper. Instead, they are a special, less common type of player object alteration.

4.3.4 Single and multiple player objects

Based on the defining characteristics of player objects – their integration within the virtual environment in particular – the following presentation of the two basic types of player objects – *single* and *multiple* – will further clarify the different ways in which player objects are manifested in digital games. This will be further expanded upon in the presentation of the PO-VE model in chapter 5, which contributes with more details than what is presented here and incorporating the defining elements of player objects across different categories to offer a tool and framework that highlights the rich and detailed nature of the PO-VE relations.

Single point of control

Games with a single player object can be described as offering a single point of control through a single object in the virtual environment. The player's point of input and way of performing actions and controlling the game system is directed through an individual object within the virtual environment, which can be controlled through a tangible and/or symbolic interface. This type of player object can be found in a great variety of games in the sample, ranging from 2D puzzle platformers like *VVVVVV* to 3D role-playing games like *The Elder Scrolls V: Skyrim* and even VR games such as *Farpoint* (Impulse Gear, 2017).

Some games present the single point of control as visually and fictionally distinct characters. When controlled sequentially, leaving the player with only a single point of control, we still speak of a *single* player object going through *conversions*, as its attributes, affordances, visualisation, and designation are altered at the same time. Because we are used to thinking of narrative characters as distinct, it may seem counterintuitive to conceive of the sequential character as implemented as a single player object. However, from a functional perspective, the player only ever controls a single object within the virtual environment, thus constituting it as *new* or *different* only in terms of its conversion, perceived as the switch between characters. Examples from the sample are *The Witcher 3: Wild Hunt*, *Tales from the Borderlands* (Telltale Games, 2014-2015), and *Batman: Arkham City*. In these games, players do not have the option of switching between different points of controls at their own discretion, and therefore the player only ever controls a single player object, as opposed to multiple player objects serving as multiple points of control within the same virtual environment.

While it is usually a relatively simple task to identify whether a game offers a single or multiple points of control, one game from the sample poses a challenge to the distinction: *QWOP*. I discussed the problems of *QWOP* in 4.2 – do we control a single player object visualised as a human runner? Or multiple distinct player objects in the form of thighs and calves? While it may yield an interesting analysis (and discussion) to conceive of the limbs as distinct player objects, I here argue that, although a borderline case, this would be an incorrect analysis of the PO-VE configurations of the game. In more standard form shooter games, we have dedicated buttons for shooting and jumping. This does not mean that we control multiple player objects consisting of a finger and legs. Yet, the *QWOP* example highlights the problems of defining the boundaries of the player object when this is defined according to observational data and not the code, and when the player object is framed through a functional perspective.

The single player object is the integrated object that the player can manipulate, and which thus functions as their point of control within the virtual environment. But it is *primarily* defined through its visualisation or its functionality? What about cases where the hit boxes of the player object expand beyond its visual representation?

The player object is first and foremost a functional object, and it is defined through its relationship to other objects and markers in the virtual environment – thus defined by its hit boxes and only secondarily by its visualisation. However, the player object is holistically experienced during play, and while there may be incongruencies between its functionality and visualisation, this is not always the case. In most cases – especially so in more modern games – the visualised player object will correspond to the functional object, and the two need not be prioritised differently in the analysis.

Multiple points of control

The other type of player object configuration is the manifestation of multiple distinct objects within the environment, each of which can be controlled by the player. Objects can be identified as distinct when they have unique locations within the virtual environment from which they can perform actions, such as movement or navigation and interacting with other objects of the environment. These types of player objects share the defining characteristic discussed above, and thus depend on the integration concept to qualify as player objects, excluding from this category many abstract games and digital board games that consist purely of markers as well as transcendent games in which symbolic actions to not map directly to objects integrated in the virtual environment.

Relatively few games in the sample have multiple player objects serving as multiple points of control, and this is in part due to the working definition that guided the sampling. *Dragon Age: Origins* (BioWare, 2009) and *Baldur's Gate II: Enhanced Edition* are configured in similar ways, where the player controls a "party" of player objects, one of them having the special status as a privileged figure. The player objects can be controlled individually or as a big unit, and each player object has distinct affordances and attributes.

4.4 Player objects compared to avatars

While the basic types of player objects differ fundamentally from many avatar theories, primarily because the analytical framework does not deal with player identification or embodiment like many of the presented theories (e.g., Boudreau, 2012; Klevjer, 2006; Vella, 2016) and clearly demarcates characterisation from the player object (as opposed to the avatar conceptualisation by Kromand [2007]), there are also clear overlaps between the avatar theories discussed in section 4.2 and the player objects as conceptualised within the PO-VE framework.

This section will first discuss the most prominent similarities to and differences from the frameworks of Vella and Kromand. Subsequently, I will discuss how the functionality focus of the PO-VE framework places characterisation outside the main theory of player objects and analyse this in relation to how other frameworks and theories have handled such distinctions. Finally, I will discuss the consequences of moving away from established discourses of embodiment and identification in the conceptualisation of player objects, and how possible analytical uses of the player object differ from the applicability of avatar theories.

Ludic subjectivities and player objects

There are no doubts that Vella's (2016) typology of modes of ludic subjectivity is the theory with which the typology of player objects has most similarities. In fact, at first glance there seems to be an almost identical correspondence between the types of each framework – the concrete manifestation of single point of control and the singular embodied ludic subjectivity, the single point of control and *conversions* and Vella's type of sequential singular embodied ludic subject-positions, and player objects as multiple free points of control and the multiple embodied ludic subjectivity.

While the analysis process involved in the development of the framework of player objects in virtual environments is discussed in more detail in the upcoming chapter, the methodology has already revealed that the study at hand is based on a comprehensive analysis of a fairly large selection of digital games. That findings based on such a research endeavour correspond, in part, to already established theories is not considered problematic. Rather, it serves as an excellent starting point for a discussion about positioning, exploring overlaps, as well as fundamental differences in the two frameworks.

Despite the apparent similarities, there are fundamental differences between the typology of ludic subjectivities and the different types of player objects. Vella's typology explores how formal aspects of the game structure the player's experience of the gameworld and their sense of self towards it (Vella, 2016, p. 2). The two definitions of player objects describe, from a more functional perspective, how interaction with and movement in or navigation through virtual environments is structured through integrated objects whose configuration determines the scope of the possibility space. Vella's framework is developed for better understanding the phenomenological experience of the gameworld. The PO-VE framework describes various configurations of points of control within virtual environments, facilitating better understanding of how games differ in terms of their PO-VE relations. Upon closer inspection, we see that these fundamentally different objectives cause not only distinct terminology, but altogether different conceptual framings of what is uncovered to be different research objects: the player's experience framed through phenomenology, in contrast to the game text framed as a relational system.

Take for example Vella's category of multiple embodied ludic subjectivities in comparison to the single player object going through conversions. Vella's framework is based on *playable figures*, implying an anthropocentric focus, and this category describes game situations that offer the player control of several such figures. These figures are, as previously discussed, defined by their *spatial standpoint*, *capabilities and limitations*, *goal-orientation*, and *passion*. Vella uses these terms in relation to their phenomenological significance, and thus defines the playable figure as something which facilitates and determines the player's relation to the gameworld, similarly to how non-virtual environments are experienced: "the player's existence in the gameworld is fully determined by her incorporation in the playable figure. As such, this is the mode of embodied ludic subject-positioning which adheres most closely to the phenomenology of the body" (Vella, 2016, p. 5). According to Vella, the player's phenomenological relation to the gameworld is complicated by the multiplicity of playable figures. This can be attributed to the fact that the phenomenology of the body only ever relates to a single body and hence an individual spatio-temporal standpoint and set of abilities. This explains why the category of multiple embodied ludic subjectivities is restricted to games in which the player can control only one playable figure at a time. The phenomenological perspective, when considered in relation to the concept of embodiment, is not truly compatible with the flexibility of multiple player objects. Vella explains this for his category of the distributed ludic subjectivity:

> When the player is controlling several of her playable figures simultaneously, as when she selects her party as a whole and instructs them to move across the map, she no longer identifies herself as occupying a spatial standpoint within the gameworld. (Vella, 2016, p. 9)

Consequently, the categorical distinctions are based on a phenomenological and cognitively dependent assertion of the experience (and limitations) of embodiment. Put differently, Vella's categories are not based on the observed structure of digital games as much as on an analysis of said games which builds on theories of embodiment and experience based on studies of the human consciousness.

Player objects, on the other hand, are not conceptualised in relation to any understanding of human cognition, nor does the framework attempt to account for the subjective or phenomenological experiences of the structure or configuration of control. On the contrary, the concept of multiple points of control as presented through multiple player objects describes observable and verifiable relationships between computational objects within a virtual environment.

Whether or not a given game qualifies as player-object-based by offering an integrated and moveable point of control can be tested by inputting data into the system and observing the results of said input. It does not matter if the player objects are experienced as distinct characters, or whether they facilitate a phenomenological being-in-the-gameworld. Player objects are described, as a minimum, as integrated objects capable of movement within a virtual environment. In contrast, Vella's playable figures are explored as facilitators of subject-positions within gameworlds.

Despite the fundamental differences in the two frameworks, they share one central premise: that playable figures or player objects can only ever be understood in relation to the world or environment in which they are located and within which they can act. Similarly, the player's understanding of the gameworld or virtual environment depends directly on the possible actions of the playable figure or player object. Vella's concept of *passion*, describing the effect of the gameworld on the playable figure is inherent in the concept of integration of the player object within the virtual environment. Both entail conceiving of the gameworld or virtual environment as a relational system in which objects influence and interact with each other. The primary difference lies in the terminology used, where *passion* brings with it a subjective focus, inevitably situating the playable figure as an anthropocentric and intentional being in relation to its gameworld.

In contrast, the aim of the terminology developed to describe player objects is to circumvent the specificities of representation altogether. Instead, the notion of player object alterations can be used for describing the functional equivalent to Vella's passions, in accounting for alterations caused by objects in the virtual environment to the player object's attributes, such as damage taken translating into a decrease of health points. It seems, however, that Vella's framework is the only one – except for the broader frameworks of GOP, HACS, and AL – that does not emphasise the role of characterisation, which is otherwise integrated in the ludic approach to avatar theory.

Avatar categorisation, characterisation, and player objects

While Kromand's avatar definition is perhaps the broadest one presented here – "a game unit that is under the player's control" (Kromand, 2007, p. 400) – it appears, at first, to come close to the definition of player objects. This is in large part due to Kromand's somewhat technical approach, which conceives of the avatar as clearly demarcated in space and bound to the player's operation within the game system (ibid., p. 400).

Kromand discussion of avatars, however, turns to focus on the extent to which the player is responsible for the characterisation of the avatar and how the perspective upon the gameworld alters the player's emotional engagement with the avatar. This character-turn has been discussed throughout the presentation of avatar theory as seemingly inevitable. Attention is initially focused on the formal aspects of the game system, only to shift to questions of representation, characterisation, and attitude and engagement resulting from these.

Apart for the centrality-continuum pointing towards a need for assessing the visual framing in an analysis of avatar-based games, which is incorporated in the framework of player objects, Kromand's framework is much removed from the approach to player objects, as player objects are studied independently of their specific representation and defined according to an understanding of visualisation that is removed from characterisation.

Functionality, representation, and characterisation

Throughout the discussion, I have returned to the point that player objects are distinct from established theories of avatars and related concepts in one particular area – namely, the way in which representation and characterisation is considered an aspect of the object under investigation. To most scholars whose work has been discussed in this chapter, the avatar is, at a bare minimum, considered an anthropomorphic figure, and sometimes a narrative character, whose representation and narrative function should be considered in its analysis. The player object, in contrast, is considered a functional object. From an OOD/A perspective, and on an analytical level, it does not matter whether the player object is represented as a blue square or a fully fleshed out character. On a fundamental level of player object analysis, what matters most is its integration, navigation or movement, and dynamics that constitute the relationships between the player object and the virtual environment – the PO-VE relations.

This is not to say that representation or characterisation does not matter. A player object needs some type of representation, most typically a visualisation, to be comprehended by the player. Most games contain narrative elements, and many modern productions are popular exactly because of the stories they tell and the characters they let us explore through gameplay. However, in this framework, characterisation is considered as distinct from the player object itself, as something resulting from a particular combination of representations of the player object, the virtual environment, other objects in the environment, and additional audio-visual material presented before, during, and after the player interacts with the virtual environment through the player object (i.e., off-line content). These representational aspects of digital games are not encompassed by the PO-VE framework.

One of the benefits of distinguishing between player objects and their characterisation is the resulting simplification of the concept. As Kromand's theory illustrates, discussing the systematic structure of the avatar and its function as a narrative character in a fictional world in one and the same theory, under the same term, makes it difficult to develop precise terminology and analytical tools for understanding the object of interest. While the distinction between player object and characterisation may meet some resistance when considering the relevance of narrative and discourse in players' emotional engagement with games, it is necessary to offer clear and concise analytical concepts and tools if we are to understand the basic structures of games. There is no doubt that avatar theory has a history of discussing embodiment, emotional engagement, and characterisation and narrative. Therefore, the player object is best understood as an independent research object, related to but distinct from the avatar.

4.5 Chapter summary and conclusion

This chapter has introduced the player object and contextualised it within existing theories and discourses on avatars, player figures, player characters, and other related terms. Based on the definition of the virtual environment in the previous chapter and the OOA/D-inspired theory of object integration within such environments, player objects are minimally defined as *integrated, moveable objects within the virtual environment that function as the player's point of control*. This definition is derived from the defining characteristics of *integration* and *movement*. Non-defining characteristics of (most) player objects are *navigation*, *dynamics*, and *visual framing*.

Player objects appear in one of two forms in digital games. Single player objects offer a single point of control for the player, whereas multiple player objects offer multiple points of control. The notion of control relates to previous discussions of control and agency that dominates much of avatar theory (e.g., Klevjer, 2006; Kromand, 2007; Wilhelmsson, 2008).

The functional understanding of player objects isolates the notion of characterisation from the analytical perspective taken upon PO-VE relations. This does not mean that representation and characterisation are ignored; in fact, the focus on *graphic virtual environment* and the extended principle of visual framing make apparent the relevance of the player object's visual presentation. However, the way in which this representation of the object along with other off-line types of characterisations may cause the player object to be experienced as a narrative character is outside the scope of the PO-VE framework.

The two types of player objects and the conceptions of alterations and conversions were found to share many similarities with Vella's (2016) typology of ludic subjectivities. A scrutiny of both frameworks, however, illustrates that Vella's work and the PO-VE framework have fundamentally different research agendas and deal with different objects of study – the virtual environments of digital games as relational systems, and the phenomenology of game experience, respectively. I discussed similarities and differences between other avatar theories and frameworks and found that player objects differ from avatars in two primary ways. First, player objects are not considered characters, and characterisation and representation are not their defining characteristics. Conversely, characterisation is an essential part of most theories of avatars and related terms (e.g., Kromand, 2007, Westecott, 2009). Secondly, player objects are not understood in terms of embodiment and not defined in relation to the player's experience of controlling them, nor their emotional engagement with them.

Ultimately, this leads to two important conclusions: player objects and avatars are not the same thing, and player objects and characters are not the same thing.

5. The PO-VE Model

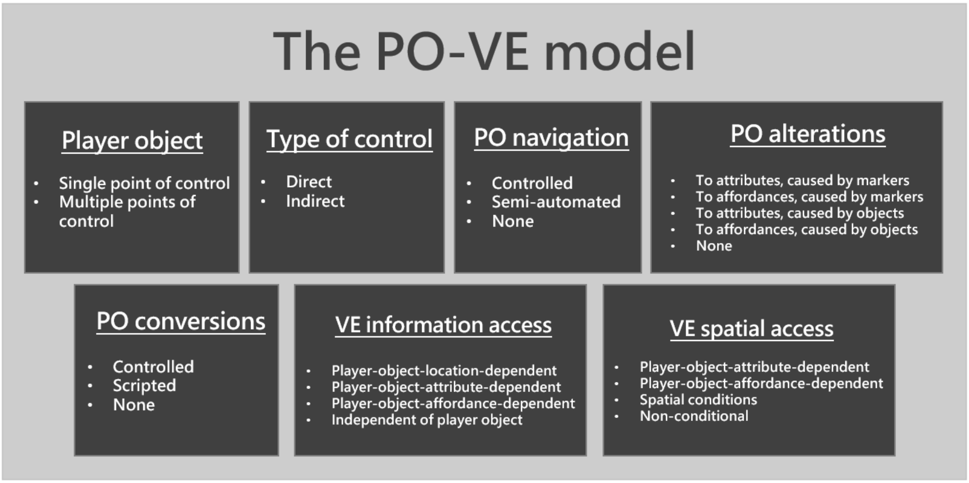
5.1 Chapter introduction

The first chapter of this dissertation introduced the task at hand: to explore the structure of virtual environments in digital games, the ways in which player objects are integrated in virtual environments, and what this means for their functional structure. Chapters 3 and 4 were dedicated to exploring and defining these two most central terms in the project – *player object* and *virtual environment*.

This chapter will bring together player objects and virtual environments in the PO-VE model, an analysis model for understanding player objects and their integration within the virtual environment. The model is presented as an analytical tool based on the various aspects of, and related to, player objects and virtual environments, as discussed in the preceding chapters. Examples from the sample are used throughout to ensure that concepts are as clear as possible, and the chapter leads up to the dissertation's comprehensive analysis of ten different games, that will further exemplify the application of the model.

5.3 The PO-VE model

Consisting of seven different categories, the PO-VE model is an analysis model that can be used to study the different relationships between player objects and virtual environments, from a functional perspective that conceives of the object of study as a relational system. The model is visualised below, followed by a description of each of the categories and their respective types, all of which build on the framework of PO-VE relations developed in the previous chapters.



Model 5.1. The PO-VE model.

5.3.1 Player Object

Based on the definition of player objects in chapter 4, this category refers to the integrated manifestations of the player's control within the virtual environment. For a game to be considered player-object based and thus suitable for analysis using the PO-VE model, it must meet, at a minimum, the defining characteristics of integration and movement that describe player objects as *integrated, moveable objects within the virtual environment that function as the player's point of control*.

The category pertaining to player objects thus serves to ensure that the game in question does indeed have player objects meeting the definition above, and if this is the case, the analyst assesses whether the game constitutes a single or multiple player objects and thus a single or multiple points of control.

Single point of control

The game offers the player a single point of control manifested by an integrated, visually represented object within the virtual environment, which is controlled either directly through direct manipulation or indirectly through a symbolic interface as an overlay. The types of control have their own dedicated category.

The attributes (e.g., size, strength, weight), affordances (what it can do, e.g., jump, run, kick), and visualisation of the single point of control may change during the game. This, however, does not change the player object's status as singular; instead, alterations and conversions describe two different ways in which a single player object exists in different *variants* and *version*, covered in 4.3.3 and discussed further in the dedicated categories of *player object alterations* and *player object conversions*.

An example of a game from the sample with a single point of control is *Crypt of the NecroDancer* (Brace Yourself Games, 2015), in which the player controls a human-shaped object characterised as Cadence and uses a keyboard or controller to navigate her around the virtual environment, represented as a two-dimensional dungeon. *Tales from the Borderlands* is similarly an example of a game in which the player object is manifested as a single point of control, although being represented as two distinct characters – Fiona and Rhys – thus resulting in conversions of the player object for every new sequence in which the player object is visualised and characterised differently. Other games exemplifying the single point of control have been used as illustrative examples elsewhere in the dissertation and include *A Dinosaur's Tale*, *Batman: Arkham City*, *Breakout*, *Don't Starve*, *Everything*, *Goat Simulator*, *Horizon Zero Dawn*, *Legend of Zelda: Breath of the Wild* and *Virtual Boy Wario Land*. In fact, most games in the sample constitute a single point of control due to the working definition guiding the selection, that prioritised this structure.

Multiple points of control

In games that constitute multiple points of control, the player controls several player objects distinguished by their distinct locations within the virtual environment. The specific control scheme of games with this configuration of control varies between games and genres.

Some games allow the player to control multiple player objects both as individual objects and as a group. This is the case in *Baldur's Gate II: Enhanced Edition*, where one player object is considered a privileged figure, but whereas all party members may be controlled and assigned tasks individually or as a group. While some players may prefer one type of control one over the other, it would seem the game is designed for the player to utilise both, at different times. For example, when traversing larger distances across a map, it may make sense to mark the entire party and have them move as a single unit. When entering new and potentially dangerous locations, it may make sense to have a single party member sneak into a room, to not risk putting all player objects into immediate danger.

Other games restrict control to only one player object at a time while allowing the player to switch between player objects (more or less) at their own discretion. This describes the configuration of the multiple points of control in *Madden NFL 07* (EA Tiburon, 2006), where the player controls an individual athlete at a time. When the player's team is in possession of the ball, it is the player object carrying the ball that is being controlled. The player may switch between different player objects by passing on the ball to available players. If the ball is successfully passed on to another player, this now constitutes the player object under control. Thus, there are some limitations as to the freedom for switching between player objects in *Madden NFL 07*, as the player object to which the player wishes to switch must be available for receiving a passed ball from the current player object. *LEGO Marvel Super Heroes*, however, is an example of a game where player object switch is non-conditional. This specific configuration of the multiple points of control in this game will be examined in its dedicated analysis in chapter 6,

5.3.2 Type of control

The type of control is discussed in-depth in 4.2.4, wherein I explored the differences between the tradition HCI-tradition of the distinction between direct and indirect manipulation and Klevjer's (2006) take on the two, that emphasises the simulative aspects of control. I also noted how only text-based games present proper cases of indirect manipulation, as using for example a mouse-curser and observing an immediate system-response to an input-action is at least part of what Shneiderman (1982) describes as direct manipulation. Regardless, some games combine direct and indirect manipulation, and it is worth distinguishing the real-time responsiveness of the mouse cursor from input keys directly mapped to the player object. The importance of such a distinction was illustrated through a *The Secret of Monkey Island* example. Below, direct and indirect manipulation are reiterated according to the understanding of the two terms within the PO-VE framework. They are both further exemplified with games from the sample, to make apparent the differences between the two – and how they often overlap, making them non-exclusive types in the category.

Direct manipulation, through a tangible interface

Direct control "simulates physical interaction" (Klevjer, 2006, p. 118) by offering the player a direct mapping between controller and player object. Direct mapping often translates into real-time control, so for example when the player moves a joystick to the left, they can immediately observe the player object representation on screen move to the left. Whether through a dedicated game controller or a mouse-keyboard combination, the tangible interface describes a game in which player input is directly translated into player object actions.

