

The Non-Player Character – Exploring the believability of NPC presentation and behavior

Henrik Warpefelt

DSV Report Series No. 16-003

The Non-Player Character

Exploring the believability of NPC presentation and behavior

Henrik Warpefelt

©Henrik Warpefelt, Stockholm University 2016

ISBN 978-91-7649-379-3

ISSN 1101-8526

DSV Report Series No. 16-003

Printed in Sweden by Publit, 2016

Distributor: Department of Computer and Systems Sciences, Stockholm University

Cover image by Aware Mustafa

Abstract

Over the last few decades there has been immense growth in the video game industry, and we have seen great improvements in both graphics and audio. Unfortunately, the development of artificial intelligence (AI) and non-player characters (NPCs) has not proceeded at the same pace. Although there have undoubtedly been improvements, the field as a whole has lagged behind its siblings.

Many of the problems with NPCs stem from the fact that they do not achieve a sufficient level of believability, particularly in the social arena. This is primarily related to the fact that the NPCs do not behave in ways that align with the expectations of the player. This can lead to the player misunderstanding the role and purpose of the NPC, which damages the believability of the game. By extension, this lessens the enjoyment the player can derive from the game. Hence, it is imperative that the design of the NPC be in line with player expectations.

This thesis takes a holistic view of NPCs, encompassing their design, evaluation, and player perceptions. It uses a design science methodology, and primarily uses qualitative and interpretative methods. It will provide a description of the various types of NPCs found in games, what their design elements are, and how they are interpreted by players.

Sammanfattning / Swedish abstract

Spelindustrin har växt enormt under det senaste årtiondet, och vi har sett stora förbättringar vad gäller både grafik och ljud. Tyvärr har inte den artificiella intelligensen i spel utvecklats i samma takt, i synnerhet vad gäller utvecklingen av icke-spelarkaraktärer (eng. Non-Player Characters (NPCs), NPC:er). Det har oförnekligen skett förbättringar, men dessa har inte varit av riktigt samma magnitud som sina syskonråden.

Många av problemen med NPC:er härstammar från det faktum att de inte uppnår en tillräckligt hög nivå av trovärdighet, främst inom den sociala sfären. Det här beror framförallt på att NPC:er inte beter sig på sätt som ligger i linje med spelarens förväntningar, något som leder till att spelaren missförstår NPC:ernas roller och deras syfte i spelet. Detta kan tyvärr innebära att spelaren uppfattar spelet som mindre trovärdigt, som i sin tur leder till att spelupplevelsen blir mindre intressant och underhållande. Det där därför av yttersta vikt att NPC:er designas på ett sådant sätt att deras beteende, utseende och andra attribut ligger i linje med spelarnas förväntningar.

Den här avhandlingen tar ett helhetsgrepp på NPC:er, och omfattar både design och utvärdering, så väl som vilka förväntningar som spelarna har på NPC:er. Avhandlingens arbetet har främst gjorts med en design science-metodologi, och använder primärt kvalitativa och interpretativa metoder. Avhandlingen tillhandahåller en beskrivningar ett antal olika typer av NPC:er som finns i spel, vilka designelement som är viktiga för dessa typer, samt hur typerna tolkas av spelarna.

Acknowledgements

No work is truly done alone and although I had help and support from many people (for which I am eternally grateful) some deserve special mention.

Firstly, my mother, father, and sister for their undying support and love. Thank you for believing in me, and for supporting me through this sometimes difficult process.

My main supervisor, Harko Verhagen, deserves no end of thanks for his contributions to this work, his guidance, and for his support. Without him this thesis would definitely not have happened.

My assistant supervisor Lars Asker deserves thanks for prompting me to create one of the concepts that would become central to my understanding of non-player characters, namely *characterhood*.

Björn Strååt and Magnus Johansson for being my coauthors and general partners in crime, as well as purveyors of sage advice.

Mirjam Eladhari, Georgios Yannakakis, and the rest of the research group at the Institute of Digital Games at the University of Malta. Thank you for asking the right questions and for providing me with the right advice at the right time.

Aware Mustafa, for always providing batch after batch of wonderful graphics, posters, and art direction on all too short notice.

No one stays sane without friends. Thank you all for graciously suffering my withdrawal from social life.

*This thesis is dedicated to my mother, father, and
sister. Thank you for your love and support.*

List of Papers

The following papers, referred to in the text by their Roman numerals, are included in this thesis.

PAPER I: Analyzing the social dynamics of non-player characters*

Johansson, M., Strååt, B., Warpefelt, H., and Verhagen, H. (2014). *Frontiers in Gaming Simulation*. Eds: Sebastiaan A. Meijer and Riitta Smeds. Springer-Verlag.

PAPER II: Analyzing the believability of game character behavior using the Game Agent Matrix*

Warpefelt, H., Johansson, M., and Verhagen, H. (2013). *Proceedings of the Sixth Bi-Annual Conference of the Digital Games Research Association: Defragging Game Studies (DiGRA 2013)*.

PAPER III: Cues and insinuations: Indicating affordances of non-player characters using visual indicators

Warpefelt, H. (2015). *Proceedings of DiGRA 2015: Diversity of Play: Games—Cultures—Identities*.

PAPER IV: Towards an updated typology of non-player character roles

Warpefelt, H., and Verhagen, H. (2015). *Proceedings of the 8th International Conference on Game and Entertainment Technologies (GET 2015)*.

PAPER V: A typology of non-player characters

Warpefelt, H., and Verhagen, H. (2016). *First Joint International Conference of DiGRA and FDG*. Submitted.

PAPER VI: A model of non-player character believability

Warpefelt, H., and Verhagen, H. (2016). *Journal of Gaming and Virtual Worlds*. Submitted.

Reprints were made with permission from the copyright holders.

Papers marked with an asterisk were previously part of my licentiate thesis *Mind the Gap* (Warpefelt, 2013)

Other publications by author

A method for comparing NPC social ability*

Warpefelt, H., and Strååt, B. (2012). *Proceedings of the 5th Annual International Conference on Computer Games and Allied Technology (CGAT 2012)*.

Breaking immersion by creating social unbelievability*

Warpefelt, H., and Strååt, B. (2013). *AISB 2013 Convention. Social Coordination: Principles, Artifacts and Theories (SOCIAL.PATH)*.

Anti-heuristics for maintaining immersion through believable non-player characters [Poster]

Warpefelt, H., and Strååt, B. (2013). *Proceedings of the 8th International Conference on the Foundations of Digital Games (FDG 2013)*.

Evaluating Game Heuristics for Measuring Player Experience

Strååt, B., Johansson, M., and Warpefelt, H. (2013). *Proceedings of GAME-ON'2013. The 14th International Conference on Intelligent Games and Simulation*.

Analyzing AI in NPCs: An Analysis of Twelve Games

Johansson, M., Strååt, B., Warpefelt, H., and Verhagen, H. (2014). *Multiplayer—The Social Aspects of Digital Gaming*. Eds: Thorsten Quandt and Sonja Kröger. Routledge.

Applying the Two-Factor-Theory to the PLAY Heuristics

Strååt, B., and Warpefelt, H. (2015). *Proceedings of DiGRA 2015: Diversity of play: Games—Cultures—Identities*.

Papers marked with an asterisk were previously part of my licentiate thesis *Mind the Gap* (Warpefelt, 2013)

Author's contribution

The contributions of this thesis are a theoretical framework by which we understand how NPCs achieve believability and immersion, a typology of NPCs that describes the impact of NPCs on both the gameplay and the narrative of the game, as well as the design restrictions and demands on these NPCs. Furthermore, this thesis contributes a models of how NPCs affect believability. The model provides an overview of how behaviors correlate to different levels of complexity of NPCs as Artificial Intelligence (AI) constructs, and a description of how these agent types influence the game experience both as a designed and as an emergent experience.

My contributions to the papers that make up the basis for this thesis have varied. The first two papers (Papers I–II) were produced in a highly collaborative environment, and as such it is difficult to discern exactly which of the authors contributed what. For Paper I, the data collection was performed by three out of the four authors, and the analysis by all four. My contribution to that paper should thus be roughly 25%. As for Paper II, the data collection was performed by two of the three authors, and the analysis by all three. My contribution to the paper should therefore be roughly 35%.

For Paper III I was the sole author, although I was advised on the study design by my main supervisor. My contribution is 100%.

Papers IV–VI were performed in cooperation with my main supervisor, who actively contributed to the study design. The data collection and analysis was performed by me. Overall, my contribution to these papers should be on average 90%.

It should be noted that these percentages do not include time spent writing the different papers, but rather only the time spent performing the actual research.