Some game genres are contingent on this type of direct control. This is the case for most sports and racing games. In *Mario Kart 8 Deluxe*, for example, the primary challenge lies in navigation, facilitated through direct and real-time control of the player-object-vehicle in the racing-track virtual environment. Mastering the controller mapping to the player object is similarly key for excelling at a fighting game like *Eternal Champions*, where timely button presses will allow the player object to perform attacks and block in immediate response to its opponent's behaviour.

When following Klevjer's (2006) definition of the term, we must also pay attention to the extent to which the controls of the player object simulate the action resulting from the button press – that which is visualised on the screen. Pressing the X-button of a PlayStation controller to make Aloy jump in *Horizon Zero Dawn* is arguably direct manipulation of the player object. But it is also, arguably, *less* direct than swinging the PlayStation Move controller to throw the ball in *High Velocity Bowling* (Team Ramrod, 2010), an action which more obviously simulates the in-game action of throwing a bowling ball.

Thus, direct manipulation can exist in varying degrees, and it is worthwhile considering the specifics of the controller used for playing a game when conducting a close reading of PO-VE relations. Motion controllers and button presses can both be mapped directly to the player object and thus facilitate direct manipulation, but one gets closer to simulating the physical interaction visualised within the virtual environment.

Indirect, through symbolic actions

Games in which the controls are not directly mapped to the player object but instead mediated though a symbolic interface facilitate indirect manipulation of the player object. As I have stated elsewhere, very few games consist of only indirect manipulation, as direct manipulation is technically involved in the use of the mouse cursor in for example games of the point-and-click and adventure genres that typically utilise the symbolic interface.

Games outside of these genres, however, can also incorporate indirect control, as is the case in *XCOM 2*'s turn-based combat, where soldiers are controlled through an overlay interface consisting of symbolic action buttons that function as orders to be executed at the soldier's given turn.

Many games utilise both types of control, and in these cases the indirect control can be constituted by, for example, overlay text menus appearing when interacting with objects, which indicate possible uses (often commands such as *inspect*, *take*, *use*, etc.). While the player object may immediately respond to the controller input from the player, the actions are mediated through the overlay, much like in *The Secret of Monkey Island*.

Games of the role-playing genre also often have an inventory overlay that can be clicked, for example to consume or use an item. While the player object may be directly manipulated in the virtual environment in such games, the overlay inventory and the symbolic action of clicking an image of an item in the inventory is indirect. Thus, games that combine the real-time responding and directly manipulatable player object in the virtual environment with symbolic, indirect manipulation of the player object through an overlay interface (which includes, amongst others, *Don't Starve*, *Baldur's Gate II: Enhanced Edition*, and *The Witcher 3: Wild Hunt*), categorise as offering *both* direct and indirect control of the player object.

5.3.3 Player object navigation

When defining the player object in chapter 4, the concept of spatial navigation was discussed as one of three non-defining characteristics of player objects. While the most common action facilitated by player objects in the sample is that of movement along a single axis (a defining characteristic), and many games also facilitate movement across multiple axes, thus involving navigation, the sample also contains examples of player objects for which navigation is semi-automatised. As is the case for other categories in the PO-VE model, these types are sometimes found in combination, as different sections or levels of a game may contain different configurations of PO-VE relations. The analyst should therefore clarify which parts of a game are analysed using the framework, and if different PO-VE configurations are at play, it may be worthwhile to analyse them as if they were distinct games, thus facilitating a potentially interesting comparative analysis between the different configurations at play in the game. The types of navigation that can be found in player object-based games are:

Controlled

When the player can move the player object along multiple axes within the virtual environment, we can describe it as *controlled navigation*. This type is found in most of the games of the set, in two-dimensional as well as three-dimensional games. As discussed in chapter 4, player object location altering actions are considered as movement, and therefore 2D side scrollers in which the player object can jump are also considered having controlled navigation. Other, more traditional examples of controlled navigation are three-dimensional games, such as *Tomb Raider* or *The Stanley Parable*, in which navigation of the virtual environment is central to the experience of the game. In *Tomb Raider*, the player object is seen from a third-person (behind-view) perspective, and in *The Stanley Parable*, the virtual environment is experienced from a first-person perspective where the player object is not visually represented, and we can thus see that controlled navigation is independent from the way in which the virtual environment is visually framed through the player object.

Semi-automated

In some games, the player object is automatically transported around the environment, allowing the player to focus on actions other than navigation. Such games allow for some type of movement within the frame, while automating the larger-scale spatial traversal across the virtual environment. This form of movement is encountered in, *Sin & Punishment: Star Successor*, *Subway Surfers*, and some levels of *A Dinosaur's Tale*, all of which allow the player object to navigate the virtual environment along two dimensions, while movement in the third dimension is automated.

None

Games in which the player object can be moved along a single axis are not considered as facilitating navigation (as navigation was defined as player object location alteration along multiple axes). It appears that mostly arcade-style games have movement but no navigation, represented in the sample by for example *Breakout* and *Space Attack*, both of which allow the player to move along the x-axis and shoot along the y-axis, thus involving two dimensions in gameplay, but only one in movement.

5.3.4 Player object alterations

During a game, player objects may be *altered*, meaning that their affordances or attributes change from their configuration in a former variant, thus influencing their relationships to the virtual environment and its other objects. Each alteration bring about a new *variant* of the player object, and as I illustrated with the *Virtual Boy Wario Land* example in 4.3.3, countless of alterations may occur during the course of a game.

Alterations may be caused by various factors and the types within this category describe the various causes for alterations, further separated according to whether the cause alters the player object's attributes or affordances.

Alterations to attributes, caused by markers

Markers – objects that are not permanently integrated within the virtual environment, but which can instead be 'used up' or 'picked up' and located to an overlay inventory – often serve the function of altering the player object (or sometimes the game state) in the moment at which their integration within the virtual environment is discontinued. This is for example the case when a player object's speed is boosted as it touches and thus 'uses up' a mushroom on the road in *Mario Kart 8 Deluxe*.

In some games, however, the marker can be kept in an inventory represented in an overlay (or in the borderline case of *ZombiU* on a secondary screen) and used when the player wishes to do so. This is in fact possible, too, in *Mario Kart 8 Deluxe* for items that are gained through collision with an item box. These will appear in a mini-inventory in the corner of the screen and can be used, for example to boost the player object's speed, whenever the player wishes to do so. An even more common example of attribute alterations caused by markers are various healing objects, such as food, potions, or dedicated health packs that are encountered in many games in the set, including *Bayonetta* (Platinum Games, 2018) and *Lollipop Chainsaw* – both of which, coincidentally, have lollipops as dedicated healing items.

Alterations to affordances, caused by markers

Like the markers discussed above, which alter attributes, some markers may facilitate new possible actions through an expansion of the player object's affordances. An example of an affordance-altering marker is the hammer in *Donkey Kong* which allows the player object to perform an attack action for a limited time. The moment the player object collides with the hammer-marker in the virtual environment, it is automatically equipped, constituting a new variant of the player object that now has the attribute of performing an attack, but for a limited time. One this time runs out, the hammer simply disappears, and the player object is once again altered back to its former variant.

Much like the attribute-altering markers discussed above, affordance-altering markers are sometimes used the very moment the player object collides with them – as is the case for the *Donkey Kong* hammer. Other affordance-altering markers may be kept in an inventory until the player wishes to use them, which can be exemplified through another marker from *Mario Kart 8 Deluxe* – the fire flower. When the player object collides with an item box and the randomly assigned item is a fire flower, the player will be able to activate the marker to alter the affordances of the player object to also encompass shooting fireballs. Like the hammer discussed above, this too is an example of a limited time alteration. The super horn marker, on the other hand, allows the player object to perform a special attack, but only once – the altered variant of the player object thus exists only during the time in which it is possible to activate this item, as the possible action of using the horn remains a possibility until it is 'used up'. Once it has been used, the player object is back to its former variant.

Alterations to attributes, caused by objects

As with markers, objects can alter the player object, both in terms of its attributes and its affordances. What appears to be object-caused alterations may in some cases be *conversions*, covered in-depth in 4.3.3 and integrated as a category in the PO-VE model in the following category. The analyst must therefore be mindful of whether the given example gives rise to a new *version* of the player object, or simply constitutes a new *variant*.

An example of attribute-altering objects – keeping in mind that objects are permanently integrated in the virtual environment – are the standing stones in *The Elder Scrolls V: Skyrim* which allow the player to increase various attributes of the player object, such as health, stamina, armour, etc. Attribute-altering objects also include most enemies that can damage the player object's health attribute. These may disappear once defeated, much like a destroyed object, but sometimes remains in the environment even after being killed, in the form of their (sometimes lootable) corpses or remains.

Alterations to affordances, caused by objects

Much like the standing stones in *The Elder Scrolls V: Skyrim*, the first four guidance stones of *The Legend of Zelda: Breath of the Wild* function as objects that alter the player object. Instead of altering the attributes of the player object, however, they alter its affordances; through these stones, the player object is granted *runes*, which expand its affordances to also encompass *stasis*, *remote bomb*, *magnesis*, and *cryonis* abilities. Thus, the permanent objects of the virtual environment are activated to cause a permanent alteration and a new variant of the player object by expanding its possible actions and hence its affordances.

The guidance stones in *The Legend of Zelda: Breath of the Wild* are quite unique, and while affordance-altering objects are generally much less common than affordance-altering markers, they do come in different forms. Another example from the sample are enemy objects that have special attacks that will alter the player object's affordances. In *Crypt of the NecroDancer*, the green monkey enemy type can grab the player object and invert its movement until it is defeated. This means, that collision with this object cases an immediate, but time limited alteration to the player object's affordance of movement. Similarly, it is not uncommon for enemy objects to have freeze-attacks that momentarily inhibits movement of the player object, which is another example of an affordance alteration caused by an object.

None

The four different types of alterations typically appear in various types of combinations, but some games in the sample have no alterations to the player object. Sounding like a broken record, *QWOP* is a borderline example because there are no other objects or markers in the virtual environment of the game than the player object itself, and therefore no objects or markers to alter it. The representation of the different (number of) types and typical combinations is discussed further in 6.2.

5.3.5 Player object conversions

Whereas alterations to the player object result in new *variants*, conversions cause new *versions* of player objects. Discussed in 4.3.3, conversions expand beyond alterations, but similarly include changes of attributes and affordances. In addition, the visualisation of the player object is changed, causing a significant modification of the representation. Whereas an alteration caused by equipping a new weapon may result in changes to the player object's attributes of strength and modify its visualisation, a conversion significantly changes the player object's representation, resulting in a different designation. If the player object in *Horizon Zero Dawn*, represented and thus designated as Aloy, equips a new weapon, the designation will not change: the player will still control Aloy as a player object. However, if Aloy were to mount a machine, using it as a transportation device, much like a horse, the representation (Aloy riding a machine) would also alter the designation of the player object to encompass both Aloy *and* machine. As such, the machine would cause a *conversion*, as opposed to an alteration, although involving similar alterations to attributes and affordances as associated with the equipment of items.

The Aloy example above illustrates the fine line between changes to designation. The sceptic may argue that the equipment of a shield similarly alters the designation from Aloy to Aloy *and* shield, much like the conversion into Aloy *and* machine. However, I argue that mounts and vehicles be considered special cases and thus exceptions as conversions, whereas alterations caused by other items, such as weapons or armour, should be considered alterations. For the most borderline of cases, the PO-VE model offers enough flexibility for the analyst to categorise the instance as either alteration or conversion and add a sidenote to the analysis elaborating on this decision, if it bears significant importance in the analysis.

As opposed to the accumulative and often diachronic structure of alterations, player-controlled conversions are often implemented as more immediately reversible (e.g., mounting and dismounting a mount, or entering and leaving a vehicle). However, conversions are sometimes *scripted* and occur automatically at given points or during dedicated sequences in a game. This is often the case for those conversions that involve character-switches, such as the examples previously discussed of *Batman: Arkham Asylum* and *The Witcher 3: Wild Hunt*. Some games combine both types, and finally, many games do not offer multiple player object versions at all.

Controlled

Illustrated by the *Horizon Zero Dawn* example above, controlled conversions are the ones resulting from the player's immediate input, such as mounting a horse or entering a vehicle. Controlled conversions need not involve another object, although they often do. The player object in *Metroid Prime* can be designated as the protagonist Samus Aran, but one of the possible actions of this player object is to transform into a ball, thus altering both attributes, affordances, visualisation, and designation (from humanoid protagonist Samus Aran to morph ball). This transformation is easily reversed, and much like the 'possession' of objects in the environment in *Super Mario Odyssey*, conversion into the morph ball in *Metroid Prime* is a central part of gameplay.

Scripted

While mounting a horse or entering a vehicle are examples of conversions that most frequently occur of the player's own volition, some conversions are not a result of player-controlled actions, but rather scripted and pre-designed, making them inevitable. Most frequently, off-line sequences such as cutscenes will give a narrative explanation for the conversion, and the new version of the player object will be active when the on-line mode resumes.

Examples include games in which the represented character of the player object switches between levels. This is the case for *A Dinosaur's Tale*, where some levels are played with a humanoid character and others with dinosaurs. Each version has unique affordances and attributes, a distinct visual identity, and a unique designation. But in contrast to the *Metroid Prime* example, the player does not activate conversions. Rather, they are scripted as a part of each new level, and hence inevitable.

None

Whereas a significant number of games in the sample present controlled and scripted conversions, including combinations of both, many games have player objects that exist in only one version, thus containing no conversions.

5.3.6 Virtual environment information access

The player object does not only serve a functional purpose in *acting* in the virtual environment; it also often functions as a point from which players can access information about the virtual environment. This means that the player's knowledge about the virtual environment is conditional and depends on the player object – for example, on its location, and consequently on what is visually accessible to the player. As such, we may speak of a type of *informational flexibility*, which can be expanded or restrained, according to a set of parameters.

Information about the virtual environment refers to representations that communicate to the player something about the virtual environment, defined in chapter 3 as *a navigable geometry constituted by a computational, relational model. The virtual environment as a spatial structure represents the relative positions of objects that can be described as integrated by virtue of being both spatially and functionally related to other objects within the virtual environment.* Thus, *information* is that which communicates to the player the structure of the navigable geometry and the function and status of the objects within it, including their respective affordances and attributes. Information therefore need not be integrated within the environment in the same way as objects are. Instead, information about the environment and its objects may be presented in an overlay. The types in this category indicate whether and how information about the virtual environment is contingent on the player object, either on its location, attributes, or affordances.

Player-object-location-dependent

When the virtual camera that determines what visual information about the virtual environment is available to the player is player-object-location-dependent, information is somewhat restricted. Through navigation of the virtual environment, the player object determines what can be visually perceived by the player. This can be configured in various ways, depending on the virtual camera's configuration and the visual framing.

For example, in games colloquially referred to as first-person games, such as *Metroid Prime*, *Homefront: The Revolution*, *The Stanley Parable*, and *Unreal Tournament*, the virtual camera is typically modelled according to what would be visually perceived if the player object were a human agent within a physical environment. For some games, this means, that hands are visible in the lower part of the camera frame, but not all first-person games visualise the player object. This is for example not the case in *The Stanley Parable*, where the player object's physicality is subject to gravity, can move much like one would assume a human body can (e.g., walk up and down stairs, jump, open doors, etc.), only this is not visualised on screen. In addition to the first-person perspectives, there are various types of "semi-subjective" perspectives (Thon, 2009, p. 283), such as the colloquial third-person perspective, for which location similarly determines the visual information about the virtual environment available to the player. This is the case for 2D as well as 3D games – the player objects of both *Undertale* (with a two-dimensional representation of the virtual environment) and *Splatterhouse* (Namco Bandai Games, 2010) (with a three-dimensional representation of the virtual environment) have virtual cameras that follow the player object, thus making only the part of the environment in which it is located visible to the player.

Games in which space is represented as discrete (Fernández-Vara et al., 2005, p. 3), where the screen contains only a fragment of the virtual environment, and where the player object's movement into new areas reveals a new segment of the virtual environment, are similarly an example of information about the virtual environment being player-object-location-dependent, as seen in *Adventure* and *VVVVVV*.

Player-object-attribute-dependent

As exemplified in the category pertaining to player object alterations, both affordances and attributes may change over the course of a game, and typically do so frequently, creating new variants of the player object on a moment-to-moment basis. In some games, alterations are used as a way of 'unlocking' information about the virtual environment, where access to this information depends on certain attributes (or affordances, as discussed below) of the player object. Informational flexibility related to player object attributes takes very different forms, depending on the specific attribute on which it is dependent.

An example is the attribute of vision, which in *Crypt of the NecroDancer* determines the radius around the player object in which the virtual environment is visible. The vision attribute can be altered using items such as the Luminous Torch, which alters the attribute in a way that gives the player additional visual information about the virtual environment.

Player-object-affordance-dependent

Games can present situations where informational flexibility depends on the affordances of the player object. In contrast to the attribute type above, affordance dependency relates directly to the possible actions that the player object can perform. This type of information access depends on the player actively inputting commands, translating into the player object performing the actions facilitating access to the information about the virtual environment.

An example which, like the one above, relates to the vision radius of the player object, but which is affordance-dependent, can be found in *XCOM 2*. In the game, the player controls multiple player objects represented as soldiers. One of the soldier classes, the *Specialist*, has a drone named the *GREMLIN*. When a soldier of the Specialist class specialises and reaches a certain rank (Combat Hacker/Lieutenant), a new affordance is unlocked: *Scanning protocol*. With the scanning protocol action, the player object can send off the GREMLIN to scan the area, expanding the specialist's area of sight, revealing hidden enemies, and lifting the 'fog of war' in possible enemy locations.

Independent of player object

If no information about the virtual environment is player-object-dependent, the game can be listed under this type, which thus functions as a 'non-type'. In the context of visual information, this is the case for single-frame games in which the entirety of the virtual environment is presented on the screen, as in *Frogger*, *Wizard of Wor*, *Breakout*, and *N++*. In these games, no information about the environment can be obtained through the player object's affordances and attributes, and the spatial and visual information about the environment does not depend on the player object's location therein, as the virtual environment is always visually represented in its entirety.

5.3.7 Virtual environment spatial access

The final category of the framework is related to the one above. Whereas *virtual environment information access* is focused on how various aspects of the player object influence what information about the virtual environment is accessible to the *player*, the types in this category present how the player object's spatial access to the virtual environment is conditional and which mechanisms (player object attributes, player object affordances, or spatial conditions) determine this conditional access.

As opposed to the previous category in which the player object functions as an influence on the information provided to the *player*, this category explores the mechanisms that may influence *the player object itself* in its navigational access to the virtual environment. For this reason, the category is relevant only for those games in which the player object can be used for navigating the virtual environment, i.e., move along multiple axes.

Player-object-attribute-dependent

The attributes of the player object, and the alteration of these, can influence the access to the virtual environment in a multiplicity of ways, depending on the involved attribute(s) and the structure of this dependence. Some games use attributes indicative of game progress to structure spatial access to the environment, where a certain player object level or accumulated XP are required to access an area. In cases involving values beyond the attributes of the player objects, game progress is directly associated with the game state and thus beyond the scope of the PO-VE framework.

An example of attribute-dependent access is *The Legend of Zelda: Breath of the Wild*, wherein the player object's stamina wheel visually represents its stamina attribute. The wheel slowly depletes when the player object performs physically demanding tasks, such as paragliding, climbing, and swimming. When depleted, the player object can no longer perform actions requiring stamina, and will need time to automatically regenerate more. Throughout the game, the attribute can be boosted, causing the stamina wheel to expand or deplete slower, meaning that physically demanding tasks can be performed for longer stretches of time. This is needed to reach certain locations in the virtual environment, as some depend, for example, on the player object's ability to climb a high mountain, thus needing a certain value of the attribute of stamina. As such, stamina in *The Legend of Zelda: Breath of the Wild* functions as a way of restricting the player object's access to parts of the virtual environment, as a high enough value of stamina can only be achieved after a certain amount of progress in the game.

Player-object-affordance-dependent

In some games, the affordances of the player object influence accessibility to the virtual environment in a way that makes certain affordances 'keys' to 'unlocking' parts of the virtual environment.

Because affordances can be altered in a variety of ways, from levelling up the player object and choosing new skills and actions to retrieving objects in the virtual environment that facilitate new possible actions, some distinctions are needed to understand in detail the different mechanisms of conditional access. The type of affordance-dependent access described here excludes cases covered in the upcoming special type, where spatial conditions determine access to the virtual environment. Thus, an example which qualifies as affordance-dependent access is the upgrades to gadgets in *Batman: Arkham City*. As the player object progressively levels up during the game, new upgrades to its 'gadgets' are available, which involves alterations to the player object's affordances, as new actions can be performed with the upgraded gear. One of the gadgets than can be upgraded is the Cryptographic Sequencer, whose final upgrade is needed in order to access specific, small spaces in the virtual environment containing *Riddler trophies* (achievement-based collectible objects). The upgrades to gear can be made whenever, wherever, as long as the player object has enough upgrade points available. The upgrades are thus not bound to any specific spatial conditions, but the affordance alterations caused by them result in access to new areas of the virtual environment.

Spatial conditions

A central mechanism in many digital games is that of spatial traversal and navigation as a measure of progress. This is highlighted in theories such as Aarseth's typology of quest landscapes discussed in chapter 3. Not only does spatial traversal serve as a way of structuring gameplay and measuring progress, but it is also often incorporated into mechanisms of access: to progress to location C, you must have visited locations A and B (and done something specific, such as obtaining a specified object or performed a specific action). While elements other than simply spatial traversal may be incorporated in such forms of conditional access, they force the player object to traverse specific parts of the environment in order to progress. These types of spatial conditions govern games in which the virtual environments are vast, presented as open worlds to be traversed freely. Similarly, the adventure game genre relies on spatial conditions when specific objects found only at specific locations are needed to progress through the games' often linear structure.

Spatial conditions are often involved in the rules and goals of a game, and thus associated with the *gameness* of games or the specific *game form*. Yet, they describe specific, functional PO-VE relations, and are therefore incorporated in the model and framework to account for the player object's access to the environment.

An example illustrating how spatial conditions govern access to the virtual environment is the paraglider in *The Legend of Zelda: Breath of the Wild*. The paraglider is received as an early quest reward at a specific location wherein the quest can be solved. It allows the player object to move from a spatially restricted starting area, *Great Plateau*, to the surrounding areas of the virtual environment. It structures the spatial traversal and restricts access to the virtual environment within the first tutorial-like quests, during which the player becomes familiar with the gameplay. The paraglider is a special example – it does not only function as an example of spatial conditions governing the player object's access to the virtual environment. It also constitutes a conversion of the player object when equipped, in a way similar to riding a horse.

Another commonly encountered example of spatial conditions as a function governing access to the virtual environment is implemented through dedicated items, such as keys, that must be retrieved from a specific location to be able to unlock parts of the virtual environment and thus progress in the game. In such cases, exemplified by *Adventure* and *Braid*, the access restriction is not circumvented through the affordance of unlocking facilitated by the key, but rather through the fulfilment of the spatial condition required to retrieve the key, thus structuring the player object's paths through the virtual environment.

Non-conditional

If the spatial access to the virtual environment is not restricted according to the other types of the category, the game can be listed under this type, which thus functions as a 'non-type'. Once again, a single-screen game serves a good example, as the player object of *Asteroids* has full spatial access to the virtual environment, contained within the single screen. The player object of this game therefore has non-conditional spatial access to the virtual environment.

5.4 Chapter summary and conclusion

This chapter introduced the seven different categories in the PO-VE model, along with their corresponding types, exemplified using games from the sample. Building on concepts developed throughout the theoretical chapters on player objects and virtual environments, the model is not only an analytical tool, but also offers terminology to help describe the ways in which players interact with virtual environments through dedicated player objects.

While the various types for each category of the model were illustrated using examples from the sample, this chapter remained mostly theoretical and conceptual. Analysis and overview of the representation of the various types in the sample belong in the upcoming dedicated analysis chapter.

6. Analysis

6.1 Chapter introduction

In chapter 4, the central terminology of the PO-VE framework was explained using examples from the sample, and in chapter 5, PO-VE model was presented using additional exemplifying games from the 99 games in the set. This chapter will dive further into the games and explore the representation of the various types in each of the model's seven categories.

As I will explain further in the following, the analysis of representation of the various types is limited to the 78 of the 99 games in the sample that meet the definition of player objects put forward in chapter 4. While I will use some of the non-qualifying examples to illustrate how to assess whether a game is player object-based or not, this chapter engages primarily with the games in the sample that can be considered having player objects, as these are the types of games that the PO-VE framework was developed for analysing.

The chapter thus presents patterns and trends in the data set, in relation both to individual categories as well as the typical combinations of types in categories and across categories. I will, however, repeat that the analyses are *qualitative*, based on observational data, and the mentions of numbers should not confuse the reader to believe that I make any claims to the data being quantifiable.

Moreover, close readings of ten chosen games – *Space Attack*; *Altered Beast*; *Passage*; *Lego Marvel Super Heroes*; *Hotline Miami; ZombiU*; *Papers, Please*; *Subway Surfers*; *The Witcher 3: Wild Hunt*; and *Reigns: Her Majesty*– will illustrate how the model can be utilised for closer investigations and deeper analyses of the PO-VE relations in a game. These are similarly represented in textual form, with screenshots accompanying the analysis for illustrative purposes.

6.2 Patterns of the 99

While the methodology described the process of developing the PO-VE model based on the empirical data gathered from the playing of the 99 games in the set, said process does not guarantee balanced representation of PO-VE relations in games in the set. In practice, when the model is applied to the games in the sample, each type is not evenly represented. Some types are represented in very few titles, whereas others are abundant in the game selection. This is due to selection method, in particular its being governed by the working definition for avatar-based games to ensure that the sample was relevant for the study at hand. As I also argued in the methodology, the sample is *purposive*, but also a *non-probability* sample, and therefore the two sections below describe the most and least common types in the games in the sample and consequently in the *data set*, not the occurrence of the types in player-object-based games *in general*. Another section is then dedicated to a presentation of the most common type combinations in the set, both within and across categories.

6.2.1 Representation of types

The following presentation of types in the set is discussed based on the number of appearances and may therefore appear quantitative and thus generalisable to a different extent, but this is not the case. The process of constructing the data set was a *qualitative* process. While I do draw conclusions based on the analyses, they are of a qualitative nature and therefore subject to the same critique and possible bias as any other qualitative research findings.

Player-object-based and not

Of the 99 games, not all have defining characteristics of player object-based games and are therefore not suitable for analysis using the PO-VE framework. 21 games in the sample are *not* based around integrated player objects in virtual environments, thus disqualifying them from further analysis using the model. While these 21 games are not suited for the analysis using the model, they have still been influential in the model's construction. Analyses of all 99 games have been utilised in defining and demarcating the central concepts of virtual environments and player objects. This is a testament to the study's empirically rooted and exploratory nature.

At the same time, it might be possible to identify a 'grey area' in terms of games that meet some of the requirements of the definitions of player objects and virtual environments, but not all. *FTL: Faster Than Light* (Subset Games, 2012) is one of the 21 games that were found to not be player-object-based, even though parts of the game consist of controlling integrated objects in the virtual environment as the player commands the spaceship's crew around to different locations, according to what tasks need to be performed. However, the majority of gameplay is constituted by resource management in an overlay interface that is not directly related to the integrated, moving objects.

This draws attention to an aspect I have not yet discussed: Games are sometime 'assembled pieces' with multiple configurations, some of which may be player object-based and some which may not. In the *FTL: Faster Than Light* example above, resource management and real-time control of integrated player objects blend seamlessly, but very few actions that a player perform during a game, and hence a limited percentage of play-time are involved with the visualised integrated objects on the player's space craft. The same can be said about *Don't Starve*, where some of the gameplay is configured as resource management in the overlay interface. However, the actions performed in the overlay are immediately transformed into actions in the virtual environment, and therefore the game *is* considered player-object based.

The assessment of whether a game's player object-based configuration is significant enough to consider a game (at least partly) player object-based is the task of the analyst. Technically, any section of a game that meet the defining characteristics can be analysed using the PO-VE framework. This may also mean, that for games that are not player object-based in the configuration in which the majority of the game is played, but which have mini-games that are (for this, *Dream Daddy: A Dad Dating Simulator* (Game Grumps, 2017) is an example), the PO-VE framework can technically be applied to the mini-games. If the analyst is occupied with mini-games, this may be a fruitful endeavour. Otherwise, I recommend applying the model only to those games in which the majority of the (time spent playing) game is played in a configuration that can be defined as player object-based. This is also the measure that has been used to assess whether a game is player object-based or not, and what has led to the exclusion of games like *FTL: Faster than Light* and *Dream Daddy: A Dad Dating Simulator*, although small parts of these games do indeed offer the player control of integrated and moveable player objects.

The 21 games not included in the following analyses deviate from the player object definition in various ways and in varying degrees. Some titles, such as *A Normal Lost Phone* and *Reigns: Her Majesty* have no virtual environment in which a player object – or other objects, for that matter – can be integrated. The latter example will be analysed more in-depth in a close reading to illustrate how it does not meet the defining characteristics of player-object based games. Others lack movement, as is the case for *Five Nights at Freddy's* (Cawthon, 2014), *Utopia* (Mattel Electronics, 1981), and *Her Story*. And many games, including some of the ones mentioned above, lack more than one defining characteristic.

While it is therefore tempting to speak of player objects in terms of degree – *FTL: Faster than Light* being seemingly closer to the definition than *Five Nights at Freddy's* – this is not the intention of the framework, but rather a potential direction for further research on PO-VE relations, and thus outside the scope of this study.

Player object

The category of player object configuration – whether the game has a single or multiple points of control and thus offers a single or multiple player objects for the player to manipulate in the virtual environment – is one of two categories in which the types are mutually exclusive. Of the 78 games, the analyses show that 70 games have a player object of the type of *single point of control* and eight games have *multiple points of control*.

The representation of the two types in this category reflect in large part the purposive sampling in which games traditionally considered avatar-based were prioritised. More games of the *single point of control* type were chosen as these are often discussed in theories and studies of avatars in digital games, thus explaining the great representation of this type in the set.

The eight titles of *multiple points of control* can be sorted into smaller groups that each have some things in common: two of them – *Chrono Trigger* (Square, 1995) and *Disgaea 2* (Nippon Ichi Software, 2017) – are developed in Japan and are typically considered to belong to the RPG genre. Both games have a privileged player object, but the player controls a whole party of player objects during combat, without having the ability to freely switch between them.

Traditional role-playing games, in the sample exemplified by *Baldur's Gate II: Enhanced Edition* and *Dragon Age: Origins* (BioWare, 2009), represent another group that I have already discussed at length. Such games might be considered by many as essential examples of avatar-based games due to the player's influence on character creation, but they also allow the player to gain control of multiple player objects in a 'party'.

The final grouping consists of more miscellaneous games, ranging from sports games (for example *Madden NFL '07* for which I described in detail in 5.3.1 how the player can somewhat freely switch between the different points of control by passing on the ball) to strategy games (such as *XCOM 2*), that would perhaps rarely be considered as having *avatars*, but which qualify as having player objects, as the points of control function as integrated objects in a virtual environment.

Type of control

In the category of type of control, the 78 games from the sample were analysed and the representation of each type and type combination is as follows: 48 of the 78 games have *direct control* only; one of the games has *indirect control* only; and 29 of the games have a combination of *direct* and *indirect control*.

As these findings reveal, the types of control are not mutually exclusive, and a significant percentage of the games studied combine the two types of control interfaces. Whereas the trend to combine direct and tangible interfaces with the indirect and symbolic type is not representative of certain genres, it appears that the combination is a characteristic of more modern games. This argument is strengthened by the representation of direct control only, which is found in abundance in the older games of the set. Of the 12 player-object-based games in the sample published in the 1970s and 1980s, all have direct control. This indicates a game design paradigm, where restrictions to both hardware and software may have resulted in less complex games that seem to focus on challenging the player kinaesthetically. In the set, games of this type are represented by for example *Breakout*, *Lazarian*, and *Wonder Boy* – games played with either joystick controllers or the simple controller of the Sega Master System, the former seeming specifically designed for direct control, the latter less explicitly so, as its buttons can be mapped to both tangible and symbolic interfaces.

At the same time, another game design paradigm is indicated by the single game analysed as having the indirect type of control. The turn-based strategy game *XCOM 2* would likely not be considered avatar-based in theories of that concept, but due to the significant differences between avatars and player objects, the framework of PO-VE relations allow us to define the objects controlled in *XCOM 2* as player objects, manipulated solely through a symbolic overlay interface. While the sample contains only a single game of this type, other games of the turn-based strategy-genre may represent similar PO-VE relations. Whereas such games would otherwise be described as *transcendent* (Vella, 2016) or *omnipresent* (Elverdam & Aarseth, 2007), the definition of player objects qualify them as player-object-based, as they offer the player points of control as integrated and moveable objects within the virtual environment. Thus, the *XCOM 2* example being the only game from the sample in which control is purely indirect illustrates one way in which player objects deviate and expand beyond other related concepts, such as the avatar.

Player object navigation

Only seven games present non-navigable player objects within the category of *player object navigation*, meaning that seven of the 78 player object-based games have movement of the player object along only a single axis. The two remaining types, *controlled* and *semi-automated*, can be combined in games by having different sections of a game configured differently, but this is the case for only one game in the sample – *A Dinosaur's Tale*. Most of the games analysed involve controlled navigation, which is identified in 68 of the 78 player-object-based games. The remaining two games have semi-automated navigation, qualifying it as a seemingly rare configuration. The two games, *Sin & Punishment: Star Successor* and *Subway Surfers* appear similar from a visual perspective but differ across many other categories of PO-VE relations, and do not seem to represent any specific design paradigms and genres except for the semi-automated navigation of rail shooters and endless runner games. *Subway Surfers* is analysed further in section 6.3.5.

Player object alterations

Player object alterations is the category containing the most types which can be combined in various ways, and of the 78 games analyses show great variety in the type combinations in the set: three games contain no player object alterations, and 27 games contain only one type of alteration. Of these, there is one instance of *markers to affordances*, four examples of *objects to affordances*, and 22 cases of *objects to attributes*, making *markers to attributes* the only type which is not represented without being in combination with other types.

The 22 cases of player object alterations caused by objects to attributes are found in games in which the player object's attributes, such as health, can be altered due to objects in the virtual environment. This includes perhaps the most basic relationship between player object and environment: one that allows for objects to inflict damage on the player object, thus altering its health attribute. This basic type of alteration is found in many of the older games in the set, including *Alien Invaders - Plus!* and *Eternal Champions*, reflecting a simpler approach to PO-VE relations. Similarly, the 22 cases of *objects to attributes* alterations also include games in which objects in the environment can influence the movement of the player object, for example its speed or direction, as exemplified by *Out Run* (Sega, 1987) and *Need for Speed: Carbon*.

While the single type of *objects to attributes* is by far the most represented, both as an individual type and in combination, the representation of the different combinations is surprisingly varied. The most typical of these combinations will be discussed further in 6.2.2. Nevertheless, it is worth noting here that the category of player object alterations is the one in which combinations appear more frequently than single types, indicating that player objects are often altered in multiple ways across their attributes and affordances, depending on their relationships with the virtual environment's objects and markers. This aligns with the non-defining characteristic of player objects as *dynamic*, which describes all player objects subject to alterations, and particularly complex in those games that combine various types of alterations. An explanation for these frequent combinations may be the complexity of the category compared to other categories in the model, as it is the only category which is split across *both* player object and virtual environment component parts – attributes/affordances, and markers/objects.

Player object conversions

As described in depth earlier, player object conversions are rarer than alterations and 58 of the 78 analysed games are of the non-type in this category. Six of the games have scripted conversions, including *Kentucky Route Zero* (Cardboard Computer, 2013-2020) and other games such as *Batman: Arkham City* and *Tales from the Borderlands* that let the player control different narrative characters, while retaining the single player object configuration. In 13 games, the player has control over the conversion, and in many of these examples conversions involve mounts or vehicles. This is exemplified by *Uncharted: The Lost Legacy* (Naughty Dog, 2017), in which the player object may take control of a jeep, thus resulting in a new version consisting of a jeep with two human passengers, one represented as the driver. Finally, games may involve both types of conversion. This is the case for only one game in the set, *The Witcher 3: Wild Hunt*, in which there is scripted conversion between the represented characters of Geralt and

Ciri as well as controlled conversions when mounting a horse. The game is further analysed in 6.3.9.

Games that involve scripted conversion seem to have narrative aspirations, but in varying degrees. The conversions typically serve as a way of facilitating play based on different narrative characters, thus presenting the individual character's perspective on the virtual environment, involving representation but also, to a high degree, functionality. Conversions combine the functional alterations of the previous category with significant changes to the representation of the player object, which almost inevitably work as a way of adding, if not story, then at the very least some visual variety meant to enhance the experience of playing the game.

Controlled conversions, on the other hand, are found in games both rich and lacking in terms of narrative aspects. Vehicles and mounts can be presented in ways that contribute to the player's experience of a narrative associated with the play experience, especially if these are expanded upon in off-line sequences, as is for example the case with the aforementioned jeep in *Uncharted: The Lost Legacy*. But a controlled conversion may also just be a way for the designer to switch up gameplay, as seems the case for the skateboard conversion of *Wonder Boy* and the nonsensical microwave conversion in *Goat Simulator*.

Virtual environment information access

As with the other categories discussed, the virtual environment information access also has a dominant single type, although types in some games are combined in a few different ways. Of the 78 games, 56 games are of the single type *player-object-location-dependent*, meaning that the player's access to information about the virtual environment is restricted only in terms of spatial/visual limitations caused by the player object's location within the virtual environment. Of single types, the second most represented is the 'non-type', in which there is no informational flexibility, and thus no information about the environment is *independent of player object*, which is the case for 12 games. These types of games were discussed in the previous chapter, but much like the findings from representation across previous types, there is a trend towards older games being sorted under a specific, single type, and this category is no exception. Of the 12 'non-types', a majority were published in the 70s and 80s, and only one game, *N++*, was published after 2010. Once again, this points towards a perhaps unsurprising historical development in the complexity of PO-VE relations.

Coincidentally, neither *player-object-attribute-dependent* nor *player-object-affordance-dependent* are represented as single types in any of the 78 games. While they do appear in combinations with other types – the former in seven games in total, the latter in five – these types are present in a minority of the games in the set. A common denominator of these games is that they also contain multiple types in other categories, thereby representing more complex PO-VE relations than, for example, the older games discussed above.

Virtual environment spatial access

The notion of less complex PO-VE relations and their repeated appearance in the older games of the sample is echoed in the final category of the model, which explores the ways in which the player object's access to the virtual environment may be conditioned. Of the 78 games analysed, 34 are of the 'non-type' *non-conditional*, and among these are many of the set's older games. The exception is *spatial conditions*, found in 25 games, including the 1980 game, *Adventure*, where access to the virtual environment depends on having obtained a specific item, a key, at a specific location within the environment. The overrepresentation of older games in the non-type is therefore not indicative of *all* games in the set, as there are some exceptions to the patterns.

The two remaining types, however, are found primarily in combination with other types: in games in the sample published after 1994, and in games with multiple types represented in other categories. As a single type, *player-object-attribute-dependent* is identified in only three games, whereas *player object affordance alterations* appears only in *Altered Beast*, analysed in-depth in section 6.3.2. Access to the virtual environment being facilitated by both types is only found in games with more complex PO-VE relations across other categories, once again highlighting the need for examining typical combinations across categories to understand patterns and trends in the set, and to further our understanding of various game design patterns with regards to the PO-VE relations.

6.2.2 Typical combinations within categories

For the six categories in which the types are not mutually exclusive (i.e., not including the first category), four categories are particularly interesting to inspect closer due to the variety of combinations of types. The following section will attempt to map out the most common combinations within *type of control*, *player object alterations*, *virtual environment spatial access*, and *virtual environment information access*.

Type of control

29 of 78 player-object-based games in the sample have a combination of *direct* and *indirect control*, in most cases due to a combination of direct navigational control and other actions performed in either a full or partial overlay. Such examples have already been discussed in length in 4.2.4 and 5.3.2.

Some games have a relatively balanced split between indirect and direct manipulation of the player object. This is the case for many Japanese RPGs, such as *Chrono Trigger* and *Disgaea 2*, where battles are played out through symbolic actions, but navigation of the virtual environment is conducted via controls that are directly mapped to the player object's movement. Other games that involve multiple types of control may incorporate one type of control to a lesser extent. For example, this is the case in games with direct control where overlay information displays possible actions described through text or symbols. An example found in many games is the on-screen appearance of a symbol signifying a controller button or keyboard button followed by text, informing the player that they can press the given button to perform the action described[13]. While interaction in these cases remains *real-time*, as opposed to the time

[13] Even if the same actions can be performed without it being in reaction to overlay information (as is sometimes the case, for example for many actions including climbing in *Batman: Arkham City*), the moment the player's actions occur in response to the symbolic information in the overlay, I argue that this aligns with Klevjer's (2006) definition of what constitutes symbolic interactions. As discussed in the introduction, the analyses are based on an implied player approach to the game, according to which player input is triggered by these symbolic

delay associated with point-and-click adventures, the interactions are mediated by the symbolic interface and seemingly mapped to this – and not directly to the player object. This makes for something resembling a mix of direct and indirect control.

Player object alterations

More complicated are the various combinations of types found in the category of player object alterations. Split across markers and objects and player object attributes and affordances, these four types can be combined in a variety of ways, the sample representing seven unique combinations.

The most common combination of types, present in 14 different games, is an accumulation of all types mentioned above. All these titles are relatively lengthy games (compared to the often rather short length of arcade-style games), ranging from the complex role-playing game *Dragon Age: Origins* to the challenging rhythm-based dungeon crawler *Crypt of the NecroDancer*. As opposed to significant representation of older titles in games of a single type of player object alterations, there is considerable representation of newer games in the combination of all four types. Once again, this points towards a historical development of complexity of the PO-VE relations.

The second most common combination of types is a combination of markers causing alterations to affordances *and* attributes, and objects causing alterations to attributes, similar to the combinations above, although lacking objects in the virtual environment that alter the player object's affordances. This combination is found in 13 games, all of which facilitate affordance alterations through items that function as markers due to their non-permanent manifestation in the virtual environment. The differences between the two most popular combinations are not necessarily experienced as significant in relation to gameplay, as markers in the latter type of combinations typically stand in for the affordance alterations offered by the former type. The second combination includes

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descriptions of possible actions. Introductory or tutorial levels, however, are not included when considering whether a game utilises both types of control, as these levels typically use overlay information to teach the player how to play, and thus basing the types of control in the analyses on these levels would be misleading.

a more diverse selection of games than the one encompassing all types, counting also older titles such as *Wonder Boy*.

The third most common combination of types, and the last one to be discussed here, consists of the two types associated with objects, namely *alterations caused to attributes by objects* and *alterations caused to affordances by objects*. This combination is found in eight rather different games, many of which have sparse to no overlay information[14] and lack of inventory to keep track of marker items. Examples include *Ico* and *Firewatch*.

The remaining combinations are spread across many different games, with seemingly few things in common. It is notable that some combinations were not represented by the games in the set: *alterations to attributes* and/or *affordances caused by markers only* (which may be explained by the fact that the virtual environments of player-object-based games typically have objects within them that alter the player object's attributes in one way or another); *alterations by markers to attributes* and *objects to affordances* (explained by the same logic as above); and *alterations caused by markers to affordances* only, but by *objects to both attributes and affordances* (which may be explained by the unlikeliness of having markers that alter player object affordances without having corresponding markers that alter its attributes). Thus, we see that while the types of player object alterations can be combined in many ways, a few appear much more frequently than others, and that there remains a logical explanation for those combinations not present in the games of the set.

Virtual environment information access

Only ten of the analysed games have multiple types in the category pertaining to access to information about the virtual environment. What is more, two types – *player-object-attribute-dependent* and *player-object-affordance-dependent* – are only present in combinations with other types, indicating that they can be used for describing only games of a certain level of complexity with regards to PO-VE relations. All

[14] What Bolter & Grusin (1999) would describe as *immediacy*, the opposite of *hypermediacy* which seeks to remind the user of the medium.

combinations in the sample include *player-object-location-dependent*, which, as previously discussed, is a characteristic of player-object-based games in which the visual framing is *not* single-screen.

The three combinations appear for unique reasons and going in-depth with them all would risk expanding too much on this more general overview of the set. In short, a few examples of the explanations or situations qualifying certain games for combinational types are as follows: Informational flexibility is directly related to the player object's attribute of sight – as, for example, in *Crypt of the NecroDancer.* Special circumstances in which affordance alterations allow the player object to perceive additional information about the environment – as is the case when assuming the 'body' of certain objects in *Super Mario Odyssey*. Finally, games containing multiple player objects where only certain affordances of the player object allow the player to access information about the environment – as is the case with Spider-Man's Spider Senses in *LEGO Marvel Super Heroes.*

Virtual environment spatial access

The final category which allows for combinations of types, and where the sample includes various combinations worth exploring, relates to the player object's access to the virtual environment of which the sample contains 15 different games with combinations of *player-object-attribute-dependent*, *player-object-affordance-dependent*, and *spatial conditions*. Of these, the most common combination, identified in seven games in the set, is of all three types. Much as with the player object alterations, titles with these combinations are typically more complex and lengthy games, including *Baldur's Gate 2: Enhanced Edition* and *Super Mario Odyssey*. The same can be said for the second most common combination, *player-object-attribute-dependent* and *spatial conditions*, represented by a total of six games, many of which are role-playing games, including *The Elder Scrolls V: Skyrim*, and *Dragon Age: Origins*.