Contents

Abstract	v
Sammanfattning / Swedish abstract	vii
Acknowledgements	ix
List of Papers	xi
Other publications by author	xiii
Author's contribution	xv
Acronyms	xxi
List of Figures	xxiii
List of Tables	xxv
1 Introduction	27
1.1 Purpose, goals and research questions	27
1.2 Overview of the method	28
1.3 Results and contributions	29
1.4 Reading this thesis	29
2 Non-Player characters	31
2.1 What are non-player characters?	31
2.2 The concept of characterhood	33
2.3 Classifying of non-player characters	36
2.3.1 Typologies of narrative characters	36
2.3.2 Ludic support character typologies	37
2.3.3 Combining typologies	39

3	Theoretical framework	41
3.1	Narrative	41
3.2	Indexical storytelling	41
3.3	Immersion	42
3.4	NPCs and the specific forms of immersion	44
3.4.1	Imaginative and narrative immersion	44
3.4.2	Challenge-based immersion	45
3.4.3	Sensory-based immersion	46
3.4.4	Social immersion	47
3.5	Believability	47
3.5.1	Affordances and believability	49
3.6	Concluding summary	51
4	Method	53
4.1	Research strategy	53
4.2	Interpretive research	54
4.3	Evaluating games	55
4.4	Studies performed for this thesis	57
4.4.1	NPCs and believability (S1)	57
4.4.2	Types of NPCs (S2)	62
4.4.3	Design elements of NPCs (S3)	64
4.4.4	Delimitations	65
4.5	Games included in the studies	66
4.6	Research questions answered	66
4.7	Ethical considerations	68
5	Non-player characters and believability	71
5.1	The importance and mechanisms of the believability of an NPC	71
5.1.1	Findings regarding the mechanisms of believability . .	72
5.2	NPCs and affordances	73
5.3	Believable behavior	73
5.4	Findings regarding NPC believability and behavior	75
5.4.1	Behaviors identified as problematic for believability .	75
5.4.2	Conclusions about NPC behavior and its impact on believability	79
6	A typology of non-player characters	81
6.1	The typology	81
6.2	Type descriptions	82
6.2.1	Description format	82
6.3	The basic type of all NPCs	83

6.4	Functions	83
6.4.1	Vendor	84
6.4.2	Services	85
6.4.3	Questgiver	86
6.5	Adversaries	87
6.5.1	Enemy	87
6.5.2	Opponent	89
6.6	Friends	90
6.6.1	Sidekick	90
6.6.2	Ally	91
6.6.3	Companion	92
6.6.4	Pet	93
6.6.5	Minion	93
6.7	Providers	94
6.7.1	Storyteller	94
6.7.2	Loot provider	95
6.8	Discussion	96
7	A model of non-player characters	99
7.1	Structure	99
7.1.1	Embedded and emergent behavior	100
7.2	Cell descriptions	100
7.2.1	<i>Act</i>	101
7.2.2	<i>React</i>	102
7.2.3	<i>Interact</i>	103
7.3	Discussion	104
8	Conclusions	105
8.1	Research questions	105
8.1.1	What types of non-player characters exist within games? (Q1)	105
8.1.2	What are the design elements of different non-player character types? (Q2)	105
8.1.3	In what ways do players perceive and determine the type or types of a non-player character? (Q3)	106
8.1.4	What makes a non-player character believable? (Q0)	106
8.2	Theory versus practice	106
8.3	The state of NPCs	107
8.4	Future work	108
8.5	Concluding remarks	109

A Value definitions for the Game Agent Matrix 111

A.1 Value definitions per column 111

A.1.1 Single Agent 111

A.1.2 Multiple Agents 112

A.1.3 Social Structural 112

A.1.4 Social Goals 112

A.1.5 Cultural Historical 112

B Games included in the studies 115

B.1 Bioshock Infinite 115

B.2 Burnout Paradise 115

B.3 Company of Heroes 116

B.4 Crusader Kings II 116

B.5 Donkey Kong 117

B.6 Grand Theft Auto V 117

B.7 L.A. Noire 117

B.8 RAGE 117

B.9 The Elder Scrolls V: Skyrim 118

B.10 Warhammer 40,000: Space Marine 118

References cxix

Acronyms

AI Artificial Intelligence

BA Believable Agent

C&N matrix Carley & Newell fractionation matrix

DM Dungeon Master

DND Dungeons and Dragons

FPS First-Person Shooter

GAM Game Agent Model

HCI Human–Computer Interaction

MMORPG Massively Multiplayer Online Role-Playing Game

MUD Multi-User Dungeon

NPC Non-Player Character

PCG Procedural Content Generation

RPG Role-Playing Game

RTS Real-Time Strategy

SciFi Science Fiction

UI User Interface

List of Figures

2.1	Examples of NPCs. Clockwise from top left: An Ork from <i>Space Marine</i> , an interview subject from <i>L.A. Noire</i> , a guard from <i>Skyrim</i> , and two soldiers from <i>Bioshock Infinite</i>	32
2.2	Non-Humanoid NPCs. Clockwise from top: street cars from <i>L.A. Noire</i> , a news van from <i>Burnout Paradise</i> , and an armored vehicle from <i>Company of Heroes</i>	35
3.1	An example of indexical storytelling from <i>Bioshock Infinite</i> . .	43
3.2	An example of sensory-based immersion from <i>Grand Theft Auto V</i>	47
4.1	The adapted version of the Carley & Newell fractionation matrix, as seen in (Warpefelt and Strååt, 2013)	60
4.2	The Game Agent Matrix as presented in Paper II (Warpefelt et al., 2013)	61
5.1	An example of an NPC that provides services. In this case, a barber from <i>Grand Theft Auto V</i>	74
6.1	The NPC typology	82
6.2	The Game Agent Model (GAM) with the different areas of capability marked. Green = high believability, yellow = medium believability, orange = limited believability, red = only occasional believability	97
7.1	The NPC model	101

List of Tables

4.1	Studies in relation to included papers	58
4.2	Games included in the different studies, sorted by title.	67
4.3	Research questions in relation to the papers	68
B.1	Games used as examples in the thesis	116

1. Introduction

Over the last couple of decades, the gaming industry has grown from a small cottage industry to a multi-billion euro industry. As the industry has grown, we have seen a rocket-like increase in graphic and auditory fidelity, but the field of Artificial Intelligence (AI) in games has not quite had the same rate of progress. Although there has been some improvement over the last decade, many fundamental problems still persist (Johansson, 2013; Warpefelt, 2013).

As explained by Johansson (2013) and Warpefelt (2013), many of the problems with the behavior of Non-Player Characters (NPCs) stem from a lack of believability, primarily in their social aspects. The behavior of NPCs must align with the expectations of the player (Loyall, 1997; Warpefelt, 2013) in order to be perceived as believable. For this alignment to take effect, however, the game must convince the player of what is real within the game world, and provide convincing environments, worlds, and situations in which the player can immerse themselves (Ermi and Mäyrä, 2005; Murray, 1997).

Convincing the player, however, is more easily said than done. In many cases, the player's interpretations of an NPC can and will differ from the design intent of the developer (Warpefelt, 2015). This can lead to the player's misunderstanding the role of the NPC, thus misleading the player and potentially damaging the believability of the NPC and the player's feeling of immersion. To better understand in what ways these problems arise, and how they can be remedied, we need to further study NPCs, and establish in what ways they affect the game experience. Because of this, there is a need for an explanation of what NPCs are, and how we can design them to achieve believability and maintain the player's feeling of immersion.

1.1 Purpose, goals and research questions

The purpose of this thesis is to provide a holistic description of NPCs, encompassing design, evaluation, and player perceptions. To achieve this purpose, we must first construct a framework that can be used to better understand NPCs.

In this thesis, that framework takes the form of a typology and a model of NPCs. The typology will then be used to structure our knowledge about NPCs. Each of the types in this typology can then be given a thick description

of what it is, and what functions it provides within the game and its narrative. Furthermore, there will be suggestions as to how each type should be designed in order to signal their type to players. The model describes in what ways these types contribute to the believability of NPCs.

The main research question for this thesis has been *What makes a non-player character believable?* The answer to this, however, is not something that is readily apparent. Thus, we needed to explore believability and its associated phenomena from many different angles. As a result, the research questions answered in this thesis are:

- Q0. What makes a non-player character believable?
- Q1. What types of non-player characters exist within games?
- Q2. What are the design elements of different non-player character types?
- Q3. In what ways do players perceive and determine the type or types of a non-player character?

1.2 Overview of the method

This section is only aimed at providing an overview of the methods used for this thesis, as well as the method for the research as a whole. The descriptions here will therefore be very superficial, and are aimed only at providing a basic understanding of the research performed. For a more in-depth explanation, please see Chapter 4.

This thesis uses a design science methodology (Hevner et al., 2004) and consists of three studies: NPCs and believability, the types of NPCs, and the design elements of NPCs. These studies are made up of 6 papers, each aimed at exploring different aspects of the studies. The interrelation between the studies and specific papers is described in Chapter 4. The research presented in this thesis is largely empirical, with each study being iterated over a number of papers in order to achieve triangulation not only on a researcher basis, but also by examining the object of study from multiple angles.

The methodology used in this thesis is interpretive, using methods such as various forms of observation and thematic analysis. The data used for this thesis have been collected partly as video recordings of gameplay, but also as online surveys centered around long-form answers. Papers I–II used video recordings that were processed using structured observation, and the observations were correlated in order to elicit commonalities within each type of observation. Papers III–V used online surveys which were analyzed using thematic analysis. In addition, Paper IV partially uses video data and analyzes it

using thematic analysis. Paper VI uses the data and results from the previous papers to construct a model of in what ways NPCs affect and create believability.

1.3 Results and contributions

This thesis provides a holistic description of what NPCs are, including how they look, how they behave, and how their different aspects are interpreted and how players identify their functions within the game and the narrative. This partly takes the form of a typology of NPC roles which, as described in Section 1.1 above, takes the role of a framework in which we can understand NPCs. This framework was developed primarily in Papers III–VI, but uses theories from Papers I and II. The need for a new typology was discovered during the work for Paper III, and the typology itself emerged in Paper IV, and was verified in its current form in Paper V. The other part of the holistic description is the model of NPCs found in Chapter 7. This model was created based on the findings and results from Papers I–V, and was developed in Paper VI.

The results found in this thesis are intended to provide game designers and game researchers with deeper insights into what types of NPCs are found in games, and in what ways these NPCs take form. The conceptual model described in Chapter 7 also provides researchers with a framework in which they can describe the interrelation of the different parts of NPCs: AI, narrative anchoring, believability, and the functions provided within the game.

1.4 Reading this thesis

The disposition of the thesis is as follows:

Chapter 2 discusses what NPCs are, what is encompassed by the term, and what different shapes NPCs may take in games.