In general, it appears that combinations of types in this category are found only in more modern releases of a certain length and complexity (with one exception being *Virtual Boy Wario Land*). Exploring the combinations of types within categories showcases a pattern of certain games being generally more complex in terms of representing multiple types within different categories, with other games in the sample appearing less complex by virtue of being represented by only one type (for the older and more minimalistic games, the 'non-type') in each category.

6.2.3 Typical combinations across categories

When exploring patterns of the PO-VE relations in the games in the set, it is interesting to study how different types in different categories are combined in various but repeated ways. As mentioned throughout the analyses of the individual categories, there are patterns emerging with regards to the complexity of the PO-VE relations, and until now these patterns have not received much attention. It has been assumed that games with multiple types in different categories constitute more complex PO-VE relations, and games with non-types and otherwise single types in all categories make for less complicated PO-VE relations. This section will present some of these patterns observed in the set.

The first prominent observation across categories is that the games in which all four types of *player object alterations* are present also typically represent multiple types in the categories of *virtual environment information access* and *virtual environment spatial access*. Of the 14 games in the sample with all types of *player object alterations*, four contain multiple types in the category of *virtual environment information access*, and more noteworthily, ten games contain multiple types in the category of *virtual environment spatial access*. All games with multiple types in the category of *virtual environment information access* have at least two types of player object alterations, and six of these ten games have multiple types in the category of *virtual environment spatial access*. For the three categories discussed above, games of multiple types are thus more likely to also have multiple types in the remaining two categories, revealing a pattern pertaining to PO-VE complexity – that variety of types in one category begs variety in other categories.

The games of the sample that have multiple types in all three categories discussed above are the following titles: *Batman: Arkham City*, *Crypt of the NecroDancer*, *The Legend of Zelda: Breath of the Wild*, *LEGO Marvel Super Heroes*, *Super Mario Odyssey*, and *The Binding of Isaac: Afterbirth+* (Nicalis, 2017). In addition to overlaps in the PO-VE relations, as indicated by their status as multi-type examples across categories, these games have certain other aspects in common, as is illustrated below:

All the games were published in 2012 or later, making them products of what we might, at the time of writing, refer to as contemporary game design. The development practices associated with the different titles, however, vary greatly since one of the above games are developed by self-proclaimed independent game studios (*Crypt of the NecroDancer*), some by so-called 'AAA' developers, i.e., bigger studios typically with larger budgets (*Batman: Arkham City*, *LEGO Marvel Super Heroes*), and others by Japanese media conglomerate, Nintendo (*The Legend of Zelda: Breath of the Wild*, *Super Mario Odyssey*), reflecting different game design traditions, development cycles, budgets, etc.

The six games all have expansive possibility spaces in the sense that the player object(s) have many different affordances that are altered during the game. In *Crypt of the NecroDancer* and *The Binding of Isaac: Afterbirth+*, affordances and attributes are subject to change on a moment-to-moment basis, as the virtual environment contains many markers and objects which alter the player object in one way or another, creating a fast-paced and everchanging gaming experience. In *Super Mario Odyssey*, the player object is similarly altered on a very regular basis, through *player object conversions*. As I have described elsewhere, the player object can 'posses' the body of other objects in the virtual environment, thus 'transforming' its affordances *and* attributes in new ways for all 18 kingdoms in the game. *LEGO Marvel Super Heroes* lets the player switch rapidly between different player objects whose affordances change on the whim, as they encounter new objects in the environment, and each develops new skills and abilities as they progress towards their goals. *Batman: Arkham City* keeps the player on their toes with scripted conversions between Batman and Catwoman, and a rich and detailed skill-tree and gadget upgrades that allows for continuous expansion of the affordances of both versions of the player object. Finally, *The Legend of Zelda: Breath of the Wild* rewards the player's early progress with new abilities unlocked in different locations of the world and lets them customise the player object through markers such as wearables and consumables to fit their immediate need, preparing for whatever threats the virtual environment poses at a given time. At the same time, horseback riding and paragliding facilitate controlled conversions essential for traversing the vast distances of the virtual environment. In other words, in all these games, the player object is ever-changing and evolving, subject to change due to the player's choices, pre-scripted elements, and sometimes unforeseen consequences of interacting with objects in the virtual environment.

On the completely opposite end of the spectrum of PO-VE relations are games with only single types in each category, represented by non-types whenever applicable. Non-types in the PO-VE model are interesting as they function as a way of indicating the irrelevance of the specific category in the analysis of the game in question, rather than describing an actual type. As such, they could be replaced with *null* or simply a blank answer. This means that games with many non-types are functionally less complex than games without non-types. They involve no alterations or conversions of the player object, thus making for more stable and less dynamic PO-VE relations. In addition, they have no reliance on the player object in terms of information about the virtual environment or conditional spatial access to the environment.

The title in the sample that has the most non-types (where applicable, as *player object* and *type of control* have no non-types) is *QWOP*. *QWOP* is by now the default borderline case, and in addition to the challenges it poses to the model as previously discussed, the game is also problematic when considering the basic principle of integration. The virtual environment of the game is nothing but a running field, a single object which is used primarily as a visual backdrop for the game, and it functions as a marker of the distance covered by the player object.

The environment in *QWOP* does not contain objects that alter its attributes or affordances, and the challenge of the game lies in the control of the movements of the player object itself – controls that are atypical and surprisingly difficult to master.

However, the player object *is* integrated into the relational system which situates it in relation to the environment, specifically to the surface of what is represented as the running field, which becomes both a measure of success (in terms of distance travelled) and failure (in case of improper control of the player object, causing it to fall forwards or backwards). The player object is very much concrete, manifested as a visually coherent athlete whose muscles are controlled through separate input-buttons, the unlikely control scheme being the heart of the gameplay. *QWOP is* player-object-based but is an example that stands out so much that it puts into perspective the complexity of the games discussed above. The game further illustrates the vast differences between titles meeting only the defining characteristics and those incorporating all non-defining characteristics discussed within the PO-VE framework.

In addition to the extreme case of *QWOP*, another pattern emerges in the sample of games of single types, sometimes non-types, with a single point of control and the direct type of control. These games include *Alien Invaders - Plus!*, *Asteroids*, *Breakout*, *Crazy Taxi* (Hitmaker, 2000), *Frogger*, and *Lazarian*, among others, and are perhaps best described as 'arcade-like' games (not least because many of them were originally developed for arcade machines and only later ported to home consoles). As previously stated, there is an undeniable correlation between the year of publication of a game and the number of types in the various categories of the PO-VE model. While being true for the individual categories, as discussed above, it is also true for the results of the application of the entirety of the model.

The games listed above have in common that their rules are easy to describe. The virtual environments have limited types of objects serving as obstacles and enemies, and the relationships between the player object and these objects is consistent and predictable. None of the games have markers. This makes for games in which the PO-VE relations are both stable and simple, especially when compared to the titles discussed with multiple types for each category.

It is also noteworthy that the games with simple PO-VE relations do not contain off-line, contextualising elements, such as cutscenes, setting up a narrative which gameplay follows. While the player objects in the games are all represented as something thematic (a spaceship, a driver in a taxi, or a frog), their characterisation is limited.

The lack of characterisation stands in contrast to the games of multiple types for each category, now warranting the term ‘complex’. In the complex games discussed – *Batman: Arkham City*, *Crypt of the NecroDancer*, *The Legend of Zelda: Breath of the Wild*, *LEGO Marvel Super Heroes*, *Super Mario Odyssey*, and *The Binding of Isaac: Afterbirth+* – the player objects are perceived as distinct characters. We can therefore observe another correlation: games of more complex PO-VE relations typically portray player objects more obviously as characters than do games of simple PO-VE relations. This may seem a consequence of technological limitations to older games and a development of digital game design conventions that increasingly prioritise narrative and hence characters.

The PO-VE model is not developed for the sole purpose of understanding the historical development of games, nor for exploring characterisation in relation to player objects. The agenda of the study is not to make broad claims about game design traditions, throughout the history of game development, or across genres. Rather, the findings illustrate the applicability of the model, point towards specific interesting points for discussion in the study of PO-VE relations (for example, in relation to characterisation), and indicate possible focus points for closer readings and further analyses.

The second half of this analysis chapter will dive deeper into selected games from the sample, to explore further the PO-VE relations in these games and illustrate the model’s applicability to an individual game.

6.3 Close readings

The ten games analysed below were chosen based on their differences across a variety of factors. Most importantly, they represent different types in the categories of the PO-VE model, as will also be revealed in their analysis. They represent diversity with regards to platform and they represent different eras of game development: *Space Attack* and *Altered Beast* being a product of the late 1980s, *Passage* being a mid-noughties indie production, and the remaining titles illustrating the rich diversity of games published during the past 10 years. The games illustrate different perspectives upon the virtual environment and the player object, and the selection includes two and three-dimensional environments. Two games that do not meet the defining characteristics of player object-based games (*Papers, Please* and *Reigns: Her Majesty*) are included to illustrate the limits of the concepts involved in the PO-VE framework. Finally, the developers of the ten games come from different parts of the world. While there is a definite Western bias in the selection, the games represent British, American, Canadian, Polish, Swedish, Danish, French, and Japanese game development, and the inclusion of *Passage* and *Papers, Please* also means the inclusion of an independently developed game, thus not only representing AAA productions.

The ten games are arranged according to year of publication, starting out with *Space Attack* and concluding with *Reigns: Her Majesty*. Some analyses are more extensive than others, depending on the complexity of the PO-VE relations of the induvial game. Similarly, some analyses cover the entirety of the game, whereas others consider only sections of it. The parts analysed are indicated for each game.

6.3.1 *Space Attack* (UA, 1982)

Space Attack (see image 6.1 below) is the Leisure Vision[15] console's version of the arcade and Atari 2600 game *Space Invaders* (Taito Corporation, 1980). Set in space, the player controls a spaceship along the bottom of the screen, navigating it left to right using the controller's joystick, while shooting by pressing one of the controller's buttons. The player must shoot all enemies before running out of energy (the resource marked by the E-bar at the very bottom of the screen). The game is separated into multiple levels, each presenting more difficult to beat enemies than the previous. When the player makes it to the next level, their E-bar is back to full. If the player object is hit by the enemies' shot or it runs out of energy, the player 'loses a life', of which they have three.

[15] A licensed release of the Arcadia 2001

The player object in *Space Attack* constitutes a *single point of control*. While the loss of a life or the progression to a new level loads a seemingly new player object with renewed energy into the virtual environment, the player only ever has a single point of control within the virtual environment.

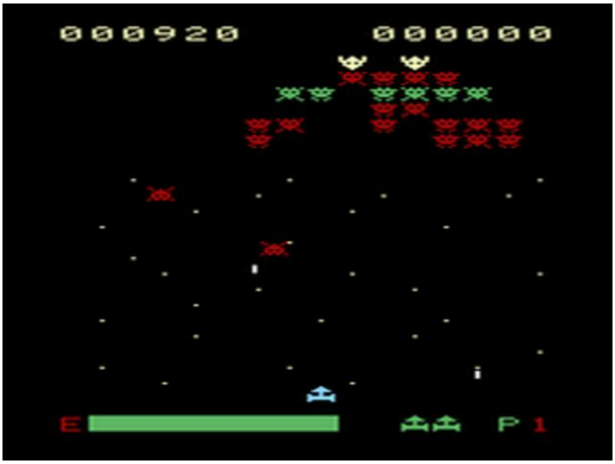
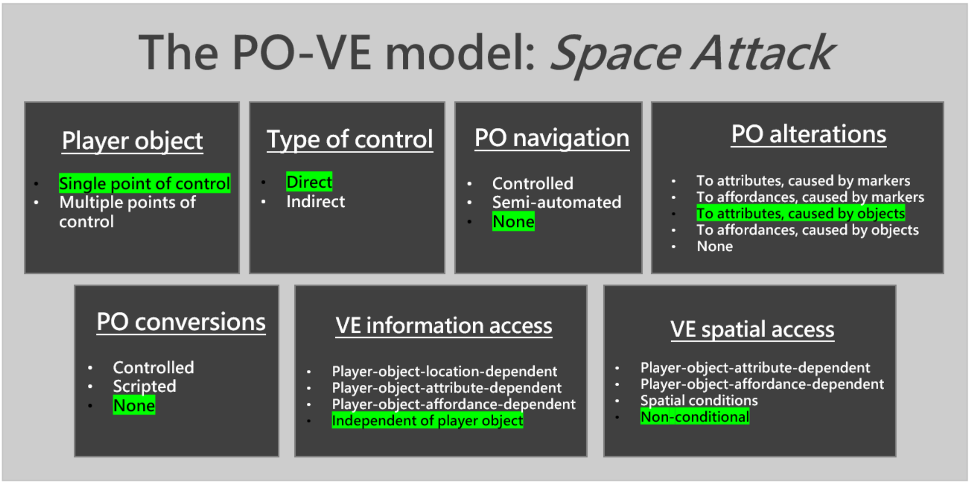


Image 6.1. Screenshot from *Space Attack* (UA, 1982).

Due to the direct mapping of movement to the controller's joystick, and shooting to one of the controller's buttons, the game qualifies as offering *direct manipulation* of the player object. Moving the joystick from side to side simulates the movement of the spaceship along the x-axis. The single-axis mapping means that the game has *movement* but no *navigation*. As I have argued in the first section of the analysis, many of the older games in the set, in particular those originally developed for arcade machines, are sparse in their representation of types in the PO-VE model, and typically categorise as one or non-types in many categories. This, too, is the case for *Space Attack*. The player object is subject to only one type of alterations – the loss of health compartmentalised into 'lives' upon impact from shots fired by the enemy, which can thus be described as caused by an attribute-altering object. The player object does not go through any conversions, no information about the environment is restricted, and there is no spatial access to be gained, as the entirety of the virtual environment is contained within a single screen and is otherwise not *navigated* as the player object is locked to movement on a single axis.



Model 6.1. *Space Attack* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

Thus, *Space Attack* exemplifies the simplicity of PO-VE relations in arcade-like games, having non-types in four categories of the PO-VE model, as can be seen in the model above.

6.3.2 *Altered Beast* (Team Shinobi, 1989)

Altered Beast, originally an arcade game published in 1988 but ported for various Sega consoles (including the Sega Master System, on which it was played for this study), is a two-dimensional side-scroller beat 'em up game. Consisting of four levels (or 'rounds', as they are referred to in the layover text following the completion of each of them), the player has to progress by attacking and defeating a variety of enemy objects. Each round is concluded with a boss fight in a non-scroller arena where the virtual environment does not expand beyond what can be seen in the frame.

As the title indicates, player object alterations are at the heart of this game, yet the game expands beyond alterations in also making conversions central to the gameplay. Starting out as what is represented as a reasonably fit, human-looking figure (see image 6.2 below), the player object's strength, size, affordances, and visual appearance can be changed through conversion. This is achieved by defeating a specific enemy, a dynamic object that appears only on rare occasions in each level. When defeated, the enemy will drop a marker – a small, blue orb that, upon collision, results in immediate conversion. If the player object is in its initial version, the visual presentation will transform into a bigger, bulkier version, and the player object's size and strength attribute will increase. If the blue orb marker is collided with in the 'brute-version' resulting from the first conversion, a brief off-line sequence will show a human face transforming into an animal or monster face (wolf, dragon, or tiger, depending on the round), after which the player object's visual presentation will have transformed into the corresponding creature (see image 6.2). Its affordances are altered depending on the creature: in its wolf-human form, the player object can throw fireballs; the dragon-form facilitates flying (thus extending the traversable parts of the virtual environment, making access to the virtual environment dependent on the player object's affordances), as well as a ranged attack similar to the fireballs; and as a tiger, the player object can perform an attack similar to the fireball that covers a larger area.

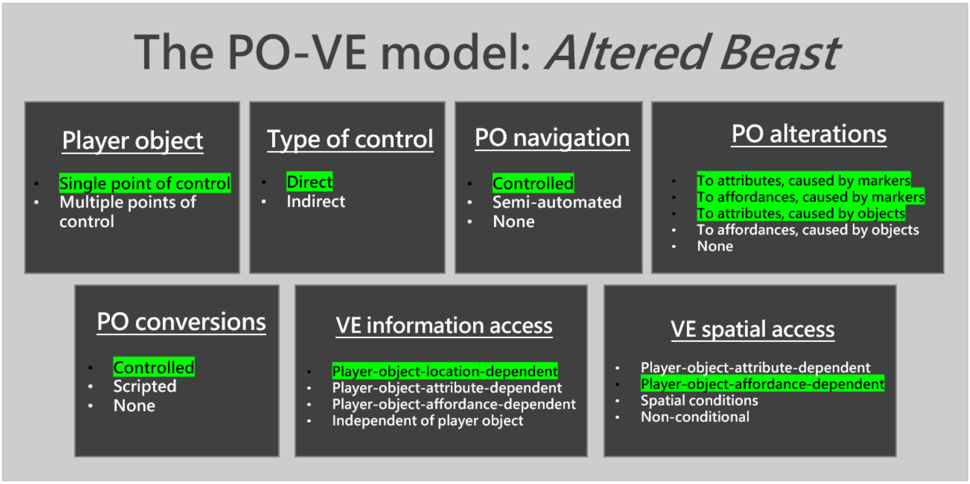
Image 6.2. Screenshot 1 and 2[16] from *Altered Beast.* Screenshot 1 shows the initial appearance of the player object, before alterations, about to pick up the blue orb marker which causes alteration. Screenshot two shows the final form of the player object in the game's first level, after two alterations.

The various versions of the player object result from conversions that involve alterations of attributes and affordances, and changes to the designation of the player object – from *human* to *brute*, and from *brute* to *dragon*, for example. The changes thus warrant the description of new *versions* of the player object, rather than merely *variants* as results of alterations. The player object does, however, go through alterations and thus variants every time it takes damage from an enemy object, which alters its health attribute marked by the blue bar at the top of the screen.

Except for the player object conversions and alterations discussed above, *Altered Beast* is an example of a relatively simple game in the sample, although more complex than *Space Attack*. It has single types in six of the categories of PO-VE relations, the exception being the alterations, including those involved in the conversion (see model

[16] Screenshots from *Altered Beast* using an online emulator.

6.2 below). The player object constitutes a *single point of control*. The buttons on controller of the Sega Master System are directly mapped to the player object. In the player object's first version, the control pad is used for movement left and right, and the buttons for kicking or punching, respectively, or in combination (both pressed at the same time) to jump. The controls differ in different versions of the player object, but they remain directly mapped, thus constituting *direct manipulation* of the player object. Said player object can move in two dimensions, thus qualifying the navigation type as *controlled navigation*.



Model 6.2. *Altered Beast* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

Information about the virtual environment depends on the player object's location, as parts of the environment are revealed as the player object moves from left to right, as is typically the case for side-scroller games of this type. Finally, the player object's access to the virtual environment is affordance-dependent, as its dragon-version allows for free movement along the y-axis, while other versions of the player object are restricted to whatever height and platforms can be reached using the jump-button-combination.

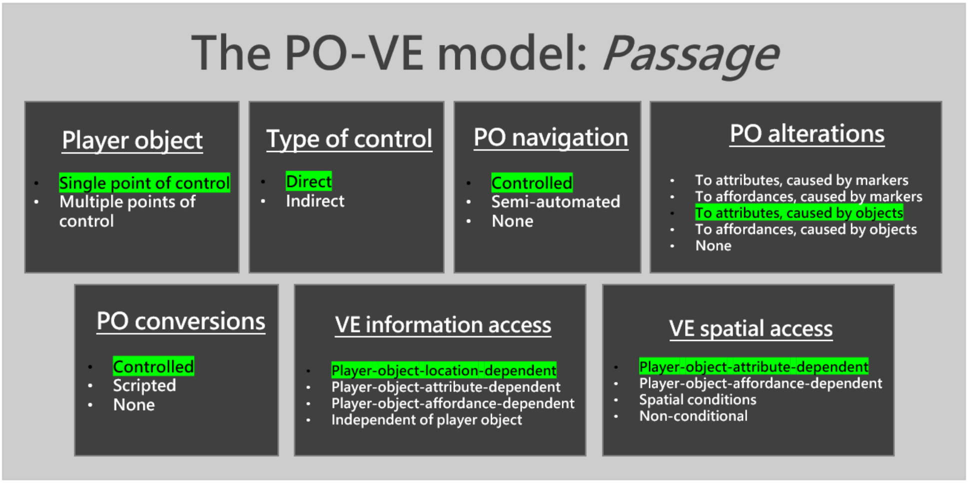
Conversions and their associated alterations are what makes *Altered Beast* slightly more complex in its PO-VE relations than its contemporaries, without which it would be a single-type game across the model.

6.3.3 *Passage* (Rohrer, 2007)

In Jason Rohrer's short side-scroller game *Passage*, the player has a fixed amount of time – 4 minutes and 52 seconds, to be precise – to navigate a player object through a two-dimensional maze-like structure. The virtual environment is only partly visible compared to traditional side-scroller games, as it is framed through a narrow strip, thus limiting visual information (see screenshot below, image 6.3). While the player is given no instructions or direct objectives, a score is accumulated during the game, which can be increased by colliding with certain objects, visually presented as opening treasure chests scattered throughout the environment, some containing flies, adding nothing to the score, and others containing point-granting riches.

Image 6.3. Screenshot from *Passage* (Rohrer, 2007), illustrating the narrow frame through which the virtual environment is visible as well as the figure-shaped object, which causes a conversion of the player object upon accumulation.

The player object in *Passage* is constituted as a *single point of control*. Even if the player object is navigated to collide with another figure-shaped object – which, upon collision, causes a conversion, now visually presented as two figure-shaped entities rather than one whose attribute of size is thus altered – the two visually distinct objects are controlled as one, and the player object is therefore still configured as a single point of control. Although this conversion involves a specific object in the virtual environment, it is *not* an example of an *association* like the ones discussed in chapter 4, for example in *VVVVVV*. The reason for this is that the version of the player object post-conversion incorporates both figures in a single object which are controlled as one, through the same input. Both pre-conversion and post-conversion versions of the player object are controlled through *direct manipulation*, responding immediately to the player's input using the arrow keys of a keyboard. Throughout the game, the affordances of the player object are restricted to that of movement in four directions: up, down, left, and right.



Model 6.3. *Passage* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

The original player object is presented as a human figure with short hair, shirt, and pants, and the conversion-causing object is presented with long hair and a dress. The conversion, which also prompts a brief heart-shaped animation, can thus be read as a unison of the two, making one the spouse or partner of the other.

The conversion into the two-character player object also causes alterations to the player object's attributes, which increases in size, therefore limiting the parts of the virtual environment traversable and increasing the difficulty of finding and opening treasure chests. When the spouse[17] dies (after 4 minutes and 21 seconds of playtime), signified by her figure turning into a gravestone and separating from the player object, the player object once again goes through a conversion in which its size attribute is altered back to its pre-spouse value. Moreover, the speed with which the player object can navigate the virtual environment decreases for the remainder of the game. This decrease to the speed attribute does not occur during late gameplay if the player object did not previously collide with the spouse object, resulting in the initial conversion.

During the game, attributes are altered, and the player object undergoes visual changes. Whether or not conversion is triggered through collision with the spouse, the player object's visual presentation is altered with the passing of time (clothes and hair colour change, making the visual representation of the player object appear older with time). If conversion is actualised, once it is reversed – visualised as the death of the spouse – the player object visually appears particularly old, crouching forward, and can move only at a slowed pace (i.e., its attributes are altered). This final stage of the aging process is only experienced post-conversion (see screenshots below).

Image 6.4. Screenshot 2 and 3 from *Passage* (Rohrer, 2007) illustrating the visual

[17] The term used by Rohrer (2007) himself in his creator statement published alongside the game.

differences between the player object after a game with (top) and without (bottom) a spouse. The images are cropped.

In terms of the player object's attribute alterations, the conversion results in a version whose size is greater than that of the former version – the two characters take up more space in the virtual environment than the single character. In relation to the implied objective of collecting points through the act of opening chests, this change in size brings with it an increased difficulty or inability (depending on the chest in question) to collect all treasure chests, as many sections of the environment cannot be traversed by the now-larger player object. While outside the scope of the PO-VE analysis, one might be tempted to ascribe symbolic meaning to this functional alteration (a possible reading could suggest that romantic love limits one's 'real life' possibility space).

Along with the alteration of the attributes and figurative attributes, the player object's location in the frame through which the virtual environment is visible shifts slowly as the game progresses, starting out at the beginning of the game at the far left and ending up at the far right. This can be seen when comparing screenshot 1 (image 6.3) with screenshot 2 and 3 (image 6.4), where the player object is located at two opposite ends of the visually presented 'slice' of the virtual environment.

In practice, this has no influence on how the virtual environment can be navigated; the player object can always navigate the environment in all directions, unless an obstacle is blocking the way. However, the narrow frame combined with proximity to the right-most edge results in a limitation on the visual information about the environment to-be-traversed when moving from left to right, as is the typical way of progressing through a side-scroller. Whereas the left-based location of the first half of the game gives the player more visual information about the environment ahead, the visually limited information of the latter part of the game makes it more challenging to navigate the maze-like structure of the environment. While the category of player object and information about the virtual environment in the PO-VE model helps shed light on this peculiar case of information dependency, none of the types listed in the framework are quite sufficient to account for the case at hand: visual information about the virtual environment is *player-object-location-dependent*, which describes part of the situation above. We must therefore turn to the category of *player object alterations* and expand beyond the assignment of types to truly understand how the continuous alterations to the player object's location within the frame function as a way of increasing the level of difficulty as time progresses by limiting the player's access to visual information about the virtual environment.

While *Passage* is a very simple and short game, the analysis above illustrates its functional depth. Applying the PO-VE model reveals details that can be interpreted as serving symbolic functions. It also illustrates how it is sometimes necessary to involve multiple categories to describe a single phenomenon in a game, as the categories and the types therein are not always detailed enough on their own to explore PO-VE relations in-depth. Therefore, *Passage* served an example of how to utilise multiple categories in a close reading to account for specificities of the game under scrutiny, in this case the continuous alteration of the player object's location within the virtual environment.

6.3.4 *Hotline Miami* (Dennaton Games, 2012)

In the top-down shooter *Hotline Miami*, the player navigates the player object around a virtual environment consisting of different buildings, killing all opponents in their way. The game is structured into different parts and chapters, and for the sake of simplicity, this analysis focuses on the prelude chapter, 'The Metro', but references different items obtained later in the game. The prelude chapter features a limited selection of weapons and functions to illustrate the most central game mechanics. The player object is tasked with obtaining a briefcase which is done by killing all 'mobsters', i.e., opponents in the level, by beating them up, using fists or some of the melee weapons that can be picked up after an opponent carrying them has been defeated (see image 6.5 below).

The player object constitutes a *single point of control* which is manipulated directly using the WASD+Space buttons of the keyboard and the two mouse buttons. The letter keys are used for moving around the virtual environment in two dimensions (the game therefore has *controlled player object navigation*), and the mouse keys are used for picking up and dropping items, interacting with other objects in the environment, and performing attacks, where the resulting attack varies according to the weapon equipped. The space key is using for 'finishing off' enemies with particularly violent attacks. The virtual environment is seen from a top-down perspective, and only parts of the virtual environment are visible to the player, depending on the player object's location. This restriction of visual information about the environment functions as a challenge to gameplay as the player will not know the layout of a room or the number of enemies therein before it is entered.

Image 6.5. Screenshot from *Hotline Miami* (Dennaton Games, 2012), showing the player object positioned in the middle of the room, lead pipe equipped, standing next to a recently killed mobster.

As can perhaps be seen from the screenshot above, the player object is portrayed as wearing a mask. As the player progresses through the game, they will unlock new masks that can be equipped at the beginning of each chapter (see image 6.6 below), each of them serving a particular function. In this case, the player object is wearing the horse mask, referred to as 'Don Juan', and when this mask is chosen, slamming doors into enemies will kill them. Other masks include, for example, Rasmus the Owl (which, when worn, highlights specific parts of the environment that contain special items that are otherwise difficult to see) or Dennis the Wolf (which starts the player off with a knife equipped as a weapon).

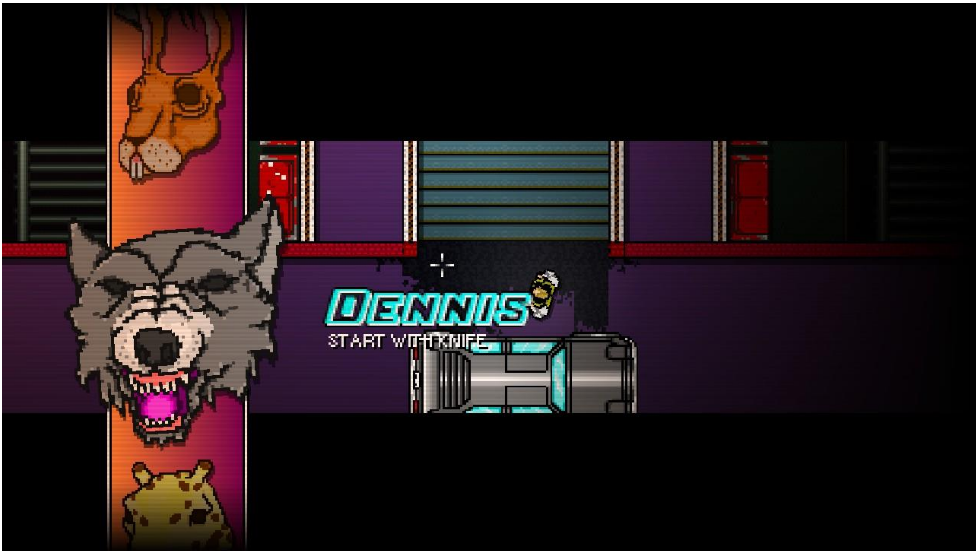
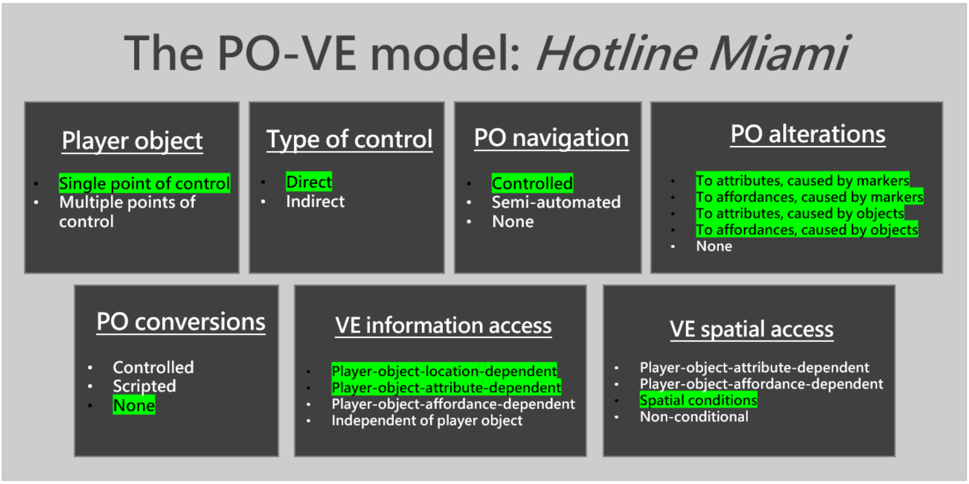


Image 6.6. Screenshot from *Hotline Miami* (Dennaton Games, 2012), showing the mask-selection at the beginning of the prelude chapter.

The different masks are *markers*. They can sometimes be encountered in the virtual environment to be picked up, and they are equipped at the beginning of each chapter to alter the player object's affordances or attributes. Some of these alterations are similar to the equipment of an item in most other games. For example, equipping the wolf mask means that a knife is equipped from the beginning of the level, thus altering the player object's affordance to include a knife attack. Equipping the owl mask, on the other hand, lets the player gain new informational access to the virtual environment by making special items more visible. Because the choice of mask is itself an alteration of the player object, albeit one that is chosen at the beginning of each chapter, the owl mask is a cross-category example: It is an *attribute-altering marker* (that increases the sight attribute, dictating how well objects of interest are distinguishable from the remaining virtual environment) causing information about the virtual environment to be *player-object-attribute-dependent*. To explain the owl mask, it is therefore necessary to draw on two categories of the PO-VE model, namely *player object alterations* and *virtual environment information access*. The horse mask and the wolf mask, on the other hand, are examples of player object alterations caused by markers to both affordances and attributes: They both facilitate attack actions (affordances) that each increase the player object's strength (attribute). However, the wolf mask is a 'double-layered' example. The *marker* mask grants the player object a knife *object* (as weapons are persistent objects within the virtual environment). The knife object alters attributes and affordances of the player object.

The marker masks can alter affordances as well as attributes, and weapon objects, too, can alter affordances and attributes. Therefore, the game contains all four types of player object alterations in the PO-VE model (see model 6.4 below).

As previously stated, 'The Metro' tasks the player with navigating the player object through a building, killing all mobsters in their way, in order to obtain a briefcase. Only once this briefcase has been obtained, and the man holding on to it as well as the backup mobsters arriving upon retrieval have been killed, is it possible to move out through the doors of building. Thus, access to the virtual environment is dependent on certain spatial conditions. The player object must have retrieved the briefcase from its dedicated location in the virtual environment, by the very end of a unicursal labyrinth, leading the player object past multiple mobsters, before getting access to the outdoor area and thus completing the chapter by getting into a car parked outside the building. Such are the structures of most of the chapters in the game – get in, get to the far end of the building, retrieve an object or kill an opponent, and only then may you get out again.



Model 6.4. *Hotline Miami* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

Model 6.4 reiterates what I have stated about the different PO-VE relations in *Hotline Miami*, and as can be seen from the many green highlights (compared to, for example, *Space Attack* and *Altered Beast*), *Hotline Miami* has some rather complex relationships between the player object and the virtual environment, constituted in large part by the game's mask markers that alter the player object as well as the player's access to information about the environment. *Conversions* is the only category in which the game presents a non-type, but it makes sense, from a design perspective, that these are not involved, since the many obtainable masks in the games allow for such varied play experiences, due to the resulting alterations of the player object.

6.3.5 *Subway Surfers* (Kiloo & SYBO Games, 2012)

In the mobile game, *Subway Surfers*, the player controls a young boy on the run from a security guard and his dog after having been busted for doing graffiti on a subway car. The game belongs to the 'endless runner' genre, in which the player object moves automatically forward in the virtual environment (or 'keeps running'). The player has to navigate the player object around various obstacles, consisting mostly of incoming trains, parked trains, and different types of barriers. The player can move the player object from left to right by swiping in said direction and can similarly make the playing object jump or crouch by swiping up or down. This constitutes *direct manipulation*.

While the mobile game is continuously upgraded and patched, introducing new items and collectibles, there is a selection of standard items in the game. These are automatically equipped upon collision and disappear from the environment once they have been ‘used up’ and can therefore be described as *markers*. The standard markers are magnets, super sneakers, power jumpers, and jetpacks. When a magnet marker is equipped, the player object will automatically collect all coins passed in the virtual environment, and not only those with which it makes contact. It thus expands the player object’s pick-up radius, which can be considered an attribute. Hence, the magnet is an attribute-altering marker. The super sneakers, however, are not as easily categorised. In fact, they pose a challenge to the distinction between attributes and alterations that has otherwise been relatively simple to make in the analyses so far.

When super sneakers are equipped, which happens automatically upon pick-up, they allow the player to perform jumps roughly twice as high as the regular jump. But this super jump also replaces the regular jump, for the period during which the super sneakers are ‘active’ (a countdown appears in the overlay). Thus, a simple analysis suggests that the player object’s attribute of jump height is altered by the marker. An alternative analysis, however, could state that the jump-action is temporarily *replaced* with a super-jump action, thus altering the player object’s affordances. The distinction between affordance and attribute alterations is similarly challenging for the power jumpers and jetpack markers, both of which launch the player into the air for a limited time – the power jumper causing a single ultra-high jump, and the jetpack carrying the player object to another part of the virtual environment ‘above ground’, otherwise inaccessible. Are these actions, triggered by collision with markers, temporary alterations of the attributes dictating how the player object can navigate the virtual environment? Or do they constitute new actions, and are hence affordance alterations?

Image 6.7. Screenshot from *Subway Surfers* (Kiloo & SYBO Games, 2012), showing the player object with the jetpack equipped, granting access to an otherwise inaccessible 'top layer' of the virtual environment.

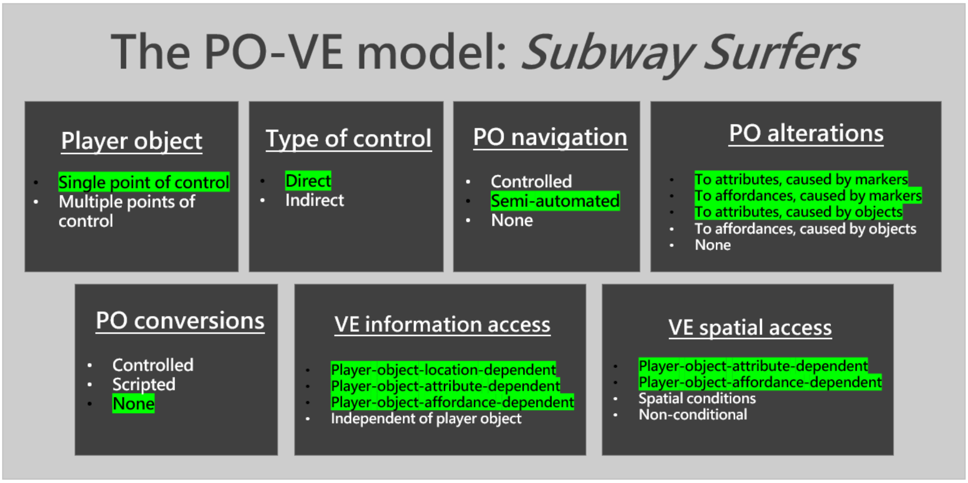
I argue that the super sneakers be considered affordance-altering, as the super jump is an action that is actively performed by the player object, and which is altered due to the use of the marker. The power jumper and jetpack, however, do not alter an action that is prompted by player input, and the single-use markers are thus perhaps best understood as attribute-altering. Perhaps the analytical difficulties arise due to their similarities to mounts or vehicles and thus conversions. I have elsewhere argued that the paraglider in *The Legend of Zelda: Breath of the Wild* be considered a conversion, much like the use of a horse, because it changes the functionality of the player object – affordances as well as attributes, the visual representation, (arguably) the designation, and the way in which the player object is controlled. This is not the case for the power jump or jetpack in *Subway Surfers*. While the jetpack is thematically like the paraglider, it differs in its minimal alteration of the player object. Furthermore, it is ‘used up’ within a short span of time, much like the other markers of the game, and it does not alter the controls of the player object and hence not what actions it can perform. From this analysis, I argue that the power jumper and jetpack both constitute attribute-altering markers, but they are indeed borderline examples that challenge the distinctions between attributes and affordances as well as the definition of conversions in the PO-VE framework.

Due to the functionality of the various markers, visual information about the virtual environment – in particular the player’s ability to see the ‘top layer’ of the environment – depends on alterations to the player object’s affordances (using the super sneakers) or attributes (height of movement caused by the power jumper and jet pack). In addition to this, the visual framing of the virtual environment follows the player object as it is automatically moved forward, thus being dependent on the player object’s location.

The different markers also serve as a way of gaining access to specific parts of the virtual environment that are otherwise inaccessible. By gaining the ability to jump higher or by being automatically transported into the ‘top layer’ of the virtual environment after colliding with a jetpack or power jumper, the player object’s access to the virtual environment is dependent on alterations to its attributes and/or affordances.

In addition to the different types of markers, the game also features *objects* in the form of obstacles in the virtual environment, some of which will slow down the player object upon collision, bringing the guard and his dog (and hence the fail state of being caught) closer. These objects therefore bring about an alteration to the player object’s pace, but for a limited time only, as speed is once again recovered after traversing a set distance without colliding with additional objects.

These observations are all marked in the PO-VE model below (model 6.5), which illustrates a perhaps surprising complexity of PO-VE relations in what would otherwise appear to be a relatively simple game.



Model 6.5. *Subway Surfers* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

Subway Surfers illustrates how mobile games are not necessarily simple in terms of PO-VE relations. The analysis above also shows that, while the touch display and swipe-based control can be considered *more* simulative than the controller-based input in *Altered Beast*, they function in the same way, and do little in terms of contributing to the complexity of the PO-VE relations. As opposed to a game like *Fruit Ninja*, where the touch input is essential for gameplay, it is easy to imagine playing *Subway Surfers* with another, less simulative input-device.

6.3.6 *ZombiU* (Ubisoft Montpellier, 2012)

ZombiU, a first-person survival/shooter game, stands out from the rest of the games in the sample due to the console on which it was played, and the way in which the PO-VE relations are influenced by the controller. Being one of three games in the sample played on the Wii U, *ZombiU* is specifically developed for this console, which is apparent in how it incorporates the secondary screen of the Wii U-controller, both functionally and representationally within the virtual environment. This is done in a multiplicity of ways, explored in the following analysis that is based on the first two missions, *Get Prepared* and *Scan 2 CCTV Junction Boxes in Supermarket Area*.

In the game, the player controls a single player object characterised as a human survivor in a zombie apocalypse. The player object is seen from a first-person perspective, meaning that its hands (and weapon, if one is equipped) are visible at the lower part of the screen. Its navigation in the three-dimensional environment is controlled using direct manipulation, as the player object movements are mapped directly to the controller's joysticks and action buttons.

However, not all actions are directly mapped to the player object. As can be seen from image 6.8, unlike other games in the set in which the inventory opens in an overlay interface, the inventory in *ZombiU* is accessed on the secondary screen on the Wii U controller. The inventory constitutes a symbolic interface, where items can be equipped or used using indirect manipulation. While the player manipulates the inventory on the secondary screen, the visual framing of the player object on the main screen is altered – we now see the payer object from a third-person perspective, and the animation illustrates the human figure rummaging around his bag. While the inventory is accessed, the player object in the virtual environment is vulnerable to attacks, and the alteration in the visual framing thus makes it easier for the player to observe potential incoming enemies.

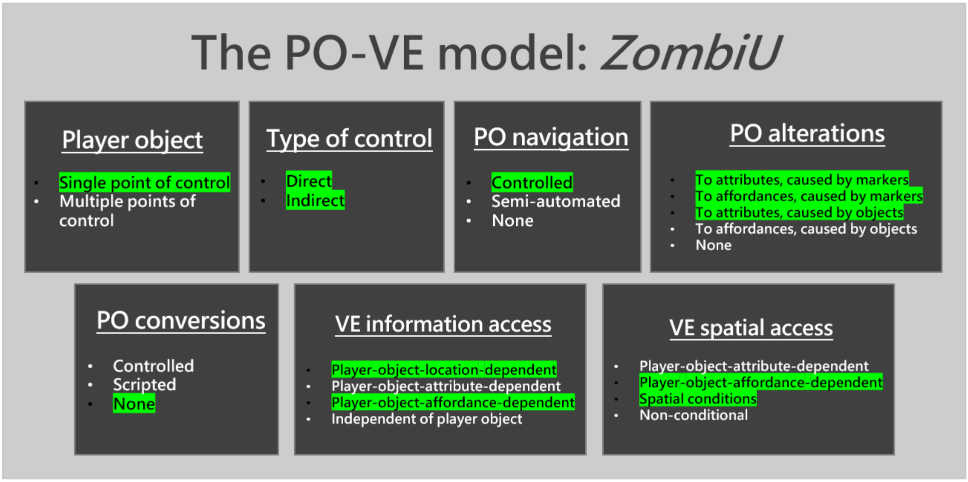
The secondary screen also serves an input method for 'scanning' parts of the environment. For example, in the second mission of the game, the player is tasked with scanning two CCTV junction boxes, and this is done by holding up the Wii U controller, a motion which is thus simulated by the player object in the virtual environment, whose movements are directly mapped to the player's own manipulation of the Wii U controller. Scanning the junction boxes (and other parts of the virtual environment in later sections of the game) gives the player access to new information about the virtual environment. In the CCTV example, the scanning action unlocks access to camera footage from certain locations in the environment, while in other examples, the scanner is used to unlock parts of the virtual environment.

The integration of the Wii U controller as a marker in the virtual environment that expands the player object's affordances, as its utility is increased as the player progresses through the game, is an unusual example that is rarely encountered in digital games. But it serves an excellent example for illustrating the value of the PO-VE framework and model, as the central concepts and the different categories and their types can help make sense of the multiple, distinct relationships that are established between player object and virtual environment, through manipulation of the rather unusual console.

Image 6.8. Double screenshot (Nintendolife, 2021) of the dual-screen configuration in *ZombiU* (Ubisoft Montpellier, 2021).