Chapter 3 provides the theoretical framework for these studies, and introduce the concepts used to describe the different aspects of NPCs.

Chapter 4 goes into detail about the methodology used for this thesis and its component parts. It discusses the methodological choices made, and their implications.

Chapter 5 describes how NPCs achieve believability.

Chapter 6 describes a typology of NPCs found in games.

Chapter 7 describes a theoretical model that describes NPCs as a believability-creating game component.

Lastly, Chapter 8 contains the conclusions of this thesis, as well as avenues for future research.

2. Non-Player characters

This chapter provides an explanation of exactly what constitutes the primary object of analysis of this thesis, and what different forms it may take. This chapter also aims to provide the foundations for a framework by which the theory from Chapter 3 can be applied to NPCs in particular.

2.1 What are non-player characters?

Non-Player Characters (NPCs), or NPCs, are characters within a computer game that are controlled by the computer, rather than the player. The term pre-dates digital games. NPCs are commonly found in, for example, tabletop Role-Playing Games (RPGs), where they are characters controlled by the Dungeon Master (DM)¹ (Mackay, 2001). In computer games, NPCs are found in many types of games and are not just limited to the genre of RPGs. The role of the DM, however, has been subsumed into the general system of the computer game. Despite the transition to a different medium, many of the fundamental concepts in analog games are still present in their digital cousins, and thus some of the terminology has been carried over from the analog to the digital.

In digital games, NPCs come in many different shapes and sizes, and as illustrated in Figure 2.1, they range from the mundane, to the fantastic, to the distinctly non-human. What exactly makes an NPC an NPC, however, is still a matter of some debate. Bartle (2004) divided the various computer-controlled inhabitants of virtual worlds into NPCs and *monsters*, where NPCs are entities that look like the player and who would “think they were the same if given the AI.” (Bartle, 2004). Conversely, monsters are entities that neither look like nor would think that they are player characters. This distinction, however, has largely become moot with the advance of game genres. Bartle’s division, based on similarity, is flawed. In many games, notably with fantasy or Science Fiction (SciFi) narratives, there are numerous different NPCs from different races and species with which the player interacts both as enemies and as allies. Because of this, the degree to which the entity looks like the player is not feasible as a criterion for categorising the entities in a game.

¹The person controlling the game and narrative



Figure 2.1: Examples of NPCs. Clockwise from top left: An Ork from *Space Marine*, an interview subject from *L.A. Noire*, a guard from *Skyrim*, and two soldiers from *Bioshock Infinite*.

Because of the lack of proper criteria, there is little point in making a distinction between NPCs and monsters. Instead, it would be more productive to discuss the type of NPC, depending on the functions they provide in the game. This way, we have a common term for the entities found in the game, but can also separate them into different categories if need be.

This approach may of course in itself lead to some problems, since some functions (for example, buying and selling items) could potentially be fulfilled both by seemingly sentient beings and by non-sentient machines. Thus, to be able to distinguish sentient beings from simple machines, we need some sort of criterion with which to make this distinction.

2.2 The concept of characterhood

The concept of *characterhood* was first introduced in (Warpefelt, 2013). Characterhood basically means that the NPC is actively involved in the portrayal of its role, and will act in ways that are conducive to convincing the player that it is indeed in that role. This basically means that the NPC must be able to enact parts of what Dennett (1981) calls *personhood*. According to Dennett, personhood is a ladder of six themes:

- Rationality
- Intentionality
- Stance
- Reciprocity
- Communication
- Consciousness

A NPC does not, however, have to be able to portray the full battery of themes described by Dennett. Rather, it must match the first two of Dennett's six themes: it must be seen as rational (Dennett's *rationality*) and it must act in such a way that to it is ascribed a consciousness of sorts in that it seemingly performs actions with intentions (*intentionality*). Matching the further four themes is of course desirable, and doing so would involve among other things being able to cause the player to interact with them as if they were persons (Dennett's *stance*), being able to reciprocate social cues (*reciprocity*), fluently and dynamically using language (*communication*), and expressing a consciousness of themselves as a thinking entity (*consciousness*). These are not, however, part of the fundamental basis that needs to be fulfilled in order to be able to

act as the most basic type of *character*. As will be seen in later sections, some types of NPCs are more advanced and others less: although some of these will need to be able to portray behaviors that match some of Dennett's more advanced themes, this is not universally required of all NPCs.

In the previous example of the vendor and the vending machine, a vendor would ask the player what they would like to buy, and provide some sort of "theatrics" to the purchasing process, whereas the vending machine would simply accept the player's money and then dispense the selected goods. For technical reasons, the distinction may be less clear in older games than in more modern ones, since playing non-essential sounds and animations may have had to take the back seat to other aspects of the game. In modern games, however, this has become less of a concern, as the availability of processing power and other system resources has increased.

Similarly, NPCs are distinct from entities that are mere scenery. A tree would be unlikely to achieve characterhood, even if it were equipped with the sound of wind rushing through its branches, since it is not actively involved in the process of being a tree. Rather, it merely exists as a tree in the world. Trees with characterhood would instead be something similar to "Old Man Willow" from the *Lord of the Rings*. In essence, characterhood requires that the NPC has the agency required to take action to fulfill the role they have been assigned.

Thus, an NPC that has achieved characterhood has actively acted in such a way that it can be said to fulfill its role within the game. The extent to which an NPC could be said to have achieved characterhood is thus very much dependent on what role an NPC is said to have, and the specific attributes and propensities of the NPC. In some cases, the NPC may not even be recognizably humanoid, or even portrayed as a "living" thing. As with the example of Old Man Willow above, some NPCs may portray what are usually considered inanimate objects. However, the player will still interpret them as being actors in the game due to their perceived volition. In some cases, an NPC may achieve characterhood even though its representation is that of an inanimate object, if through its behavior the inanimate object becomes infused with a derived agency of sorts. In a racing game, a car in motion would be considered to have achieved at least some level of characterhood, in that it will actively behave and act in relation to the player (for example as an opponent in a race). A car in itself would be an inanimate object, but given that it is in motion and seemingly under control, the player will assume that there is some type of entity in control of the car, even if that entity is wholly unseen. Thus, the car becomes the avatar of this unseen entity, and, by its design, a car that has been imbued with characterhood. Examples of NPCs of this type can be found in Figure 2.2.



Figure 2.2: Non-Humanoid NPCs. Clockwise from top: street cars from *L.A. Noire*, a news van from *Burnout Paradise*, and an armored vehicle from *Company of Heroes*.

2.3 Classifying of non-player characters

Characters have long been the subject of media studies, where the different roles of characters in literature, film, and other arts have been described time and again (for example by Propp (1968)). To some extent, this work has been adapted to the field of digital games, notably through the work of Aarseth (2012). As stated by Juul (2001), however, the study of games cannot be performed only using the lenses of other disciplines, but we must also understand what the unique characteristics of games are:

“Using other media as starting points, we may learn many things about the construction of fictive worlds, characters ... but relying too heavily on existing theories will make us forget what makes games games: Such as rules, goals, player activity, the projection of the player’s actions into the game world, the way the game defines the possible actions of the player.” — (Juul, 2001)

Thus, the analysis of NPCs in games cannot be made only from fields outside of game studies, and it cannot only come from the perspective of the narrative. It is, however, important to remember that NPCs are essentially incomprehensible if they are not framed according to the narrative (Warpefelt, 2015). Because of this, we cannot view NPCs as entities existing solely in either narrative or ludic space, but must instead consider them as entities existing in an intertwined world of both. However, in previous research, much of the focus has been on the ways NPCs tie into the narrative, rather than on how they help support the ludic nature of the game.

2.3.1 Typologies of narrative characters

There are a number of typologies that can be said to exist in the narrative space. In his work on traditional folk tales, Propp (1968) identified a list of prototypical characters and what he calls their *action spheres*. These are:

- *Villain* – the opponent of the hero
- *Donor* – provides the hero with a magic agent (possibly as a reward)
- *Helper* – transports, rescues, or otherwise assists the hero
- *Princess* – the person the hero is trying to “acquire” through marriage or something similar
- *The princess’s father* – gatekeeper for the marriage, provides a quest
- *Dispatcher* – sends the hero on a quest

- *Hero* – Two types:
 - *Seeker hero* – goes on a quest or completes a task to fulfill the requirements of the *donor* and/or the *father*. Marries the *princess*.
 - *Victim hero* – As above, but does not go on a quest
- *False hero* – tries to steal the glory from the *hero*

These characters each appear in different combinations in the folk tales studied by Propp, and can be combined to form a number of different narratives. Propp introduces a grammar that can be used to formalize the basic concept of the stories he has studied.

Characters, and specifically NPCs, have also been studied in the field of game studies. Aarseth (2012) presented a theory of narrative in games, where characters play a role as one of the analytical dimensions. Aarseth divides characters into *deep characters*, *shallow characters*, and *bots*. *Deep characters* have believable and seemingly well-rounded personalities, comprehensive backstories, and evolve with the story. *Shallow characters*, by comparison, may have fairly comprehensive backstories, but will rarely exhibit the same level of personalities as their deep brethren. They will also rarely develop with the story, but rather remain static over the course of the narrative. *Bots* are the proverbial faceless enemies (or allies) of the world: they lack an individual identity (Aarseth, 2012).

Aarseth's typology is of course vastly different from Propp's. They do, however, represent two different ways of looking at how characters fit into a narrative. Where Aarseth examines each type of character based on its complexity, Propp instead examines how the story is supported by the type of character. This illustrates two antipodes on the scale of how characters can be examined from a narrative point of view. There is, however, more to NPCs than just the narrative. One must also consider their ludic aspects.