In large sections of the game, the controller functions as any other game controller would, by facilitating direct manipulation of the player object in the virtual environment. As an inventory, the secondary screen offers indirect manipulation of the player object, as it can be used for equipping new weapons. In this case, it remains a controller and not an object within the virtual environment. However, when using the controller’s scanning protocol, the controller makes an appearance as a marker – an item held by the player object in the virtual environment, to which the player’s movements are directly mapped. In this example, the scanner marker, controlled directly by the Wii U controller, is a marker that expands the player object’s affordances, and which grants both information and spatial access to the virtual environment. The special controller thus has multiple uses and different mappings, direct and indirect, to the player object.

ZombiU also contains objects and markers like those found in more traditional first-person shooters. Food and medipacks exist as markers that can be looted from around the virtual environment (some looting is handled on the secondary screen, in an inventory similar to the one associated with the player object). When picked up, they disappear from the environment, and when used, they disappear from the inventory, resulting in a health increase attribute alteration. Similarly, there are various weapons scattered around the environment that can be picked up, equipped, or kept in the inventory. When equipped, these markers alter the player object's affordances. Objects, such as enemy zombies, can alter the player object's attributes by dealing damage, thus reducing its health.



Model 6.6. *ZombiU* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

In model 6.6 above, the analysis of *ZombiU* is represented in the PO-VE model. Here we also see that the game has no player object conversions, and that, in addition to the information about the virtual environment that is dependent on the affordances facilitated by the scanner-as-marker, the player object's location also determines the player's access to information about the virtual environment – as is the case for all games with the first-person visual framing. Finally, spatial access to the virtual environment depends not only on the use of the scanner, but also on *spatial conditions*. For example, many doors are locked, and in order to access the parts of the environment behind them, the player must retrieve the appropriate key card at its specific location in the environment. The player object must visit the specific location at which the key card in question can be retrieved and return to the locked door to gain access to what lies behind. Thus, much like the other key examples discussed in 5.3.7, the key card is an example of spatial access being dependent on *spatial conditions*, as access depends on having visited a specific location in the environment to retrieve the object needed for unlocking parts of the virtual environment.

The PO-VE relations of *ZombiU* are unusually complicated, in large part due to the special controller and its multiple uses in the game. Only in one of the PO-VE model's categories does the game qualify as a non-type. In four of the seven categories, *ZombiU* involves multiple types, and it is therefore an example of a game with rather complex PO-VE relations. What is more, it is an example that expands beyond relations and configurations typically encountered in digital games, and hence a bit of an outlier in the sample.

6.2.7 *LEGO Marvel Super Heroes* (Traveller's Tales, 2013)

The analysis of the 2013 game *LEGO Marvel Super Heroes* is focused on the game's very first mission, 'Sand Central Station', which introduces the player to the basic structure of the game. It therefore functions as an excellent example of how the game structures the relationships between player objects and the virtual environment.

Just like most other missions in the game, Sand Central Station is introduced through a short cutscene, in which the (future) player objects and enemy objects in the virtual environment are introduced to the player. After the opening cutscene ending with Hulk smashing his way into the area in front of the station, which becomes the virtual environment at the start of the game, the mission starts, and the player now controls a player object represented as Hulk. This player object, as well as the others introduced in the following, are controlled through direct manipulation, as both navigation in the virtual environment as well as attack actions are mapped directly to the controller. In this case, the game was played on a Wii U, but unlike *ZombiU*, the controller was used as any conventional console controller, and the secondary screen was of no relevance to gameplay.

Through the overlay interface at the bottom of the screen, the player is informed by Agent Coulson that pressing the triangle button will ‘switch characters’. In practice, this means that pressing the triangle button allows the player to switch between player objects, at this point in the game between Hulk and Iron Man. It is apparent from the first moment of the very first mission of the game that it is configured with multiple player objects or *multiple points of control*.

Hints regarding additional possible actions appear in the overlay and through Agent Coulson’s voiceover: when controlling Hulk, the player can hold down the triangle button to trigger a conversion into Bruce Banner, Hulk’s human form, causing alterations to affordances, attributes, visualisation, and designation. The other buttons on the controller translate into specific actions when controlling Hulk, which differ significantly from the affordances of Iron Man: Hulk can move and destroy large objects, perform a powerful Hulk smash attack, and rip up the ground to throw at enemies, whereas Iron Man (in the iteration encountered in the first mission) can fly, shoot, and attack with a powerful Unibeam attack. He can also target special silver Lego objects (that cannot be destroyed by Hulk) and assemble special Lego bricks into new objects with special uses.

In the very first part of the first mission, the player experiences the need for switching between the two player objects, as their unique affordances are required to progress through different parts of the virtual environment. Thus, while the player may freely switch between the player objects, it is necessary to make certain switches in a certain order to be able to perform the actions needed to progress. Hulk is big, strong, and a bit of a brute (see screenshot in image 6.9 below), which stands in sharp contrast to his altered version resulting from conversion, Bruce Banner, who is neither heavy nor strong, as is revealed by his lack of impressive attacks and his ability to climb structures too fragile for Hulk to ascend. The affordances of the different player objects and versions of Hulk/Banner establish different relationships between them and the virtual environment: whereas Hulk can primarily destroy, Iron Man can create.

Image 6.9. Screenshot[18] from *LEGO Marvel Super Heroes* illustrating how Hulk's attribute of size influences his affordances, which differs from non-big player objects.

After succeeding at a quick-time fight between Hulk and Abomination and making it out of the Central Station indoor area, Spider-Man joins the team, expanding the number of player objects from two to three. His affordances in the first level include Spider Senses (that, when activated as a type of scanning of the environment, show possible points of interaction), vertical wall-climbing, web-shooting as an attack, and web-shooting at interest points, allowing him to pull around objects in the environment.

Throughout the game, the player objects will act autonomously when not being controlled by the player. However, the range of actions performed while not being controlled are restricted to basic movement, following the controlled player object's movement in the virtual environment, and basic attacks towards enemies. Autonomous player objects will not perform special attacks or actions targeting parts of the environment other than attacking enemies. Once in the virtual environment, they are always available for the player to switch to.

[18] Screenshots from *Lego Marvel Super Heroes* are from the PlayStation 4 version of the game, whereas the initial data resulted from playing the Wii U version.

Some points in the environment are highlighted with colour palettes of the characters in question: green for Hulk, typically in the form of handlebars or cracks in a breakable surface; red and blue for Spider-Man, through knobs and other objects his webs can attach to; and (the exception to the colour-rule) silvery sparkling constructions that can be destroyed or jumping Lego bricks that can be assembled into new creations by Iron Man. The highlighted points typically facilitate the actions described here, thus establishing stable affordances of the player objects that are not altered during the mission in question.

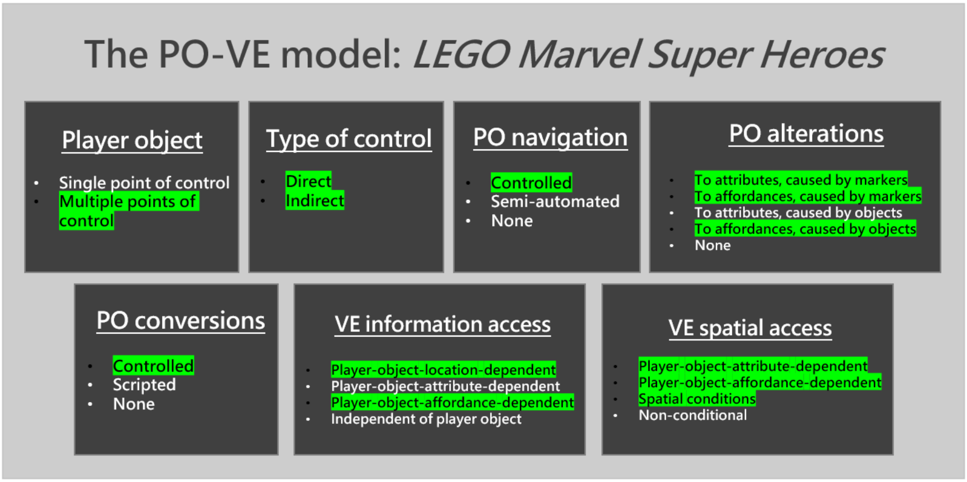
There are, however, some exceptions to this. For example, at a certain point in the mission, Spider-Man can interact with a static object in the form of a knob that he (instead of swinging to or pulling from, as are the default actions performed when interacting with the knob by pressing the circle button) attaches a web to, allowing the other player objects to climb up to his current location. In this situation, the player object's affordances are temporarily altered, but in ways unpredictable to the player, and which do not follow the typical diachronic structure of alterations but rather depend on the objects of the environment, a selected few of which appear to facilitate affordance alterations.

The example above is the most unique case of player object alterations in the first mission of the game. Other alterations follow traditional structures found in many games, including enemy object attacks' damaging effect on the player objects' health, and healing markers that, upon collision, disappear from the environment and boost the player object's health attribute. These alterations are the same for all player objects in the first mission.

An example that stands out from the otherwise traditional structure of attribute changes found in *LEGO Marvel Super Heroes* is Hulk's player-controlled conversion ability, allowing the player object to change back and forth between Hulk and his human form, Bruce Banner, at any time during the game. This conversion alters the player object's attributes associated with weight or mass, made explicit when Hulk and Iron Man attempt to climb Spider-Man's web – the one discussed as an exception to the stable affordances. On the platform onto which Spider-Man's web is attached are green handlebars, indicating that Hulk can interact with the object. However, when approaching the web as Hulk, overlay text appears, informing the player that "Hulk is too heavy to climb! Hold triangle button to change into Bruce Banner!". When in the Bruce Banner version, the player object can climb the rope, after which the player can once again use the triangle button to activate the conversion from Banner into Hulk, whose affordances allow him to interact with the object atop the platform. Through conversions, the attributes are altered. This not only serves as an example of player object conversion and alterations to the player object's attributes and affordances but is also an example of player object access to the virtual environment being attribute-dependent, as only player objects with a certain weight can climb Spider-Man's web and reach the platform.

This leads us to the final two categories of the PO-VE model pertaining to informational flexibility of and access to the virtual environment, and the way in which this is related to various aspects of the player objects. The visual framing of the semi-subjective camera of the game prioritises whichever player object is currently being controlled. In fact, other player objects will follow the player object in control as it navigates the virtual environment, to ensure that they are all visible to the player. Thus, the information about the virtual environment is player-object-location-dependent. Moreover, Spider-Man's Spider Senses (only available as an affordance after making it halfway through the level and reaching the point where Spider-Man joins the team) serve as an example of affordance-dependent informational flexibility, as new information about traversable paths through the environment – for example, climbable walls – is revealed once his special ability is activated.

The spatial access to the virtual environment is dependent on the player objects in ways already discussed; progress can be made only by performing special actions using the different player objects and their unique affordances. The very first obstacle encountered by the player is a sand wall that needs breaking through. By having Iron Man utilise the objects in the environment (more specifically, two fire hydrants), the sand wall turns wet, which thus makes it possible for Hulk to break through. Hence, access depends on Iron Man's affordances as altered by the fire hydrants, making it possible for Hulk to use his special powers to break down the wall.



Model 6.7. *LEGO Marvel Super Heroes* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

The above analysis is represented in model 6.7, which also illustrates the high complexity of PO-VE relations in *LEGO Marvel Super Heroes*, due to its multiple types in many categories as well as its complete lack of non-types. Moreover, the game is the only one of the ten games chosen for close analysis that represents multiple points of control. The analysis above illustrates how multiple player objects with different configurations makes the PO-VE framework additionally relevant, as it allows the analyst to explore the functional differences between different player objects, which facilitates a comparative analysis. Comparisons between the different player objects and their functionality may also be relevant for studying other layers of the game, for example in an analysis of narrative and characterisation.

6.3.8 *Papers, Please* (3909 LLC, 2013)

Papers, Please is a difficult game to describe. Part simulation, part puzzle, the game puts the player in the role of an immigration officer, who is tasked with reviewing documentation from each immigrant wishing to cross the border into the game's fictional country Arstotzka. The list of rules and to-dos for each immigrant review is extends for each new level, but involves, for example, checking passport and entry permit. Image 6.10 below shows how the game is set up: an immigrant enters the facility, illustrated from an outside perspective in the top left corner, and from a first-person perspective of the implied role in the lower left corner. Most of the screen is taken up by what appears to be the immigration officer's desk, on which documents can be investigated using the mouse cursor. In the example below, the immigrant's passport number and the one listen on the entry permit do not match, in which case the player should press the exclamation point in the lower right corner to mark the discrepancy which will prompt an interrogation, i.e., a dialogue appearing in text above the head of the immigrant, who will get a change to explain the problems in their documentation. Following this interrogation, a red button will appear on the screen, allowing the player to detain the immigrant.

Image 6.10. Screenshot from *Papers, Please*.

While a section of the screen is presented from a first-person perspective, thus implying an integrated being within at least that limited section of the virtual environment, the player has no control of an integrated object. Instead, as stated above, the mouse curser is used for examining the documents on the ‘desk’, and similarly used for pressing other elements on screen to advance gameplay (including the speaker on top of the booth in the top left of the screen to ‘start the day’, the exclamation point to mark discrepancies, etc.).

According to the two defining characteristics of player objects, these are *integrated, moveable objects within the virtual environment that function as the player’s point of control*. In *Papers, Please*, the player’s point of control is *the mouse cursor itself*, which fluently moves between the different sections of the screen. The mouse cursor is not integrated within the virtual environment and does not constitute a moveable object therein. The game cannot be considered player object-based and therefore the PO-VE model cannot be applied to it.

6.3.9 *The Witcher 3: Wild Hunt* (CD Projekt Red, 2015)

The final player object-based game up for a closer inspection is the massive RPG, *The Witcher 3: Wild Hunt*. Due to its extensive size and copious content (it took the author 85 hours to play through the game for the initial data collection, and an additional seven hours to replay the first quests to select content for this close reading), the analysis will be focused on the general configuration of the PO-VE relations encountered in the initial five or so hours of the game, drawing on content from two quests in particular: ‘The Bloody Baron’ and ‘Ciri’s Story: The King of the Wolves’.

In *The Witcher 3: Wild Hunt,* the player assumes control of the player object represented as Geralt of Rivia, a monster slayer for hire. Through a combination of off-line, contextualising elements such as opening cinematics and cutscenes, as well as non-PO-VE dialogue trees and information given as part of the main quest line, the player learns that Geralt is looking for Ciri, the emperor’s daughter, to whom Geralt has been a paternal figure.

While the game is famous for its many side-quests, each containing independent narratives that add depth to the fictional world projected by the game, following the main quest line means looking for Ciri by following leads and traversing the land of

The Continent. The two quests on which this analysis is based are both parts of this main quest line.

Geralt's movement, whether on foot or horseback, is mapped directly to the player's controller's joystick. The same is the case for basic combat tactics such as attacking, blocking, and dodging, all of which are mapped to the game controller's buttons, and therefore the player's control of the player object can be described as *direct manipulation*. Part of the game, however, consists of activating special types of attacks through *signs*, and utilising special potions and oils. These actions are performed in an overlay and are thus of the *indirect* type of control. While the player will likely spend more time controlling the player object through direct manipulation, these symbolic actions are central to gameplay and cause interesting alterations to the player object's affordances and attributes throughout the game. As opposed to the traditional overlay item-menu which when opened pauses the player-object-based part of the game, the overlay use of runes and equipped consumables are activated in real time. This means, that the player object can be controlled through direct and indirect manipulation simultaneously, as some buttons of the controller are mapped directly to the player object and its movement in the virtual environment, and others to the see-through overlay rune-interface.

A characteristic of the RPG genre is the diachronic development of the player object, which typically advances through the accumulation of skills and items, growing stronger and more apt to take on new challenges. In this regard, *The Witcher 3: Wild Hunt* is no exception. With a comprehensive crafting system that allows the player to brew potions and make oils that strengthen the player object and its equipped weapons in battle, combined with an extensive ability point system that allows for alterations of the player object's abilities and attributes across a variety of variables, the game presents player object alterations in a myriad of ways.

The potions and oils are examples of markers, as they exist in the inventory and selected markers are presented in the overlay for immediate use, but they do not exist as integrated objects with a location within in the virtual environment. Most markers alter the attributes of the player object by increasing certain attribute values for a limited time, as is the case for the Thunderbolt potion, which increases attack power. However, a few potions have affordance-altering abilities. For example, the *Cockatrice decoction* will allow the player object to use alchemy markers one additional time. This means that the game has both attribute- and affordance-altering markers.

Alterations caused by objects are found in various forms, altering attributes as well as affordances. Like *The Elder Scrolls V: Skyrim*'s standing stones, Places of Power are scattered around the virtual environment of *The Witcher 3: Wild Hunt*. At these locations, marked by tall stones with a colourful light emanating from them, the player object can increase sign intensity and gain new ability points. Places of Power share many similarities with Grindstones and Armorer's Tables (see image 6.11 below), found primarily in villages and larger cities. At locations with these objects, the player object can get temporary armour and weapon enhancements, altering the player object's attributes for a limited time. These boosts to attributes are marked in the overlay interface with a small symbol below the health bar which also marks for how long the increase is active.

Image 6.11. Screenshot[19] from *The Witcher 3: Wild Hunt* showing the player object's activation of a Grindstone resulting in a temporary weapon enhancement.

Whereas Places of Power, Grindstones, and Armorer's Tables are examples of attribute and affordance altering objects in the virtual environment, *The Witcher 3: Wild Hunt* also contains various types of conversions. One type is caused by dynamic objects that alter the affordances and attributes of the player object, its visual representation, and its designation. Roach, Geralt's horse, is a persistent, dynamic object in the virtual environment and a primary example of this. When Roach is mounted, a conversion of the player object occurs, wherein both attributes and affordances are altered. The new version remains until the player prompts Geralt to dismount the horse, or the horse's fear exceeds a certain level, resulting in Geralt getting kicked off the horse, thus returning the player object to its pre-horseback version and Roach to an independent object in the environment.

When the player object mounts the dynamic object, the conversion alters the player object in various ways, both visually and functionally. Perhaps most prominently, the

[19] Screenshots from *The Witcher 3: Wild Hunt* are from the PlayStation 4 version of the game, whereas the initial data resulted from playing the Windows PC version.

new version of the player object now consists of two visually distinct entities – horse and horseman – but functionally, it constitutes a single player object. The player object's attributes are altered accordingly to this new visual presentation and the size is increased. The speed attribute, too, is altered, as the horse facilitates navigation of the environment at a more rapid pace. Moreover, new attributes are added to the player object, represented by two bars on the overlay at the bottom of the screen: one textually represented as the horse's fear level, and the other as its stamina (see screenshot below, image 6.12). Some original attributes remain, including Geralt's health and strength.

Image 6.12. Screenshot from *The Witcher 3: Wild Hunt*, illustrating the version of the player object resulting from conversion through the horse, Roach.

Affordance-wise, the player object is altered, too. While mounted, only one type of attack is possible, whereas the former version of the player object can perform a fast attack or a strong attack. Instead of being able to interact with interest points, the new version can switch between paces, to canter and gallop, with the Witcher senses not usable during gallop.

While the primary version of the player object is represented in the two versions of Geralt and Geralt on a horse, a second type of conversion – a scripted one – results in a new version of the player object, represented as the distinct narrative character Ciri.

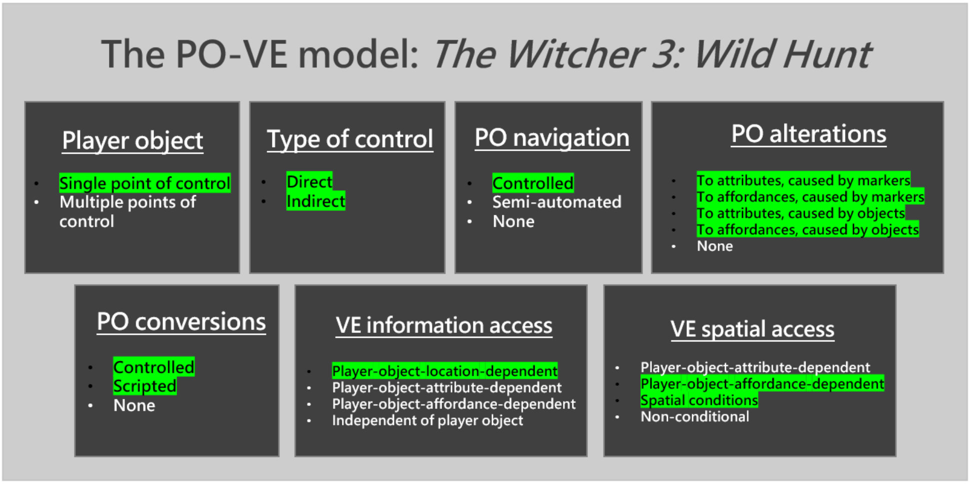
After completing 'The Bloody Baron', Geralt will have made it to Crow's Perch, a small fortress occupied by Phillip Strenger, also known as The Bloody Baron. Following a non-PO-VE dialogue between the two, an off-line cutscene is activated in which the Baron tells Geralt about Ciri's recent visit to Crow's Perch. Presented as a flashback, the player is given control of a new version of the player object, represented as Ciri.

Image 6.13. Screenshot from *The Witcher 3: Wild Hunt* when the player first encounters the player object in its Ciri version.

The controls of the player object's third version as Ciri are much like those of Geralt, but with the conversion comes some alterations to both attributes. As opposed to the player object in the Geralt version, the Ciri version has no inventory and thus no items (including potions and oils) to use. She has only a single sword, as opposed to Geralt's two different swords with different attributes, she cannot use signs, and she can use only one type of attack, which is faster than Geralt's two different attacks. An analysis focusing on representation and narrative would likely argue that Geralt and Ciri are more distinct than Geralt and Geralt-on-horse. However, from a functional perspective, each of these versions of the player object seem to vary from one another in similar degrees.

When playing *The Witcher 3* for the first time, players may be led to believe that the game has a vast, open world. The virtual environment can indeed be navigated freely, along multiple axes as is the norm in three-dimensional games. Proper free navigation, however, is only possibly once the player has made a particular region accessible by travelling there and activating a fast travel signpost. Signposts function as a way of fast-travelling between different regions and islands in the game, and once a signpost has been activated, the player object can always reach that location. For signposts to be activated, one must get to their location in the first place, and many can initially only be reached by following the main quest line. Once activated, the game affords traversal to said location, thus making access in this regard *player-object-affordance-dependent*. Following the main quest line includes performing specific tasks, solving certain problems, but perhaps primarily navigating the virtual environment and visiting specified locations. As such, *spatial conditions* are conditional for access to the virtual environment.

Information about the virtual environment is similarly restricted by the player object's spatial location, making it *player-object-location-dependent*, much like other third-person games. The spatial conditions for access to the virtual environment force upon the game a certain structure that secures narrative continuity and facilitates integration of the many events that contribute to the depth of the game's overarching story and the comprehensive world-building.



Model 6.8. *The Witcher 3* analysis in the PO-VE model. Types marked in green correspond to the types identified in the game.

To summarise, as can be seen in model 6.8 above, *The Witcher 3: Wild Hunt* presents complex PO-VE relations, specifically with regards to player object conversions and alterations, and constitutes the only example in the sample that has both scripted and controlled conversions. The contrasting affordances and attributes between the various versions of the player object set apart them apart functionally, and this is emphasised further in their different visual presentation, in particular the representation of two distinct narrative characters in various versions of the single player object.

6.3.10 *Reigns: Her Majesty* (Nerial, 2017)

The final game of this analysis is yet another example of a game that does not have any player objects. Much like the inclusion of *Papers, Please*, it is a part of this chapter to illustrate the limitations of the framework and exemplify types of games that cannot be analysed using the PO-VE model.

Reigns: Her Majesty is a card-based mobile game, in which the player takes on the role of the regent of a fictional fantasy country. They are confronted with a set of choices that they may accept or reject by swiping left or right. Some choices have significant narrative consequences for the story that unfolds through textual descriptions, whereas others have immediate effect on one or more resources that are key to the game: the relationship to the church, the relationship to the people, the military's power, and the economy (see top of the screen, image 6.14 below).

Image 6.14. Screenshot from *Reigns: Her Majesty*.

While the game does indeed present the player with a fictional role to play, there is no virtual environment at all in *Reigns: Her Majesty*, and hence no environment for a potential player object to be integrated within or move or navigate through. Instead, the player makes choices much like in a conversation tree, by swiping cards left or right, a movement similar to the input used when playing *Subway Surfers*, but which translates quite differently in the card-based game, where there are no player objects to control, and hence no possibility for analysis using the PO-VE model.

This concluding the close readings of ten examples from the sample in which I have presented eight player object-based games with widely different PO-VE relations, as well as two games that cannot be considered having player objects, and which instead function to illustrate that not all games can be analysed using the PO-VE framework and analysis model.

6.4. Summary and conclusion

This chapter has illustrated the applicability of the PO-VE model in analyses on various levels of depth. In the first part of the chapter, a broad look at the games in the sample and the result of their analyses based on the model showed how the many different configurations of PO-VE relations reflect different game design paradigms. Many trends and patterns were revealed in these analyses, and it became apparent that PO-VE conventions have developed over time. Older games have more simple structures, many of which were reflected through non-types in the analysis model, whereas longer and more complex games seem to also involve complex PO-VE structures. In general, it seems that many older (especially arcade-style) games meet the minimal definition of player objects in terms of integration and movement, whereas most games published after the mid-80s meet the extended definition by also facilitating navigation, involving dynamics through player object alterations and conversions, and presenting visual framing in which the player object's location determines the player's access to visual information about the virtual environment.

Complex PO-VE structures are found in virtual environments in which there are many different types of relationships between the various objects. In such environments, player objects and objects may access information about and/or alter the attributes and affordance of other objects. From a technical perspective, this reflects a more complex relational model on which the game is built. It therefore makes sense from a techno-historical perspective that the complexity of PO-VE relations increases as both hardware and software improve, allowing developers to create increasingly complex systems.

The need for distinguishing between the attributes and affordances of player objects as well as other objects in the environment became apparent in the close reading of *Passage*. While the player object's only affordance consists of navigation, its attributes, were altered during the game, which created variety and constituted surprisingly complex PO-VE relations in an otherwise simple game. The game similarly exemplified how conversions and alterations may have gameplay-altering consequences.

This point was made even more apparent in the analysis of *Altered Beast*. In this game, we saw how a simple design revolving around player-controlled conversion caused by collision with specific objects caused significant changes to gameplay. *LEGO Marvel Super Heroes* showed that conversions can co-exist with multiple player objects, and that controlling multiple player objects brings with it a notion of resource management, where player objects can be seen as tools useful for solving different problems. While the unique attributes of the multiple player objects of the Lego game were of some relevance, it was ultimately the distinct affordances that gave them this tool-like quality, tasking the player not only with navigating the virtual environment, defeating enemies, and keeping player objects alive, but additionally with figuring out which player object to use when and where.

Whereas the controllers used for playing each of the games analysed were considered, the Wii U controller in *ZombiU* poses a particularly interesting case to explore using the PO-VE framework. Applying the different concepts of the model allowed me to explore how the controller was in fact involved in different configurations, and *ZombiU* is therefore a perfect example of the importance for including perspectives on the controller and its mapping to the player object as a part of game analysis.

The close readings of the eight player object-based games illustrate how the application of the model allows for insights into the PO-VE relations of game, and how the various ways of designing objects and relationships between them equates in large part to designing the possibility space of the game. While the eight games analysed differ in their PO-VE relations as well as in genre, visual identity, console, etc., the PO-VE model could productively be applied to all and revealed fundamental differences and similarities between games that would otherwise be easy to overlook. The results of the analyses and its implications for the utility and value of the PO-VE framework will be explored further in the penultimate chapter – the discussion.

7. Discussion, reflection, and conclusion

7.1 Limitations of a structuralist framework

Like any other project that develops categories and types, boxes and labels in which games can be deconstructed and fitted accordingly, the PO-VE framework has its limitations. It does not and cannot account for all aspects worth exploring in terms of PO-VE relations. This has been acknowledged throughout the project and exemplified in the close readings in the analysis, which illustrate how the central concepts of the framework and the categories and types of the model can be used to dive deeper into PO-VE relations than what is otherwise facilitated by a more broad and simple analysis based on the model.

The model is a *condensed* lens upon PO-VE relations: a tool facilitating structured analysis, which came into being through a process of selection, exclusion, and compression. This is the inescapable truth of any structuralist framework, and in essence also the purpose. It thus becomes the responsibility of the individual scholar applying the model to challenge its structure if or when they identify blind spots unaccounted for in the framework.

Because the model is a condensed lens upon PO-VE relations, there are examples of games and content that falls between the types of the categories, and even between the categories themselves. A recurring example throughout the dissertation has been the game *QWOP*, that helps put into perspective how not all games share a similar form that is equally simple to study through the model. Yet, while types and categories proved difficult for analysing *QWOP*, the attempted application did reveal something new about the game that an analyst might otherwise have overlooked, including the complexity of understanding the cardinality of gameplay, assessing whether a game constitutes a single or multiple points of control, and when the concept of the virtual environment ceases to be relevant.

An example of a specific type-breaker identified within the data set is the configuration of games that might best be described as *consecutive points of control*. In *Frogger* and

Wizard of Wor (both of which contain a single player object according to an analysis based on the PO-VE model) the player object is presented as multiple consecutive points of control – the player object's *lives* in *Wizard of Wor* are configured and represented in a way that resemble pinballs, as multiple representations are lined up on the side, ready to be launched into activation, once their twins have been defeated. However, the player only ever controls a single object and cannot switch between them, and therefore the game does not qualify as having multiple points of control, although parts of the visualisation make it appear as such.

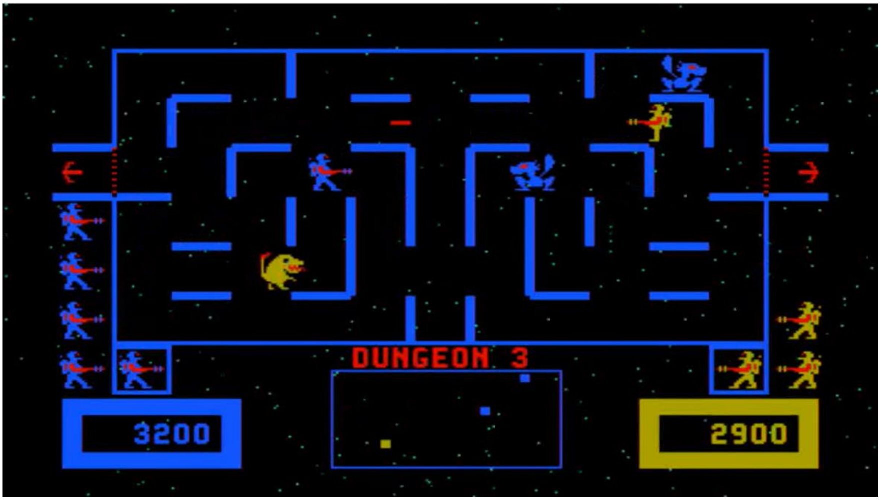


Image 7.1. Consecutive player objects as type breakers in *Wizard of Wor*[20] (Dave Nutting Associates, 1983).

This configuration is not considered a distinct type due to its close resemblance to the single player object with multiple lives. When applying the model, the game is categorised as having a single point of control, but as further analysis prompted by the application of the model and its inability to properly fit the case above proves how games of this sort do not quite fit into the identified types of player object configurations.

[20] Screenshot from *Wizard of Wor* using online emulator.

Another limitation to the structuralist framework, although not a specific type-breaker, results from the distinction between the framing of the project through the virtual environment and the functional aspects of the digital game, in contrast to the ludic aspects or specific ‘gameness’ of digital games. I have, for example, discussed how *goals* lie outside the PO-VE framework, as they belong to the ‘game system’ and not the virtual environment, and therefore do not fall within the frames of the PO-VE relation. One thing that is difficult to make sense of in this regard is the notion of *rules*.

In digital games, *rules* can describe anything from the rules of the virtual environment (e.g., a gravity simulation, or the possible behaviours of an object) to rules determining when a point is granted or how many monsters must be defeated to beat a level. While the distinction described above means that many rules are excluded from the PO-VE framework, some govern what is at the heart of the study – the PO-VE relations. *Rules* are therefore not considered the constituent of the ‘game form’, ‘gameness’, or ‘ludic aspects’ of games, and their relevance in the PO-VE analysis must be understood based on whether something is a rule of the software system, the virtual environment, or whether it exists in the alternative framing of the ‘gameness’ of the game in question.

This complicated rule-case puts into question whether the functionality-centric and software-systems-inspired approach to the virtual environment’s structure can ever be truly separated from its game form as ‘the rules of the game’ will also determine how the player object can behave within the virtual environment. It puts into perspective that the framing of this research project is exactly that: a specific approach to a specific part of a research object, that attempts to make sense of specific parts of said object. Inevitably, such a research endeavour (especially a structuralist one) involves contrived and artificial boundaries, borders, and boxes that serve the purpose of facilitating analysis, while ultimately giving a distorted presentation of the holistic object in its natural form (however *natural* games can be).

7.2 Things that are *there*: A non-hierarchical and inclusive approach

As I have already discussed above, the PO-VE framework is both a result of and tool for analysing elements of digital games that are more descriptive than conceptual. At the same time, the PO-VE model is a compression of the prominent structures and repeated patterns in the data set deemed most relevant for understanding virtual environments and the player objects within them. The very tangibility of the data translates into a framework that is non-hierarchical and rather inclusive.

'Non-hierarchical' is to be understood in contrast to descriptive frameworks developed as hierarchies, where some elements are considered more fundamental or important than others, such as game design patterns and the Game Ontology Project discussed in 4.2.5. The iterative coding process pulled in a direction opposite from a hierarchical structure, and while some early forms of the framework had nested categories, a more general hierarchy-like structure did not present itself in the data. Structuring the PO-VE model as hierarchical would thus be enforced, a move I considered too radical, resulting in too big a gap between the empirical data and the model.

The model *is* conceptual in the sense that many codes were compressed into single categories and types that encompass more than what is described through their titles. It is also conceptual because some terms describe a conception of a software structure that is not actually visible to the player, and which can only be explored through the analysis of the game as a *black box*, known only through input and output.

An example that illustrates both ways in which the PO-VE model is conceptual is the category of *player object alterations*. As described in chapter 4, alterations exist in many forms, and rather than having an overly extensive list of types that describes how they are presented when playing a game (visually, functionally, or otherwise), the four types in the category describe how alterations are caused by *markers* or *objects* and to *attributes* or *affordances* of the player object. The intricacies of the alterations are not covered in these types, and individual alterations are only explored in-depth if the analyst choses to study them in a close reading. The model itself does not accommodate a use that highlights alterations in *all* its various forms.

Instead, the types serve as umbrellas for alterations that are functionally similar. Based on the emphasis on the virtual environment as a relational model, alterations to the player object were explored first and foremost in terms of what caused them: another *object* in the environment or a *marker*. This categorisation thus excludes alterations that cannot be understood in relation to PO-VE relations. Alterations were further sorted according to what aspects of the player object they alter. Based on the OOA/D approach in which individual objects are analysed according to their *attributes* and *affordances* (encompassing what in UML language is covered by the terms *methods*, *associations*, and *responsibilities*), the four types in the category of player object alterations are thus partially conceptual as they build on OOA/D ways of understanding software systems, a specific definition of the virtual environment and its objects and markers based on this specific framing of the research object. At the same time, each type is so relatively inclusive – *objects to attributes*, for example, includes everything from an enemy attacking the player object who as a result loses health, to a player object increasing miscellaneous stats by activating a magical stone in the environment. This illustrates how the types are compressed, making them less descriptive and more conceptual than their forms in the observational data and early notes, the latter of which remained specific and descriptive. Consequently, the framework is more inclusive than would be the case for a highly detailed and descriptive framework (such as the earlier iteration of the PO-VE framework [in Willumsen, 2020]). Specificity in each type or category would increase the risk of limiting the type of content that can be described using the model.

The structure of the model makes it relatively simple to apply to larger selections of games, thus facilitating broader investigations of, for example, historical or genre developments of PO-VE relations, and the findings in the analysis point towards this being a study worth pursuing. At the same time, the model can be used for closer readings, as each category can be explored in-depth, for example by studying individual examples of player object alterations, as was done in the close readings in the analysis.

Similarly, the non-hierarchical structure of the model may invite the analyst to dive deeper into certain categories. Since no single category bears more importance than the other, the individual game analysed can guide the analysis, leaving the analyst free to assess which categories and types are more relevant to explore for the game in question. This, I believe, makes the model applicable in a wide array of studies, facilitating analyses on different levels of depth, while always contributing with general insights into the relationships between player object and virtual environment in the games analysed.

7.3 Tensions and balances in the PO-VE framework

The large sample and data set as well as the comprehensive first part of the analysis pull in the direction of quantitative methods, while remaining qualitative by default, for reasons covered in the methodology. The functional approach, emphasised through the terminology and framing borrowed from software studies and OOA/D, gives the study a technical semblance, and the methodology draws the project in a more structuralist direction. The acknowledgement that functionality is never experienced independently from its representation and the way in which the project builds on ideas from avatar theory, theories of space in games, and other less structuralist, text-centric theories, bring about a certain tension between these two poles of structuralist analysis of the functionality of virtual environments and the close readings where the (visual) representation of the virtual environment and its objects and markers, including the player object, were considered as an inevitable part of the analysis.

Rather than these two poles being at odds, however, I argue that analyses of PO-VE relations can contribute to studies of narrative and characterisation in digital games – and vice versa. This potential is hinted at through references to the characterisation of player objects in many of the games of the sample, for example the ease of identifying a conversion in games like *Batman: Arkham City* and *The Witcher 3: Wild Hunt*, when the conversion results in a representation of a narratively distinct character. I believe that some PO-VE relations may serve characterising functions, but unfortunately this can be nothing but a claim for now, as functionality is at the heart of the PO-VE framework, resulting in the exclusion of perspectives on representation. I will, however, argue that while I introduced the project through this distinction between representation and functionality, I believe that player objects unite the two perspectives, as they are not only functional and relational objects in virtual environments, but also often highly characterised fictional beings in corresponding fictional worlds.

7.4 Player objects and avatars

In addition to the analysis model, one of the original contributions of the PO-VE framework is the development of the concept of the *player object*. Explored in depth in its dedicated chapter 4, the player object is characterised by a set of defining and non-defining characteristics. Central to its definition is the concept of integration, which involves the virtual environment directly with the player object. Movement, the second defining characteristic, further underscores that player objects depend on their ability to move within the virtual environment.

As discussed already in chapter 4, the player object has many things in common with Vella's (2016) concepts of playable figures and modes of ludic subjectivities. Yet, these similarities are not immediately apparent when considering the defining characteristic of integration and movement. In fact, player objects seem to share more similarities with *entities* in the Game Ontology Project, that, much like the player object's attributes and affordances, are defined according to their abilities and attributes (Zagal et al., 2005, p. 8). Some entities can be *manipulated* and exist as a single or multiple point(s) of control, just like player objects. In fact, the defining characteristics of player objects has much more in common with the entities of the GOP than Vella's framework. The GOP similarly employs a seemingly OOA/D-inspired approach to the system-structure of the game. The primarily differences lie in the object of study (the GOP explicitly deals with *games*, including their rules, and is not restricted to *digital* or *video games*) and the structure of the framework (the GOP is hierarchical, whereas the PO-VE framework is not).

The similarities between player objects and entities in the GOP, however, do not extend beyond the defining characteristics. The non-defining characteristics of navigation, dynamics, and visual framing remain more comparable to Vella's playable figures, as the extensive section 4.4 reveals. Games that meet only the defining characteristics of player objects are of non-types across five of the seven categories. This is because of five of the PO-VE model's seven categories pertain to the non-defining characteristics of player objects.

It thus follows that player objects share similarities with alternative concepts and terms (such as *entity*, *playable figure*, *component of self*, *game ego*, and the various forms of *avatars*), but it depends on the specific configuration of the player object in question. A single player object with direct control, controlled navigation, and multiple types across the remaining categories, for example, would more likely be considered an avatar by Klevjer (2006) than a player object with indirect control, no navigation, and non-types across the remaining categories. This makes positioning challenging, but also exciting, because it illustrates just how inclusive the player-object term is, while also showing how the different categories of the PO-VE model each play a role in describing the exact configuration of the player object and PO-VE relations of the game in question.

In chapter 4, I pointed out the similarities between Vella's (2016) typology of modes of ludic subjectivities and the player object types, emphasising the point of control in the comparison. I noted the differences in research agendas and how Vella's study deals with a different object of study, namely the phenomenology of the game experience. Most terms and concepts that have inspired and that are somewhat comparable to player objects differ via the framing and intention of the respective study in which they are developed and applied. This is most apparent in the two sub-categories through which they were explored in 4.2.3 and 4.2.4: theories associated with what I refer to as the ludic tradition that searches to uncover avatars as tools that extend the player's agency within the game combined with its ability to represent and/or facilitating a role for the player to assume while playing. Frameworks of the phenomenological tradition explore the existential and experiential aspects of the avatar, giving priority to the ways in which avatars facilitate embodiment and a sense of being-there.

The framework of player objects is not easily placed within either of these groupings of theories. It does not explore the player object in relation to the ludic structure of the game and therefore cannot be properly described as a *ludic* theory. It does, however, conceive of the player object as a functional entity within the relational system of the virtual environment, and as such it explores the functional structure of games – something which resonates with the formalism of ludology. Yet, as I have argued throughout as well as above, it is impossible to properly separate functionality and representation when studying digital games, at least when games are analysed through observational data, 'as played', and not through for example their source code. When studying games in graphic virtual environments, what allows us to explore and understand PO-VE relations, whether these pertain to the attribute-alterations of the player object or its function in limiting information available to the player about the virtual environment, are the visual representations of the virtual environment and its objects. The visuals of the game do not only serve the function of conveying this functional information. They also contribute to the game representations that may involve narratives and characterisation; things that have not been addressed in the study. What is more, one of the player objects non-defining characteristics – the visual framing that determines the player's access to information about the virtual environment in the sixth category of the PO-VE model – deals directly with representation, framed through the functional perspective of the entire PO-VE framework. It therefore becomes apparent that there are no clear lines that can be drawn between functionality and representation when analysing PO-VE relations.

Thus, as opposed to some ludology theories of games and avatars, the PO-VE framework involves primarily functionality, but also in an inevitable, secondary sense representation, for understanding the functional relationships in virtual environments. While expanding beyond some of the ludic theories of avatars in its inclusion of the visual representation of the player object in the virtual environment, the framing of the virtual environment and not the entirety of the game system, makes the PO-VE framework narrower than many avatar theories. The PO-VE framework only explores the game-specific or *ludic* aspects of digital games when these are directly involved in the PO-VE relations.

At the same time, the PO-VE framework involves some of the principles from phenomenological avatar theories, as the type of control and the more in-depth investigations of the specific controllers' simulative qualities related to the control of the player object relate not only to Klevjer's (2006) theory of avatars, but also to the experiential aspects of PO-VE relations. While the player's general experience of being-in-the-gameworld is not explored in this study, some of the analyses in chapter 6 illustrate a potential in involving this functional perspective on player objects and virtual environments when exploring the phenomenological experience of playing digital games. Because some controllers, such as the touch pad of smartphones and tablets or dedicated motion controllers involve more simulative manipulation of the player objects, the mapping between input and player object appear more direct. No games analysed in chapter 6 depend on what Shneiderman (1982) originally opposed direct manipulation to (syntax-dependent input with non-continuous representation). But games involving indirect manipulation of the player object through a symbolic interface, as is the case for parts of the player object control in *The Witcher 3: Wild Hunt* as well as *ZombiU*, establish quite different relationships between the player and the player object due to their different controllers. *ZombiU*'s secondary screen demands the player's attention when using the inventory, making it impossible for the player object to be controlled in the virtual environment while the inventory is accessed. Much like the survivor of the game, that serves as an entity for the player to embody (following the reasoning of phenomenological game theories), the player's attention is, while using the Wii U controller for accessing the inventory through a symbolic interface, elsewhere. That makes the player object an easy target for zombie attacks, thus bringing the player in a similar fragile position (they may lose their survivor and must re-start the game with a new survivor) to the fictional as well as functional fragility of the player object in the moment the inventory is accessed.

In contrast, accessing or utilising one of multiple types of inventories in *The Witcher 3: Wild Hunt* does not involve this fragmented attention, as all occurs on a single screen due the game's controller (or mouse and keyboard) input. Close analyses of the specific configuration of type of control of the player object, as facilitated by the model's second category, thus proves relevant for and related to the notion of embodiment explored in the phenomenological tradition of avatar theory.

However, while the type of control as it is currently involved within the PO-VE framework proves a useful analytical perspective upon digital games as they are studied here, further details pertaining to the physicality of the specific game controller lies at the border of PO-VE relations. While the analyses illustrate that attention to the controller is important for understanding the simulative aspects of direct control, the physical interface of the controller lies outside of the relationships between player objects and the virtual environment. Instead, it pertains to the player's relationship to the player objects as integrated objects within the virtual environment, and it is therefore formally outside the scope of the study.

I can thus position the PO-VE framework as somewhat in-between the ludic and phenomenological research traditions of avatars, although it remains important to state that the player object and avatar is *not* the same thing. At the same time, I have illustrated how the framework contributes something new and meaningful to both 'camps' of scholarship. It also illustrate some of the potential in further investigations of the player's relationship to player objects and virtual environments.