2.3.2 Ludic support character typologies

Unfortunately, fairly little work has been done on NPCs as ludic support characters of the game. Bartle (2004) provided a typology of NPC functional roles in *Designing Virtual Worlds*, but the work there has been shown to have been quite over-fitted to games like Multi-User Dungeons (MUDs), as we have described in Paper IV (Warpefelt and Verhagen, 2015). Nevertheless, Bartle's work represents the most well-developed work on how NPCs can provide supporting functions in a game. The typology contains the following types:

- *Buy, sell and make stuff.*
 - *Provide services.*
 - *Guard places.*
 - *Get killed for loot.*
 - *Dispense quests (or clues of other NPCs' quests).*
 - *Supply background information (history, lore, cultural attitudes).*
 - *Do stuff for players.*
 - *Make the place look busy.*
- (Bartle, 2004)

Bartle's types are fairly straight-forward, but some explanation is necessary to describe the specific aspects of each type. Bartle describes the *Buy, sell and make stuff* type as “fictional conveniences; they may as well be vending machines”. He then states that the same is to some extent true for the *Provide services* type. Essentially, these two types are interface access functions that have been given a diegetic form. Compared to User Interface (UI) elements, these NPCs are more conducive to an immersive experience, and Bartle describes them as being *player-friendly*.

The *Guard places* type is similar in the way that it allows a designer to less intrusively introduce restrictions on a player's freedom by punishing undesirable and antisocial player behavior by having someone enforce the “laws” of the virtual world. It should be noted that in Bartle's work this type does not include NPCs that are essentially only placed as guards to prevent the player from progressing in a dungeon or something similar: such NPCs should instead fall under the *Get killed for loot* type. Bartle considers NPCs that are there to be killed for loot are simple monsters, and thus distinct from NPCs. However, NPCs of the *Get killed for loot* type are described as “basically just regular monsters that look like player characters.” Bartle also states that these NPCs rarely even have names, and by extension they are therefore likely to belong to Aarseth's narrative type *Bots*.

NPCs of the *Dispense quests* type, much like their vendor and service provider cousins, often are there to provide the player with a diegetic interface to quest management, to provide the player with the mission, and then to reward the player when they have completed the mission. However, Bartle states that although this type can co-occur with other types, it is most often found separately. The inverse of this NPC type is the *Do stuff for players* type. Whereas quest givers give the player a task to complete, the NPCs of the *do stuff for players* type instead complete missions given to them by players.

These are usually simple missions, for example, carrying the player's loot or healing them in combat.

The final two types are directly related to conveying the narrative to the player. In essence, NPCs of the type *Supply background information* will act as dispensers of lore, either after being queried by the player or by forcibly telling the player the snippet of lore. They will often have some other function, for example, dispensing quests. The NPCs of the type *Make the place look busy* are there to simply make the place look busy. Bartle claims that these NPCs are uncommon, but in more modern games they are in fact extremely common.

Although Bartle's typology is, with the exception of our typology², the only one focused on the actual in-game functions of NPCs, it has some drawbacks. It seems to suffer from over-fitting to the specific case it was developed from, namely, MUDs. Furthermore, Bartle's typology divides NPCs into somewhat strictly separated categories, whereas in more modern games, NPCs are more likely to portray more than one role at a time. Bartle does acknowledge that NPCs can belong to several types, but unfortunately some of the types in his typology are overly restrictive for the purposes of modern games. (Warpefelt, 2015; Warpefelt and Verhagen, 2015)

2.3.3 Combining typologies

NPCs play a central role in creating and upholding the player's feeling of enjoyment in the game, and in order to do so, they must be perceived as believable. This believability, however, does not arise from how well the NPCs are portrayed as either narrative actors or ludic support constructs: instead, they must be a fusion of both. It is a tempting notion to unify the disparate approaches into one grand typology, capable of describing both the narrative and the ludic roles of NPCs, but one must also acknowledge that these typologies are very dissimilar, and may not directly map in a meaningful way. Thus, a better approach is to add a layer which encompasses the previous typologies.

Each of the typologies presented in this chapter highlights different aspects of NPCs, and allows us to categorize NPCs according to different criteria. They also provide us with some of the components we need to create holistic descriptions of NPCs. That said, there are still some components that are missing. As mentioned above, a holistic typology will probably be best served by being constructed as a layer on top of these existing typologies. Unfortunately, the typologies we have so far discussed are not easily combined, and there is a need for a theory that can be used as a glue between the typologies. The following chapters will describe this theory.

²Our typology is described in Chapter 6 and in Papers IV (Warpefelt and Verhagen, 2015) and V (Warpefelt and Verhagen, 2016b).

3. Theoretical framework

This chapter describes the theoretical framework for the thesis. This is intended to serve as an introduction to the concepts used throughout the thesis, and to provide the reader with an understanding of some of the central concepts used in game studies.

3.1 Narrative

The narrative of the game is essentially the story told as the player progresses through the game. It is delivered in different ways and from different sources. Jenkins (2004) divides the narrative into two parts: the *embedded* and the *emergent* narratives. The embedded narratives are narratives that are part of the designed game experience; for example, the quest lines or in-game environments. The emergent narrative is the part of the narrative that comes into being as the player plays the game. Examples of this would be how NPCs in the game behave over time.

However, the narrative as an all-encompassing entity connected to all parts of the game has been criticised by Calleja (2009). He argues that the current use of the narrative as a concept makes it useless as an analytical tool since it effectively encompasses the entirety of the game. Instead, Calleja proposes that we differentiate what he calls the *scripted narrative* from the *alterbiography* of the player. The scripted narrative is akin to Jenkins's concept of the embedded narrative in that it encompasses the pre-defined parts of the game narrative, e.g., the quest lines from the previous example. Similarly, Calleja's alterbiography can be likened to Jenkins's emergent narrative, with the important difference that Calleja does not consider it to be a part of the narrative, but rather a separate process which uses the scripted narrative to generate a user experience. In essence, Jenkins's emergent narrative is the story of how the player has played the game as told by a narrator, whereas the alterbiography is the story of how the player has played the game as described by the player.

3.2 Indexical storytelling

The framework for the alterbiography is constructed by providing the players with clues as to what to expect from the world, which Fernández-Vara (2011) calls *indexical storytelling*. In essence, the environment and actors of the game will have small indicators, called *wieners* by Fernández-Vara, that clue the player into what to expect from this environment and its denizens. Together, these indicators, through Fernández-Vara's indexical storytelling, form part of the *embedded narrative* described by Jenkins (2004). Combinations of indicators can be used to create certain types of environments, which the player will identify as signaling certain things. Basically, the indicators described by Fernández-Vara (2011) are used to provide the player with clues as to what type of environment or NPC they are encountering, and thus invoke certain preconceived notions. These indicators can be found in many different elements of the game, including the architecture of the buildings, environmental effects such as fog, the items worn by NPCs, and the items placed in the game world. For example, an environment with chimneys, transportation infrastructure, and a lot of various goods will likely be interpreted as belonging to an industrial sequence. The game environment essentially becomes a *simulacrum* (Baudrillard, 1994), i.e., an instantiation of something that only exists in the narrative context of the game. In essence, it is the realization of a concept, such as the aforementioned industrial environment. This is illustrated by Figure 3.1, where we see many indicators that tell us about the environment and narrative. Waggoner (2009) calls this kind of characteristic *simulacratude*. The simulacratude of an environment provides the player with clues as to what to expect from the game, and in what ways the narrative will be communicated. In essence, this forms an implicit contract between the designer and the player; breaking this contract may adversely affect the believability of the game, and by extension lessen the player's enjoyment of the game.

In order for these indicators to actually strengthen the player's sense of immersion, however, they must form a coherent picture. If the indicators are unclear or conflicting, they can instead cause the player to misunderstand what the game is trying to convey. This can lead to the player's perceiving the game as non-believable, thus shattering the *suspension of disbelief* (Coleridge, 1817) and negatively affecting the player's sense of *immersion*. In addition, this can also cause the player to become frustrated with the game since they can't interact with it in the manner they expected.



Figure 3.1: An example of indexical storytelling from *Bioshock Infinite*

3.3 Immersion

The concept of immersion is defined by Bartle (2004) as the feeling the player has of losing themselves in the game world. Murray (1997) describes immersion as “the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention.” In essence, achieving immersion means that the player starts accepting the game world as a real world, and acts in it as if it were a real world. This effect is akin to the concept of suspension of disbelief, and can be seen as an effect akin to that described by the *Thomas Theorem*: “If men define situations as real, they are real in their consequences” (Thomas and Thomas, 1928). Thus, to achieve immersion, the player must accept that the game world has a set of rules that may be different from the real world, and that such a world can be “real” despite its working differently.

Immersion has, however, long been criticised for being what McMahan (2003) calls “an excessively vague, all-inclusive concept.” In her 2003 article, McMahan describes two different phenomena: when “the player is caught up in the world of the game’s story”, and their “love of the game and the strategy that goes into it”. McMahan claims that these define immersion on a diegetic and non-diegetic level, respectively. In later research, Ermi and Mäyrä (2005) categorized immersion into certain subtypes, which independently and in co-operation cause the player to achieve an immersed state. Ermi and Mäyrä divided immersion into *imaginative*, *challenge-based*, and *sensory-based* immersion. Other authors have also discussed other aspects of immersion, for example, the *narrative*, *tactical*, *strategic* (Adams, 2010), and *social* immersion (Johansson, 2013). These types of immersion all highlight different aspects of the overall concept, and in combination they help address some of McMahan’s critique of the concept.

However, the different types also have some amount of overlap. In essence, *tactical* and *strategic* immersion (Adams, 2010) are two aspects of the *challenge-based* immersion presented by Ermi and Mäyrä (2005). *Narrative* (Adams, 2010) and *imaginative* (Ermi and Mäyrä, 2005) both describe how the player achieves immersion on what McMahan (2003) calls the diegetic level, i.e., through immersion in the story of the game.

3.4 NPCs and the specific forms of immersion

NPCs affect the different forms of immersion differently. Although this list is probably not exhaustive, it provides a broad view of the ways the player’s sense of immersion can be defined. The sections below will explore in what ways the impact of NPCs on immersion can be described within the context of

each form of immersion.

3.4.1 Imaginative and narrative immersion

Imaginative immersion (Ermi and Mäyrä, 2005) and narrative immersion (Adams, 2010) describe two very similar concepts. In essence, both describe how the player is immersed through the telling of a story and the stimulation of the imagination. They do, however, present different aspects of how the player is affected by the narrative. Imaginative immersion is more closely tied to the concept of alterbiography (Calleja, 2009), whereas narrative immersion is more closely related to the pre-defined (Calleja, 2009) or embedded (Jenkins, 2004) narrative.

NPCs affect these forms of immersion in a variety of ways. As mentioned in Chapter 3, NPCs can affect immersion on the diegetic level (McMahan, 2003) of the game. This means that through their presence in the game, and the way they perform their roles as actors in the narrative, they will affect how the player experiences the story of the game, and how the player therefore builds their alterbiography (Calleja, 2009). This means that NPCs must, to some degree, be designed as a part of the narrative of the game, so that, through their design as a part of the pre-defined narrative, they can influence the player's alterbiography. This need not be in the most complicated way: the types described by Aarseth (2012) range from deep characters, to shallow characters, to faceless bots. Each NPC needs to be assigned a role in the narrative and needs to have the capabilities and appearance to fulfill that role. If they do not, they will negatively affect the player's sense of immersion.

3.4.2 Challenge-based immersion

Challenge-based immersion (Ermi and Mäyrä, 2005) is essentially the type of immersion the player derives from being challenged. This is very closely tied to the concept of *flow* described by Csikszentmihalyi and Csikszentmihalyi (1992). Basically, flow is achieved when the player's skill and the challenge of the game form an equilibrium, and the player enters a state of optimal concentration, and the rest of the world falls away. This is very similar to the description of immersion. The flow state, however, can be disrupted by the challenge's being too hard or too easy relative to the player's level of skill. This will also have a jarring effect on the player, where the illusion of a conquerable yet somewhat difficult challenge is shattered and the situation loses believability—either through sheer frustration or by the player's failing and being launched into a death screen or the like. NPCs can affect this type of immersion by being either too skilled at their task, or not skilled enough to pose a credible challenge. If one applies the work of Adams (2010), the concept of

challenge-based immersion can be further broken down into different types. In essence, challenge-based immersion can be said to work on two levels: tactical and strategic.

Tactical immersion

Tactical immersion (Adams, 2010) is the type of challenge-based immersion that arises from the immediate need to act in a situation. The player must make rapid decisions to overcome challenges. This type is often found in fast paced games, such as First-Person Shooters (FPSs) or timed puzzle games. Adams calls it *tetris trance*. This type of immersion can be greatly influenced by NPCs, especially in games where combat situations and the like are common, such as FPSs or action RPGs. The NPCs will often meet the player as the “opposing team,” but can also be used to assist the player in overcoming situations (Tremblay and Verbrugge, 2013). NPCs must behave in ways that are in accordance with the expectations of the player, and be skilled enough to not be too easily conquered. They cannot, however, be too skilled: this will cause the player to become frustrated, and thus drop out of the flow channel and lose their sense of immersion. This is a difficult balance between difficulty and stimulus, and designing NPCs for this purpose is a very active field of research (Orkin, 2006; Weber et al., 2011). If the assisting NPCs require a lot of management, this can potentially be immersion-breaking if it interrupts the flow of the game, or transform the scenario so that strategic immersion instead becomes the more prominent type.

Strategic immersion

Strategic immersion (Adams, 2010) is the form of challenge-based immersion that arises not from the more immediate situation of the game, but from the overarching strategy of the game. This type of immersion is found notably in strategy games, especially of the turn-based, grand strategy, variety. Adams describes this as the immersion of the chess master: the importance of things such as narrative and game world fall to the side, and instead the overall grand plan becomes the sole focus. This type of immersion is difficult to achieve with NPCs, and they will probably only act as pawns in the different tactical situations that make up the strategic landscape. Although strategy games will often have one or more opposing AI, this is rarely diegetically represented as a singular NPC, but rather as an incorporeal entity much like the player themselves. In some games it is possible to find NPCs without a diegetic representation that will still influence immersion, for example, the nobles in *Crusader Kings II* (see Section B.4).



Figure 3.2: An example of sensory-based immersion from *Grand Theft Auto V*

3.4.3 Sensory-based immersion

Sensory-based immersion (Ermi and Mäyrä, 2005) arises from the audiovisual aspects of the game. Through a combination of interesting and attractive architecture and nature, lighting, animations, camera angles, sound, and music, the game can lull the player into a sense of immersion, as exemplified in Figure 3.2. This type of immersion needs to be complemented with narrative or imaginative immersion, which will provide the frame for the appearance of the game. NPCs will affect this type of immersion through their appearance and the sounds they make. Again, it is important that these are in accordance with the narrative. Most of the work for this type of immersion will happen as the game is designed and implemented, and the situations that strengthen this type of immersion will often be pre-designed experiences.

3.4.4 Social immersion

Social immersion (Johansson, 2013) is the form of immersion that arises from social interactions within the game. As Johansson defines it, this exists only between the players and the NPCs, and arises when their interaction reaches such a level of complexity that the player becomes immersed in the social interaction itself. Of the types of immersion described in this thesis, this is the least developed type.

3.5 Believability

In order for the player to achieve a feeling of immersion, the game must draw the player in and cause them to become engaged in the game. This requires that the game persuades the player that it is believable. Furthermore, the narrative must contextualize the player experience and provide a framework in which the player can construct their alterbiography (Calleja, 2009). However, many of the factors that affect believability also affect immersion, and to some extent immersion also affects believability through the narrative anchoring¹ that immersion provides. In essence, the immersion and believability co-exist and feed into each other. Because of this, a negative feedback loop in either will probably spread to the other:

“The key to immersion is *persuasion*. The more persuasive an environment is, the easier it is to become immersed in it. The biggest weapon in the designer’s armor of persuasion is familiarity. [...] When knowledge and belief coincide, that’s immersion.”
– (Bartle, 2004)

Loyall (1997) exemplifies this persuasion with the Disney classic *Dumbo*. The movie tells the viewer that the “Dumboverse” is a world where animals speak, and where an elephant can fly using its ears, thus making Dumbo believable as a character. This builds a narrative that becomes convincing, and provides the framework for the alterbiography.

However, the problem of contextualizing characters in virtual environments is not unique to games. In the field of AI there exists a subfield concerned with the development of *agents*², which are essentially pieces of software that act on their own volition in order to achieve some goal. Some of the research into agents is applicable to NPCs, particularly in cases where the agent research is concerned with believability or social capability—most often called Believable Agent (BA).

Mateas (1999) discusses the difference in research goals between the traditional AI approach and that of the BA approach. Whereas the goals of AI research are competence, objective assessment, generality, and realism, the goals of BA research are personality, audience perception, specificity, and characters. Both of these are of course important to NPCs, but one particular point

¹The narrative anchoring of NPC believability and immersion encompasses both the alterbiography and the pre-defined narrative (Calleja, 2009), as well as the embedded and emergent narratives (Jenkins, 2004).

²Agents share many characteristics with NPCs, and to some extent NPCs can be said to be a special case of agents. But it is important to note that not all agents are NPCs

that Mateas makes is that “[t]he success of a believable agent is determined by audience perception. If the audience finds the agent believable, the agent is a success.” This approach is very much relevant to NPCs, which are almost entirely judged by how believable they appear to be. It also encapsulates the core of immersion, in that the one must reach acceptance with the target audience. A basic level of competence is of course required to achieve believability, but as stated by Bartle (2004) NPCs, cannot be too competent or they will spoil the fun of the game. Consider, for example, an NPC that has perfect aim. This is trivial to achieve in most games (by adding a node to the most efficient point to hit the target, we can make the NPC a superhuman marksman) but this would not be perceived as believable since no one will score perfect hits every time. Instead, in order to maintain believability, the NPC must maintain a level of marksmanship that falls inside the scope where they are believably accurate, without being so competent that the player’s level of fun is disrupted. For highly delimited tasks such as marksmanship this is fairly simple: simply add some deviation to the aim of the NPC. For less delimited tasks, for example social interaction, the problem becomes much more complicated.

Loyall (1997) presents a list of the abstract properties that an agent must possess in order to be perceived as socially believable. These are:

- *Personality*
- *Emotion*
- *Self Motivation*
- *Change*
- *Social relationships*
- *Consistency*
- *Illusion of Life*
 - *Appearance of Goals*
 - *Concurrent pursuit of Goals*
 - *Parallel Action*
 - *Reactive and Responsive*
 - *Situated*
 - *Resource Bounded (in body and mind)*
 - *Exists in a Social Context*
 - *Broadly Capable*
 - *Well Integrated (capabilities and behaviors)*
- (Loyall, 1997)

This list contains many attributes that are closely related to the social capabilities of BA. As one can discern from Loyall’s approach, the capability for social exchange and interchange is extremely important for the believability of agents. However, these are only part of what makes agents, and by extension NPCs, believable. In order for the player to understand and interpret the behavior, it must also be framed in a narrative in which the behavior makes sense. This also ties into the indicators described by Fernández-Vara (2011): NPCs are littered with small clues as to what they are and what they do. Thus, players must be able to perceive and identify what type of NPC they are interacting with. In short, the NPCs must afford certain interactions.