The PO-VE framework can thus be seen an *addition* rather than *alternative* to some of the approaches to avatars and other terms. It offers in-depth insights into the functional structure of the player object and the virtual environment in which it is integrated, but while functional at heart, the framework also involves certain representational and experiential aspects.

7.5 PO-VE and ontology

The PO-VE framework can be used as a tool for extensive analysis of the functionality of player objects, while also offering a comprehensive terminology for describing the various PO-VE relations. In turn, the framework encompasses not only the player object, but also other objects of the environment and therefore the entire functional structure of the virtual environment as a relational model. Because it describes the fundamental structure of the virtual environment, it has some ontology-like characteristics.

The PO-VE framework's functional framing and the defining characteristics of player objects are comparable to (parts of) the Game Ontology Project. When exploring the similarities in structures, we see that the PO-VE framework, despite its non-hierarchical structure, could possibly assume the function of an ontology, or a part of one.

The reason the PO-VE framework is not presented as an ontology or as having any ontological ambitions stem from its focus on virtual environments in digital games rather than digital games in general. Therefore, if it were to be defended as an ontology, it would only offer parts of one, as the very premise and promise of an ontology is to map out the "important structural elements" (Zagal et al., 2007, p. 2) of the objects of study in question.

While I can defend the PO-VE relations of digital games as an important structural element, it is only one amongst many, as is illustrated by some of the other elements of the GOP that are explicitly not considered in the PO-VE framework. Instead of conceiving of the framework or model as a part of an unfinished ontology, I argue that this project contributes new findings about the basic structures of games to the field of game studies. These findings can be considered, for example, when analysing avatars, as discussed above. The structuralist nature of the study makes it fit well within the recognised forms of game ontologies, and the empirical foundation serves as a further argument for why it could be applied as such. Perhaps the way to advance the study of games is by collectively establishing a foundational ontology, by bringing together frameworks that dive deep into the individual structural elements of games, without excluding those that are not necessarily applicable or relevant for *all games*. And perhaps that is already what is happening, with still more research projects being funded, each of which approaches a specific area within games and game research.

The PO-VE framework was never intended as an ontology or a contribution to the construction of a specific (type of) ontology. It helps the analyst uncovering details about one aspects of games' structural elements, but I will not make any claims as to its importance compared to other elements of games. Nor will I state that PO-VE relations are a defining characteristic of games, because, clearly, they are not. Only 78 of 99 games categorise as player-object-based according to the minimal definition, and two of the examples in the analysis chapter, *Papers, Please* and *Reigns: Her Majesty* illustrated this very limitation of the framework. Regardless, although these games could not be considered player object-based, the terminology of the framework allowed for an insightful discussion of their configuration and why this was not the case. Thus, the framework proves useful for more games than what it properly encompasses, as the discussion of integration can be used as an analytical point of departure, without diving into the specifics of the PO-VE model.

7.6 PO-VE in the time of game design

In addition to being a useful and readily applicable analytical framework for game scholars, the PO-VE framework has some possible uses for game designers, both theoretically and practically.

While the dissertation is situated within the theoretical and analytical domains of game studies, there is a body of scholars working at the intersection of software studies, game design, and game studies. As discussed in chapter 2, game design patterns (Björk et al., 2003) is an example of such work that combines the various approaches into a software-design-centric structuralist framework. Their study is methodologically similar to the development of the PO-VE framework.

Yet, whereas it would seem in the interest of a project mapping out the patterns of game design in more than 200 different titles to make the findings relevant for game designers, Björk et al. (2003) state their primary aim as contributing to the "language for ludology", and that "many of the characteristics of design patterns will be included in such a language, and that continued work with design patterns will help reveal truths about game and game play until such a language is found" (ibid., p. 10).

Perhaps this is due to the difficulties of understanding a descriptive framework's practical uses when the norm within the field does not involve engaging with designers to understand whether and how the academic work is useful in the everyday development practices. On the other hand, little theoretical work on literary theory involves author interviews, as the intention of the development of analytical tools –

even structuralist endeavours like Propp's mapping of the Russian folktale – is *not* to make frameworks for authors to improve their (process of writing) literary works.

However, that a framework of certain research objects is not developed in collaboration with creators of said object does not mean that the analytical findings cannot be relevant for their practice, nor that scholars should avoid making suggestions or recommendations as to how a more analytical, descriptive, or theoretical framework could possibly be used in practice.

The PO-VE framework offers terminology inspired by OOA/D, thus basing analytical concepts on a terminology already used within development practices. This is a step towards minimising the gap between development and research. As the PO-VE framework is based upon a functional approach to the game text, it overlaps with what software developers and other practitioners of the Unified Process are familiar with.

While it might still be difficult to assess exactly where in the development cycle of a digital game the PO-VE framework, or any descriptive and analytical framework, can find its place, making sure that the framework is based on terminology that is easily comprehensibly for those who practice development and design is one step in the direction of making research on digital games relevant for designers. Perhaps the framework can be used for exploring potentials for innovation according to the combinations of types. Maybe assessing the complexity of the PO-VE relations in games could be useful for UX testers. I believe that a tool for describing in detail the relationships between player objects and virtual environments may indeed be valuable to developers and designers, much like I believe that mapping out game design patterns is of great importance when fostering further and better collaborations between industry and academia.

7.7 UO-VE for non-games

In the introduction, I explained how digital games were chosen as the object of study for inquiries into virtual environments, thus resulting in the framework accounting for player objects and their integration within said environments. While games were chosen as research objects, however, the framework developed in this dissertation did not engage with the game form *per se*, but rather with virtual environment as they present themselves in games.

Naturally, the in-depth findings of this study are limited to the objects studied – games, and hence the virtual environments of games. Simply because the in-depth findings are specific to virtual environments of games, however, does mean that it impossible to make qualified assumptions about virtual environments in other media, based on the findings embodied in the PO-VE framework.

In chapter 3, I defined the virtual environment as a navigable geometry and a computational, relational model that represents the relative positions and functions of objects within it. This definition can be used for describing some games, but also expands beyond the game form in that in can encompass virtual environments of other media. VR journalism, for example, can involve such environments, although current forms seem limited in terms of navigation which is either non-existing or automated. The same is the case for other uses in the entertainment industry, with virtual social media such as *Second Life* being one amongst a few exceptions.

The primary difference between the virtual environments in games and non-game media is that very few non-game environments, in their current form, give the user a point of control through an object with affordances and attributes. Like the player object of digital games, we may speak of *user objects* of other virtual environments. But whereas player objects are described in terms of their affordances and attributes – much like other objects and markers in the environment – user objects have few or no affordances. Instead, the virtual environment often takes the form of a 360-degree video, where the user's head movement (assuming they experience the media product with head-mounted VR glasses) corresponds directly to the visual framing of the environment. Put differently, the user of VR journalism controls a non-integrated camera, much like the one involved in digital games but left out of the PO-VE framework due to its lack of functional integration.

The PO-VE framework therefore has limited applicability in media of this form, as they do not involve the types of relationships explored between player objects and virtual environments in digital games. However, if the virtual environments of, for example, VR journalism start incorporating an integrated point of control, the framework can be adapted accordingly, which may in turn be called the *UO-VE framework*.

Like the PO-VE model, a UO-VE model should consist of categories accounting for the user's point of control, the type of control, and details on user object navigation. The remaining categories of the PO-VE model are likely less relevant for a UO-VE analysis, as for example *conversions* are likely a type of PO-VE relation found only in games. The same may be the case of *alterations*, although one can imagine its potential relevance in a UO-VE framework. Whereas the user's access to information about the virtual environment remains important even if not motivated by a ludic structure and goal, it is perhaps more difficult imagining the user object's spatial access as constrained outside of a games context. Thus, if the PO-VE model is to be adapted into a UO-VE model, the resulting model might have four categories: *point of control/user object*, *type of control*, *user object navigation*, and *virtual environment information access*. Ultimately, however, the potential UO-VE model would demand its own dedicated research project exploring the exact details of UO-VE relations in virtual environments beyond games. The framework above is merely a suggestion, based on the findings of the project at hand, of how a user-object-specific model might look.

The alterations to the model expose just how different the virtual environments of digital games and other media are. This study has explored only those of games, and whereas this cursory glance at what a UO-VE model might look like would require further research to be proven accurate, it proves the point that digital games present highly complex virtual environments, thus allowing designers to design and develop complex and nuanced PO-VE relations. With characterisation added to the mix, the virtual environments of digital games are unparalleled by other media. Functionality and representation combine into complex systems that, when interpreted by the human player, facilitate unique experiences that stretch from the simple and kinaesthetic challenge of *Breakout* to the multifaceted and story-rich involvement of *The Witcher 3: Wild Hunt*. The PO-VE framework facilitates analysis on various levels of depth to help scholars and developers alike to explore and understand the structures of these complex systems.

7.8 In conclusion

> *"Unless we can begin to embody the notion of change in the words we use, we will continue to be lost".*
>
> Paul Auster, *New York Trilogy*

Rooted in the analysis of 99 different digital games, this study has developed a framework for understanding the functionality of and different relationships between player objects and virtual environments. The PO-VE framework was developed in response to inquiries into these relationships, based on an initial methodological curiosity motivating an empirical approach involving iterative coding of a large sample of data, eventually compressed and conceptualised into the PO-VE model, an analytical model that accounts for those most prominent PO-VE relations identified in the data.

At the very heart of the PO-VE framework is the notion that PO-VE relations are dynamic and flexible. They change during the course of a game; without these changes, there would be no game. Exploring, understanding, and reacting to these constant changes is what playing a game is all about.

As part of the work on the PO-VE framework, I have developed a specific terminology accounting for its various components. The terminology reflects a certain approach to, or framing of, the research object.

A virtual environment is a navigable geometry and a computational, relational model that represent the relative positions and functions of objects within it. Objects, including player objects, are conceived of as integrated in the virtual environment by being spatially and functionally related to other objects within it, thus emphasising its relational system-structure. Within the virtual environment, player objects constitute the player’s point of control. As integrated and movable objects, they consist of attributes (properties such as health, speed, and size) and affordances (possible actions such as running, shooting, and jumping). In most cases, player objects also have some sort of visual presentation, which varies according to the specific visual framing of the player object and the virtual environment.

Many player-object-based games involve navigating the spatial structure of the virtual environment using said player object. This structure is sometimes referred to as a *quest structure* (Aarseth, 2007), and the specific topography of the environment, determined by its (non-player) objects that encompass anything from mountains to trees, can function as a way of establishing certain paths through it. While a defining characteristic of player objects is *movement*, this relates only to location changes along a single axis. The more complex *navigation* describes player objects than can be moved across multiple axes, thus facilitating navigation of the spatial structure and the various paths of the virtual environment.

The affordances and attributes of player objects are often *dynamic*, meaning that they can be altered throughout the game. Alterations are typically diachronic and describe how either attributes or affordances are changed because of an object or marker in the virtual environment. Examples of alterations include picking up a health pack (marker) that increases the player object's health (attribute), or an enemy (object) attacking the player object with a freeze attack that renders it unable to move (affordance). Similarly, player objects may go through *conversions*, involving alterations as well as changes to the player object's visualisation and designation. Conversions can be scripted or controlled by the player, the latter exemplified by entering or mounting vehicles or mounts.

Player objects are thus defined according to defining and non-defining characteristics. According to the defining characteristics, player objects are *integrated* and *moveable* in the virtual environment. The non-defining characteristics describe them as *navigable*, *dynamic*, and *visually framed*. In the sample, arcade-style games with simpler PO-VE relations meet only the defining characteristics, whereas games with more complex PO-VE relations are also explored according to their non-defining characteristics.

Both defining and non-defining characteristics are at the heart of the PO-VE model that was applied in a broad manner to the entire sample, and in close readings of ten chosen games from the set. The broad analysis illustrated patterns corresponding to the year of publication, where older games typically involved fewer and less complex PO-VE relations, and more modern games, especially those associated with specific genre labels (RPGs in particular) represented multiple types in many categories, thus involving more complex PO-VE relations. Games of more complex PO-VE relations were also shown to characterise their player object(s) in more depth, and in more PO-VE specific ways than games with less complex PO-VE relations.

The most substantial result of the study, however, does not pertain to the specific PO-VE configurations of any game, but rather to the PO-VE framework itself. Through a unique framing of the virtual environment of digital games, based on the OOA/D-inspired approach, the environment was conceptualised as a system in which individual objects can be studied and analysed according to their individual properties and relationships to other objects. This is a unique and descriptive approach to analytical game studies, that utilises a computer science understanding of the digital object while focusing on the environment as a relational system, and on the concept of integration therein – an alternative to focusing on, for example, rules, goals, or player experiences. And one that does not depend on access to the game's source code. Instead, analysis based on the PO-VE model relies only on observational data.

This relatively narrow focus and specific framing makes the PO-VE framework applicable in broad as well as in-depth analyses, but it also situates it as a potential cornerstone of a more fundamental way of analysing digital games. It allows the analyst to describe in detail the functionality of the object with which the player interacts and through which they experience other aspects of the game. It might be beneficial to add to more in-depth analyses an additional lens that facilitates more thorough exploration of the representation and/or narrative relevance of the PO-VE relations, but on its own, the framework facilitates a functional analysis that involves representation to a limited extent. The model is easily applicable in broad analyses, as illustrated in the first half of the analysis, in contrast to existing analytical frameworks discussed, such as

Järvinen's (2008) Rapid Analysis Method. At the same time, the model offers depth that can help uncover the unique PO-VE relations of individual games. For some games, the type of control and the specific controller involved in gameplay may be of particular importance, as was the case for *ZombiU* in the analyses. In this example, the framework facilitated thorough investigation of the secondary screen and its many and varied functions involving simulative direct control in varying degrees. For other games, the category of conversions is more relevant, as illustrated by *Altered Beast* as well as *The Witcher 3: Wild Hunt* – two games in which conversion was one of the primary points of interest in the analyses. Yet, the analyses revealed unique types of conversion (one is controlled, the other is scripted), and otherwise very distinct PO-VE relations (*Altered Beast* is significantly less complex than *The Witcher 3: Wild Hunt*). Thus, the PO-VE framework and model is not only useful for individual close readings or more general pattern-investigations of a larger set, but also for comparative analyses. The very different results of the ten games analysed in 6.3 demonstrate this point.

Consequently, questions and issues pertaining to the very *gameness* of games have not been addressed in this study. Whereas other terms and concepts related to player objects, including the thoroughly discussed avatar theory, involve the experiential qualities of play, in particularly in the phenomenological tradition of avatars as embodiment, the study at hand has only explored the player through the *implied player* construct.

There are likely many ways in which the framework can be expanded upon if any of these aspects of games and game studies are combined with the PO-VE perspective. There are likely also some who may believe that the most important work within game studies still lies ahead. I agree with these points. I hope the PO-VE framework will serve as a tool and terminology that scholars can use in future research, to fill gaps between game development, design, and analysis, and to ultimately better understand *how* we play and *why* we play. This study is a contribution to the most fundamental level of this research endeavour: attempting to map out (parts of) the research object and develop a language that facilitates closer inspection and ultimately a better understanding of digital games and virtual environments.

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10. Appendix: Gameplay log

Game title	*Platform*	*Controller type*	*Time played*	*Type of play*
80 Days	Android	Touch display	01h30m	Repeated play
A Dinosaur's Tale	Sega Genesis	Controller	01h30m	Partial completion
A Normal Lost Phone	PC	Mouse cursor	01h25m	Total completion (A)
Adventure	Atari 2600	Controller	01h00m	Partial completion
Alan Wake	Xbox 360	Controller	02h00m	Partial completion
Alien Invaders Plus	Magnavox Odyssey II	Controller	00h30m	Light
Alone in the Dark: A New Nightmare	Gameboy Colour	Controller	00h30m	Light
Altered Beast	Sega Master System	Controller	01h15 min	Partial completion
Asteroids	Atari 2600	Controller	00h40m	Repeated play
Baldur's Gate II: Enhanced Edition	PC	Mouse + keyboard	02h00m	Light
Batman: Arkham City - Armored Edition	Wii U	Controller	04h45	Partial completion
Bayonetta	Nintendo Switch	Controller	02h00m	Light
Braid	PC	Keyboard	02h00m	Partial completion
Breakout	Atari 2600	Controller	00h15m	Light

Brothers - A Tale of Two Sons	PC	Controller	04h10m	Total completion (A), Repeated play
Candy Crush Saga	Android	Touch display	02h00m	Repeated play
Catherine	Xbox 360	Controller	14h35m	Total completion (A)
Chrono Trigger	Super NES	Controller	02h30m	Partial completion
Civilization V	PC	Mouse cursor	04h00m	Repeated play
Cook, Serve, Delicious	PC	Controller	02h10m	Light
Crazy Taxi	Sega Dreamcast	Controller	01h10m	Repeated play
Crypt of the Necrodancer	PC	Controller	01h00m	Repeated play
Cuphead	PC	Controller	05h30m	Repeated play
Dance Aerobics	Nintendo Entertainment System + Power Pad	Special controller	00h30m	Light
Dave Mirra Freestyle BMX	Sega Dreamcast	Controller	00h40m	Light
Demolition Man	3DO	Controller	02h00m	Partial completion
Diddy Kong Racing DS	Nintendo 3DS	Controller	01h20m	Partial completion
Disgaea 2	PC	Mouse + keyboard	01h25m	Light
Don't Starve	PC	Mouse cursor	05h00m	Repeated play
Donkey Kong	Game Boy	Controller	01h30m	Partial completion

Dragon Age: Origins	PC	Mouse + keyboard	03h00m	Light
Dream Daddy: A Dad Dating Simulator	PC	Mouse + keyboard	6h00m	Total completion A
Eternal Champions	Sega Genesis	Controller	0h30m	Light
Eurotruck Simulator 2	PC	Mouse + keyboard	02h00m	Light
Everything	PC	Mouse + keyboard	01h10m	Light
Farpoint	PlayStation VR	Controller + motion	00h30m	Light
Fez	PC	Keyboard	03h00m	Partial completion
Firewatch	Xbox One, PC	Controller	07h00m	Total completion A, repeated play
Five Nights at Freddy's	PC	Mouse cursor	00h30m	Light
Freedom Fighters	Magnavox Odyssey II	Controller	00h30min	Light
Frogger	Intellivision	Controller	01h00m	Repeated play
Fruit Ninja	Android	Touch display	02h00m	Repeated play
FTL: Faster Than Light	PC	Mouse cursor	01h45m	Partial completion
Goat Simulator	PC	Mouse + keyboard	01h10m	Light
Guitar Hero III	PlayStation 2	Special controller + motion	02h00m	Partial completion
Hang-On	Sega Master System	Controller	0h30m	Light
Her Story	PC	Mouse + keyboard	01h30m	Total completion (A)
High Velocity Bowling	PlayStation 3	Special controller + motion	00h30m	Light

Homefront: The Revolution	Xbox One	Controller	01h00m	Light
Horizon: Zero Dawn	PS4	Controller	41h00m	Total completion A
Hotline Miami	PC	Controller	00h45m	Partial completion
Ico	PlayStation 2	Controller	02h00m	Partial completion
Kentucky Route Zero	PC	Mouse cursor	05h00m	Partial completion
Lazarian	Commodore 64	Controller	01h00m	Repeated play
The Legend of Zelda: Breath of the Wild	Nintendo Switch	Controller + motion	17h00m	Partial completion
LEGO Marvel Super Heroes	Wii U	Controller	01h45m	Light
Lollipop Chainsaw	Xbox 360	Controller	01h45m	Light
Madden NFL 07	Gamecube	Controller	01h00m	Light
Mario Kart 8 Deluxe	Nintendo Switch	Controller + motion	10h00m	Total completion A, repeated play
Mario's Tennis	Virtual Boy	Controller	00h30m	Light
Metal Gear Acid	PSP	Controller	03h30m	Partial completion
Metroid Prime	Gamecube	Controller	02h00m	Partial completion
Myst	Sega Saturn	Controller	0h50m	Light
N++	Nintendo Switch	Controller	02h30m	Partial completion
Need for Speed: Carbon	Wii	Controller + motion	02h00m	Light
Out Run	Sega Master System	Controller	00h25m	Repeated play

Oxygen Not Included	PC	Mouse + keyboard	01h15m	Light
Papers, Please	PC	Mouse cursor	02h00m	Partial completion
Passage	PC	Keyboard	00h30m	Repeated play
Please Knock on my Door	PC	Mouse + keyboard	01h50m	Partial completion
Pony Island	PC	Mouse + keyboard	00h45m	Partial completion
QWOP	PC	Keyboard	00h45m	Repeated play
Reigns: Her Majesty	Android	Touch display	01h00m	Repeated play
Sin & Punishment: Star Successor	Wii	Controller + motion	01h45m	Light
Skate.	Xbox 360	Controller	01h10m	Light
Space Attack	Leisure Vision (Canadian Arcadia 2001)	Controller	00h30m	Repeated play
SPEEDWAY!	Magnavox Odyssey II	Controller	00h15m	Light
Splatterhouse	Xbox 360	Controller	02h00m	Partial completion
Subway Surfers	Android	Touch display	05h00m	Expert play
Super Mario Galaxy	Wii	Controller + motion	01h45m	Light
Super Mario Odyssey	Nintendo Switch	Controller + motion	13h00m	Total completion A
Tales from the Borderlands	PC	Mouse + keyboard	03h00m	Partial completion

The Binding of Isaac: Afterbirth+	Nintendo Switch	Controller	06h30m	Repeated play
The Elder Scrolls V: Skyrim	Switch	Controller	05h00m	Partial completion
The Marriage	PC	Mouse cursor	00h30m	Repeated play
The Stanley Parable	PC	Mouse + keyboard	02h00m	Partial completion
The Witcher 3	PC	Controller	85h00m	Total completion A
Tomb Raider	PlayStation 1	Controller	03h00m	Partial completion
Uncharted: The Lost Legacy	PlayStation 4	Controller	04h30m	Partial completion
Undertale	PC	Keyboard	04h00m	Partial completion
Unreal Tournament	PlayStation 2	Controller	00h45m	Light
Utopia	Intellivision	Controller	00h45m	Light
VVVVVV	PC	Keyboard	08h00m	Total completion A
Wario Land	Virtual Boy	Controller	01h00m	Light
Wizard of Wor	Commodore 64	Controller	00h40m	Light
Wonder Boy	Sega Master System	Controller	01h45m	Partial completion
Xcom 2	PS4	Controller	48h00m	Total completion A
ZombiU	Wii U	Controller	00h30m	Light
Zork (in The Zork Anthology)	PC	Keyboard	00h50m	Light

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