3.5.1 Affordances and believability

In the field of Human–Computer Interaction (HCI), the concept of *affordances* (Gibson, 1977) exists as a way of describing how users understand in what ways they can interact with the software. The software must indicate what will happen when the user performs a certain interaction. When an object in a user interface is interactable, its appearance must indicate what will happen when it is interacted with. For example, the printing icon in a word processor will look like a printer and thus indicate that clicking the icon will send the document to the printer.

According to Gibson (1977), these affordances exist independently of the entity that is trying to perform these actions. However, the notion that the existence of affordances is independent of the acting entity has been criticised by later research, notably by Norman (2013), who argues that the perception of affordances is key to being able to use them. This is further expanded by McGrenere (2000), who point out how one must not only be able to perceive the affordance, but also do so correctly. Failure to do this can result in the non-detection or the false detection of an affordance. Furthermore, as described by McGrenere, Norman’s affordances are also dependent on the experience, knowledge, and culture of the acting entity. The implication of the experience-dependency of Norman’s affordances is that they can also to some extent be taught. Before the demise of the floppy³ disk as a conventional storage medium, the use of a floppy disk as a save icon also indicated an affordance. Nowadays this has largely been relegated to convention, where users who have never actually seen a floppy disk still know that clicking the floppy disk icon will save the document.

Similarly, the perceived affordances in games must be in line with what the player expects. According to Linderoth (2013), the perception and manipula-

³The name “floppy disk” is itself a relic of the past, since the later generations (for example 3.5" disks) were in fact rigid rather than floppy.

tion of affordances is central to the act of playing a game:

“To engage in game-play is to perceive, act on, and transform the affordances that are related to a game system or to other players in a game.” – (Linderoth, 2013)

For players to be able to use these affordances, they must first be able to identify them (McGrenere, 2000). This can become problematic if the player is unable to discern and interpret the affordances presented by the game. This transforms the challenge of playing the game from what Linderoth (2013) calls *performative* to being what Linderoth calls *exploratory*. In performative challenges, the objective of the challenge is perfectly visible to the player, and the challenge lies in the performance of the steps needed to complete the challenge. In an exploratory challenge, the difficulty instead lies in discovering what is to be done, and the action(s) needed to complete the challenge are fairly simple. If the affordances needed to complete a performative challenge are poorly designed, the challenge instead becomes both an explorative and a performative challenge, potentially increasing the difficulty of the challenge.

Thus, identifiable affordances is a primary design concern for any game, and something that must be taken into account. In addition, these affordances must, as previously mentioned, be in line with what the player expects. The items in the world must, if they are to be interactable, be interactable in such a way that they conform to the expectations a player would have of such an item. For example, a wooden crate would afford stacking, climbing onto, putting items on, and putting items in. If it fulfills these affordances, it could potentially be seen as believable⁴.

3.6 Concluding summary

As described in this chapter, the evaluation of the player experience cannot begin and end with narrative and immersion. Instead, these are just the first links in a chain of phenomena that combine to create the player experience. If we examine this chain of phenomena in reverse order, we can see that game developers, by having affordances that the player can manipulate in expected ways, can create believable NPCs which can then act in ways that induce the player to enter a state of immersion. This then enables the player to use the indicators found in the game as a basis on which they can build their alterbiography, and experience the emergent narrative of the game. In turn, this shapes

⁴It should be noted that some items may not have affordances that are directly matched to their real-world counterparts. The crate mentioned above may, for example, not be openable, and thus not usable for storing items. Similarly, perhaps only crates of a certain color are strong enough to support the weight of the player.

their understanding of the scripted or embedded narrative. By extension, then, the affordances and the believability of NPCs within games become the basis on which we build the player experience.

4. Method

This chapter describes the methods used in the research done for this thesis, and in what ways the constituent studies relate to each other. Because this is a compilation thesis, there is no one method. Instead, this thesis is composed of a number of studies with varying levels of interconnection. This does not, however, mean that it is a grab-bag of different studies. Instead, these studies constitute a body of work of which the main focus has been the exploration of what types of NPCs exist, and what are the various characteristics of these types. The overarching approach used in the research underlying this thesis can best be described as explorative. Over the course of the research, we have followed the results down the proverbial rabbit hole, exploring new questions as they arose. Although some branches of the burrow have yet to be explored, we have focused on the parts that provide the most descriptive power for better understanding the different aspects and proclivities of NPCs, as will be outlined in this chapter.

4.1 Research strategy

This work used a design science (Hevner et al., 2004) methodology. This methodology is essentially a combination of the steps taken to develop artifacts with those taken to create publishable research. The design science method marries these two traditions, and describes a method by which artifact development can be performed while still maintaining scientific rigor. As described by Hevner et al. (2004), design science has seven guidelines:

1. Design as an artifact
2. Problem relevance
3. Design evaluation
4. Research contributions
5. Research rigor
6. Design as a search process

7. Communicate the research

The main objective of design science is to create an artifact that can be used to solve a problem, and in this thesis this takes the form of a typology and a model of NPCs. Furthermore, as in all research, the problem must be relevant. Although Hevner et al. (2004) frame this as a “business” problem, it has previously been applied in the field of game studies. One such application is in (Johansson, 2013), and generally design science is applicable to other fields of research where the production of an artifact is a main concern.

The design science methodology also calls for the evaluation of the artifact, which is an integral part of the iterative nature of design science. Our typology has been incrementally developed and verified in many papers, notably Papers III–V, but with supporting work done in Papers I–II and numerous other papers (Warpefelt, 2013; Warpefelt and Strååt, 2013; Warpefelt and Strååt, 2012) as well as this thesis. Each of these papers includes a piece of empirical work, in many cases through experimental approaches. As for the model from Paper VI (Warpefelt and Verhagen, 2016a), it is largely a meta-product of the studies described above. Lastly, as can be seen in the list of publications above, the guidelines describing the design as a search process and the communication of the research have been fulfilled.

That leaves us with the topic of research rigor. This has been discussed in each paper, and this thesis provides an in-depth discussion of the specifics of this research as a part of design science. This thesis uses a number of different methods, among others, various forms of observation and thematic analysis. Most of these are interpretive methods, and this is a design choice that warrants some exploration.

4.2 Interpretive research

Interpretive work, such as that performed for this thesis, is inherently subjective, and to clothe it in the illusion of absolute objectivity would be to deceive the reader. However, subjectivity is a fundamental part of research and objectivity is to some extent often a product of a consensus within a research field (Longino, 1998): thus discussing scientific veracity from the point of objectivity and subjectivity may be less than productive. Furthermore, subjectivity may not necessarily equate to bias; as described by Myers (2009),

“[I]nterpretive researchers tend to focus on meaning in context. They aim to understand the context of a phenomenon, since the context is what defines the situation and makes it what it is.” – Myers (2009)

The implication of what Myers is saying is that some things cannot be studied in isolation, instead, the context in which they are presented is of vital importance to understanding the item of analysis. Removing the object from its context would therefore alter the understanding of it. As described in Chapters 2 and 3, NPCs are to a very large degree interconnected with the context in which they are found, and thus trying to understand them without their context is essentially futile. Furthermore, subjectivity is an inescapable part of research (Boellstorff et al., 2012) and the question must then instead be how we control and describe the subjectivity of the research, and how we communicate to our readers that there is some subjectivity, and what type of subjectivity is inherent in the research. In order to do this, we need to have some way to reason about what subjectivity is, and to what extent the studies found herein are affected by subjectivity. In this thesis, the problems inherent in interpretive science will be discussed from the perspective of the criteria of Lincoln and Guba (1985):

- **Credibility**—To what extent the findings can be said to describe the “truth” of the object studied;
- **Transferability**—How applicable the findings are to other contexts;
- **Dependability**—How repeatable the findings are;
- **Confirmability**—To what extent the findings can be confirmed by others, and are not biased or colored by the researcher or other interested parties.

Lincoln and Guba’s criteria will be used in this chapter to assess and describe the strengths and weaknesses of the different studies. That said, no study is ever perfect, and there are always weaknesses. However, by virtue of de Condorcet’s Jury Theorem (1785), we should slowly approach the truth by being right at least more often than we are wrong. Thus, the principle of triangulation (Kitto et al., 2008) becomes very important for achieving our goals. By producing a number of studies of sufficiently high quality, we can slowly chip away until we have carved out the truth, rather than revealing it with one gargantuan blow of the metaphorical hammer.

4.3 Evaluating games

As mentioned in Chapter 3, the contract between the designer and player places some restrictions on the ways a designer should design the game. As with any software, the design must be coherent, and in harmony with what is indicated to the user. If the contract is to be broken, or the harmony of design elements disrupted, this must also be indicated by the design of the game. In order to ascertain that the design does in fact work as intended, games, much like other

software, need to be evaluated. This also mirrors the guidelines for design science laid down by Hevner et al. (2004). Performing this type of analysis is also what provides a design science approach with the credibility and confirmability needed to elevate it from software development to actual science. Thus, the choice of evaluation approach becomes a prime concern.

The field of HCI has produced a number of approaches for evaluating software. One of these is to use heuristics for the evaluation. Heuristics are simple rules of thumb used to evaluate games and their design. Although they can be used as design tools, this is less common. Heuristics have long been used to solve problems, and the term is used in many different fields of research. The use of heuristics for UI evaluation was originally popularized by Nielsen and Molich (1990), whose method, called *heuristic evaluation*, has since become widely used within the HCI community. It has been fairly extensively studied and applied to games by different researchers. Notable examples include Malone (1982), who essentially introduced the concept of heuristic evaluation of games before the term was popularized by Nielsen. Later work includes Isbister and Schaffer (2008) and Desurvire and Wiberg (2009). The latter introduced the *PLAY* heuristic list, which is derived from data collected from game designers, which was in turn based on previous research by Desurvire et al. (Desurvire et al., 2004; Desurvire and Wiberg, 2008). Less famously, we previously introduced a number of anti-heuristics aimed at describing how NPCs should *not* behave (Warpefelt and Strååt, 2013).

These different heuristics can all be used to identify problems in games, as a sort of rapid evaluation tool. They allow developers and evaluators to quickly identify problems in their products. In the case of traditional HCI, this is mostly related to the usability of the product. In the case of games, the heuristics also extend to other fields, such as the “fun factor” of the game. Heuristics, however, are inherently inexact instruments, and they are often formulated in ways that leave room for interpretation.

If one desires a higher degree of precision, there are other approaches. One common approach is that of *design patterns*, a concept originally from the field of architecture, introduced by Alexander et al. (1977). The concept was popularized for computer science and software development by Gamma et al. (1994), a book known informally as “Gang of Four Book.” Design patterns are essentially ready-made solutions that can be used by designers to solve specific problems. They can also be combined, much like puzzle pieces, to create more complex constructs. Design patterns are primarily intended to be used as a tool for design, but they can also be used as more formalized heuristics. Basically, a design can be broken down into design patterns to get a more structured and formalized view of the actual construct that has been created. This aids in the analysis of the design, since it allows the designer to

manipulate and interact with the design patterns rather than with the individual design elements. Within the context of games, design patterns have, famously, been produced by Lankoski and Björk (Björk et al., 2003; Lankoski, 2004; Lankoski and Björk, 2007; Lankoski et al., 2011). These patterns cover most aspects of games, and exist to be applied as ready-made solutions to specific problems. This allows designers to standardize the interaction, portrayal, and other elements of game design.

The use of design patterns has, however, been subject to some criticism. Žavcer et al. (2014) stated that most of the criticism directed towards design patterns is that the patterns they describe are often fads, or either too formal or insufficiently formal. Žavcer et al. does go on to state that this is not unique to the field of computer science, nor to the field of computer games, but is a general critique of the concept of design patterns. In general, much of the critique of patterns, for example the critique Almeida and da Silva (2013) gave of the work of Björk et al. (as mentioned by Žavcer et al.), is based on the perceived quality of the patterns themselves. To alleviate potential shortcomings, Žavcer et al. (2014) suggest a more formal approach to design pattern creation, where they are made using a template called a *design pattern canvas*. This would allow greater formalization and standardization of design patterns, thus hopefully lessening some of the problems associated with design pattern specificity. As for the potentially transient nature of design pattern applicability, this may be due to changes and evolution in the field of video games, where the state of the art changes with greater frequency than is the case with other fields. Furthermore, the craft of creating software in general, and video games in particular, is less restricted than many of the other fields in which design patterns are used. In architecture, gravity or other physical phenomena will still be a factor, whereas in the virtual space of software we are only limited by the ever-increasing computational ability of our computers.

4.4 Studies performed for this thesis

This thesis basically encompasses three different studies, distributed over six papers. These three studies are:

- S1. NPCs and believability;
- S2. Types of NPCs;
- S3. Design elements of NPCs.

The relation between the studies performed as part of this research and the papers included in the thesis can be found in Table 4.1, and the details of how

Table 4.1: Studies in relation to included papers

Study		Explored in paper					
#	Study	I	II	III	IV	V	VI
S1	NPCs and believability	X	X				X
S2	Types of NPCs			X	X	X	
S3	Design elements of NPCs		X	X		X	

the studies are represented in the papers are discussed in Sections 4.4.1–4.4.3 below.

4.4.1 NPCs and believability (S1)

The research described in this thesis essentially stems from the study of NPC believability, originating in the work of Verhagen et al. (2011), and inspired by the work of, among others, Loyall (1997), Mateas (1999), and Verhagen (2000). The results of this study can be found in Chapter 5. Initially, the intended goal was an implementation of a more socially capable NPC. This, however, proved difficult. Although we had successfully described in what ways NPCs both are able to and unable to behave in ways that are socially believable, we lacked the details needed to actually realize these behaviors as implemented NPCs. This prompted us to redirect our efforts to study NPCs in greater detail.

The study that consists of Papers I–II (Johansson et al., 2013; Warpefelt et al., 2013) and its predecessors (Warpefelt and Strååt, 2013; Warpefelt and Strååt, 2012), was aimed at eliciting the current state of the art of believability in social behavior of an NPC, as well as to create and verify a tool specifically for evaluating the believability of an NPC in a social situation. The games used in this study (see Table 4.2 on p. 67) were primarily chosen because they featured a way for the player to interact with NPCs similarly to how they would with a human in the real world: mostly face to face and with the player in control of a specific avatar at any given moment. As a result, the games included in that study are almost all RPGs, with only a few exceptions (mostly third- or first-person shooters). This is largely a product of the selection criteria: games where the player interacts face-to-face and controls a single character will often be RPGs or shooters. Thus, the results from that study are likely to be biased towards these genres. Their transferability to other genres may therefore be somewhat limited, although in (Johansson et al., 2013; Warpefelt et al., 2013; Warpefelt and Strååt, 2013; Warpefelt and Strååt, 2012), it was

found that NPCs in RPGs consistently portray the highest level of social capability and believability¹. Moreover, a more rigid selection process for the games would have been beneficial for additional credibility and transferability, but it was judged that a larger sample of data was more important than strict rigidity due to the potential for a greater diversity in the games.

Papers I–II use very similar methodologies, basically a variant of structured observation. The observations were performed on pre-recorded videos of gameplay, consisting of both large swathes of regular game play and shorter clips of potentially interesting behavior found during play-throughs. The data collection was performed by a total of six people, split between two researchers in the department and four bachelor students². This type of data collection is somewhat problematic. The play style of the person playing the game in the recorded video will of course impact what data can be identified, and there is the possibility that the selection of potentially interesting behavior by the initial data producers may have affected the outcome of the study since they place special attention on certain instances, while potentially missing or overshadowing others. The collection was performed by two to three researchers, depending on the paper, where each researcher kept their own protocol of the observations as relating to the structured model used for the study.

For the initial studies (Warpefelt and Strååt, 2013; Warpefelt and Strååt, 2012), we used the Carley & Newell fractionation matrix (C&N matrix) (see Figure 4.1), whereas the later studies (Johansson et al., 2013; Warpefelt et al., 2013) used the Game Agent Model (GAM) (see Figure 4.2) when the C&N matrix proved to be too unwieldy to be used effectively.

Each observation was classified as having a negative or positive impact on immersion in relation to one or more of the values in the respective models, and the number of instances for each value/type pairing encountered was recorded to provide the severity of impact on the different values. In deviation from common practice with structured observation, we were unable to intervene with the situation we encountered in the videos. Instead, we could only observe. As previously discussed, however, intervention may have to some extent occurred in the collection of the video data.

These observations were then compared, and a consensus was achieved through thorough discussion about specific values. This was done in order to increase the interpretive rigor through researcher triangulation (Kitto et al., 2008), thus strengthening the credibility and dependability of the research. The credibility of the research would probably have been further strengthened by additional evaluators, but due to the realities of scheduling, this proved diffi-

¹The findings from Papers I–II are discussed further in Chapter 5

²The use of bachelor students for data collection, and the ethics thereof, is further discussed in Section 4.7.

Processing		Knowledge					Increasingly Rich Situations	
Increasingly Limited Capabilities	↑		Nonsocial Task (NTS)	Multiple Agents (MAS)	Real Interaction (RIS)	Social Structural (SSS)	Social Goals (SGS)	Cultural Historical (CHS)
		Omnipotent Agent (OA)	Goal directed Models of self Produces goods Uses tools Uses language	Models of others Turn taking Exchange theory	Face-to-face Timing constraints	Socially situated Class differences	Social goals Organizational goals	Historical situated motivation
		Rational Agent (RA)	Reasons Acquires information	Learns from others Education Negotiation	Scheduling	Social ranking Social mobility Competition	Disillusionment	Social inheritance Social cognition
		Bounded Rational Agent (BRA)	Satisfices Task planning Adaption	Group making	Social planning Coercion Priority disputes Miscommunication	Restraints on mobility Uses networks for information Corporate intelligence	Party line voting Delays gratification Moral obligation Cooperation Altruism	Gate keeping Diffusion Etiquette Deviance Roles Sanctions Role emergence
		Cognitive Agent (CA)	Compulsiveness Lack of awareness Interruptibility Automatic action	Group think	Crisis response Social interaction	Automatic response to status cues	Clan wars Power struggles Group conflict	Develop language Role development Institutions
		Emotional Cognitive Agent (ECA)	Intensity Habituation Variable performance	Protesting Courting	Mob action Play Rapid emotional response	Campaigning Conformity	Nationalism Patriotism Team player	Norm maintenance Ritual maintenance Advertising

Figure 4.1: The adapted version of the Carley & Newell fractionation matrix, as seen in (Warpefelt and Strååt, 2013)

	Single Agent	Multiple Agents	Social Structural	Social Goals	Cultural Historical
Act	Goal directed Route following Uses language Uses tools	N/A	N/A	N/A	N/A
React	Adaption Acquires information Crisis response Interruptability Awareness Models of self Rapid emotional response Navigation	Learns from others Models of others Turn taking	Class difference Mob action Social ranking	Disillusionment	Advertising Institutions Roles
Interact	N/A	Face to face Group making Social interaction Memory of previous interactions	Coercion	Clan Wars Cooperation Group conflict Patriotism Power struggles Team player	Etiquette Norm maintenance Sanctions

Figure 4.2: The Game Agent Matrix as presented in Paper II (Warpefelt et al., 2013)

cult. This approach to data analysis somewhat resists classification as formal method; it uses the inherent quantitative nature of the data collected only to identify which values were most commonly encountered. For each of the values, we then analyzed in what ways they were impacted by NPC behavior, as observed by the researchers. The similarities between these situations were then identified and described. This elicited the commonalities in how NPCs fail to uphold believability in relation to the different values.

Unfortunately, the dependability and confirmability of this research are inherently lower than optimal. As described in Chapter 3, believability is a very soft and malleable construct, and thus the individual researcher's perception of what is believable behavior is likely to change over time. This is further exacerbated by examining large swathes of data in one session, which may cause fatigue and complacency to set in. Ideally, the data analysis should have been done in several sessions and iterations, where the researchers had some time between both sessions and iterations. This was done for one of the preceding papers (Warpefelt and Strååt, 2013), but due to time constraints it proved impossible for the research described in Papers I–II. That said, examining the same data several times may also cause overfitting to the dataset, and thus the iterative approach is not without its own drawbacks. This can be avoided by splitting the data into separate sets and performing cross-analyses. This, however, requires a much larger dataset, which was not available due to the qualitative nature of the data used for these papers.

The approach used for the research in Paper VI (Warpefelt and Verhagen, 2016a) is very different from that used for Papers I–II. It is a purely theoretical construct created from the results in all of the studies, which informed the final stages of the exploration of NPC believability. For this reason, the transferability of the results is inherently low: the model produced in only intended to be used to describe the state of NPC believability, and will therefore not be transferable to other contexts without being fundamentally altered. The credibility, dependability, and confirmability of the results should, however, be higher than for the individual studies. This research relies heavily on the results from the previous studies, and as such achieves a high level of triangulation in its data, method, and theory (Kitto et al., 2008). The model itself can be seen in Chapter 7.

4.4.2 Types of NPCs (S2)

The work on the typology of NPCs was presented in Papers III–V. The need for that work was initially discovered in Paper III (Warpefelt, 2015), where we found that the respondents expressed confusion about some of the typology created by Bartle (2004). Due to the identification of this problem in Paper

III, we aimed to create an updated and expanded typology in Papers IV and V. In order to establish this typology, we studied a larger number of NPCs from a larger number of games in Paper IV (Warpefelt and Verhagen, 2015), producing a provisional typology. This typology was then later verified and revised in Paper V (Warpefelt and Verhagen, 2016b). The results of that study can be found in Chapter 6.

Paper III (Warpefelt, 2015) used an online survey, where the respondents were shown ten random images of NPCs from a pool of twenty-seven, taken from four different games, and asked to classify them as one of the types created by Bartle (2004) and to provide a reasoning for why they chose the type they did. The responses were later analyzed using thematic analysis, where the aim was to elicit in what ways players identify NPC types. This survey was distributed online using social media, and the respondents were entirely self-selected. This can of course create some level of bias, and the total reach of the survey is impossible to ascertain. A total of 294 responses were recorded, of which 213 were complete and with respondents over 18. The respondents were almost exclusively from the western world, primarily from Sweden (29%) and the United States (25%). The ratios for the countries are probably due to the method of distribution, and thus the results are likely to be skewed towards the preferences of gamers in those countries. James and Fletcher (2015) suggests that there are significant regional differences in game design elements, and this may impact the perceived relevance of the survey for respondents who are not Western. Lastly, the survey was only available in English, and although the level of language competence required to complete the survey was fairly low, there is a chance that this alienated potential respondents from cultures where English is not widely spoken.

As for gender, 76% of the respondents identified themselves as male, 21% as female, 1.5% as other, and 1.5% declined to specify. With regard to gender, it is more difficult to ascertain how the ratios in the data collected for Paper III differ from the actual ratios between gamer genders. Winn and Heeter (2009) found that females generally spend less time playing games than males, but did not specify the types of games played by the different respondents. Heeter et al. (2009) have suggested that younger gamers of both genders prefer games designed with their gender in mind, and the four games included in the study are generally of genres that are less preferred by female gamers (Scharkow et al., 2015) and contain elements that are generally less preferred by female gamers (Vermeulen et al., 2011). Hence, there is a chance that females may be less likely to complete the survey given that the source material may be perceived as irrelevant to their interests. The exact impact of this on the ratios between the respondent groups in contrast to the actual ratios of the genders of gamers who actually play these types of games is unknown.

Paper IV (Warpefelt and Verhagen, 2015) used the survey data from Paper III. This survey data was re-analyzed using thematic analysis, this time with the aim of identifying in what ways the respondents expressed confusion about the Bartle types. These themes were used to modify the Bartle list, in order to suggest an updated typology. The updated typology was then verified against a larger corpus of NPCs and games, as seen in Table 4.2. We gathered video data from games, which was analyzed using thematic analysis. The aim of this analysis was eliciting the types of NPCs found in the games. The thematic analysis used the updated typology as a basic collection of themes, and then added, removed, and revised types as needed. This resulted in a tentative typology of NPCs.

Paper V (Warpefelt and Verhagen, 2016b) used the tentative typology from Paper IV and verified it further. This was performed using an on-line survey similar to that of Paper III. The survey design was similar to that in Paper III, with respondents being shown a number of images or videos containing one or more NPCs and asked to classify them and provide a reasoning for their decision. All NPCs in the study were available in both animated and still forms, but respondents were only shown one type. In contrast to the data collection made for Papers III and IV, however, the respondents were asked to provide their own type rather than choosing one from a list. In addition, we also classified the NPCs found in the images according to the tentative typology from Paper IV. The respondents' classifications were then clustered, and the clusters were compared to our classifications. Where they differed, the relevant types in the typology were updated, possibly adding, removing, or revising as needed.

In total, we received 352 complete responses in the data for Paper V, of which 31 were discarded since the respondents were not aged 18 or above. Thus, the final respondent count was 321. Of these, 82% identified as male, 10% as female, 1% as other, and 7% declined to specify. As with the survey for Paper III, the respondents primarily hailed from the western world. This time 79% were from Sweden, 8% were from the United States, and 3% were from Finland. Respondents from other countries made up 6%, and a further 4% declined to specify. In general, the same imbalances and problems were present in the respondent demographics for this data as were present in the data collected for Paper III. Although special effort was made to reach female respondents, this proved unsuccessful.

The main weakness of the qualitative analysis performed for this research is that it was performed by only one researcher. This makes it highly likely to be skewed towards the proclivities of that single analyst. In essence, this could have an extremely adverse effect on its credibility, transferability, dependability, and confirmability. In order to alleviate this, the finalization of

the typology in Paper V uses a very respondent-centric approach, with the data being collected using a more open methodology. This ought to have greatly increased the credibility, transferability, dependability, and confirmability of the research, although the relative lack of heterogeneity of the respondents may be detrimental to the transferability of the study. The final outcome is still also analyzed by a singular researcher, but the shortcomings stemming from that should still be alleviated by the triangulation provided by the use of the different data sources.

4.4.3 Design elements of NPCs (S3)

The work on the design elements of NPCs was conducted in Papers II, III, and V. This process combined results from many different papers (Johansson et al., 2013; Warpefelt, 2015; Warpefelt et al., 2013; Warpefelt and Verhagen, 2016b) and was aimed at eliciting the things we needed to know in order to design NPCs for certain purposes, be it social believability or simply posing as a guard in a game. The results from this study are shown in Chapter 5 and as part of the typology in Chapter 6. The results of this study essentially act as the glue-ware between the believability research done for Study 1, and the typology created in Study 2 (as seen in Table 4.1).

Paper II (Warpefelt et al., 2013), as described in Section 4.4.1, describes the characteristics of the social believability and behavior of a NPC. This allowed us to understand in what ways NPCs must be designed in order to be perceived as being believable, as well as help us with analyzing other aspects of NPCs design. Paper III (Warpefelt, 2015), described in Section 4.4.2, describes in what ways players visually identify the type or types of an NPC they have encountered. This was further studied in Paper V, also described in Section 4.4.2. Furthermore, the typology finalized in Paper V allowed for a more rigid categorization and identification of the design elements of NPCs based on their type.

This is the study with the greatest possibility for improvement of the three included in this thesis. It encompasses some of the most important material, since it holds the key to the implementation of more socially capable and believable NPCs. This of course means that that study has weaknesses and strengths similar to those of the other studies in relation to credibility, transferability, dependability, and confirmability. That said, given that the results of that study arise from so many different sources, the results should have greater dependability. Similarly, the transferability of the results should be fairly high. Unfortunately, the same factors may also impact the confirmability negatively, since the results arise from a very disparate body of research. The credibility of the research is judged to be high. We have consistently used different tech-

niques so as to obtain a high credibility, notably triangulation. The research has been marked by a prolonged engagement (Lincoln and Guba, 1985) with the issue.

4.4.4 Delimitations

As a part of Paper III (Warpefelt, 2015), we identified that UI components will have an effect on how players identify and type NPCs, and showed that these components could potentially override the player's other vectors of identification. For the work done in this thesis we have chosen to disregard this problem, and we have accepted that UI components will be a part of the actual game that the player is playing. Thus, the impact of this on our research should not be of great significance. That said, this is an issue that must be explored in future research.

Furthermore, we have also disregarded the content of in-game cinematics. Although these are used to establish the narrative context for NPCs, they are also highly designed experiences wholly encompassed by the scripted narrative (Calleja, 2009). Our focus has instead been on how players experience NPCs in situations where the player is in control of their avatar.

Lastly, we have limited ourselves to certain types of games and to certain types of NPCs. In short, we have only studied NPCs that are diegetically embodied. This means that we have only considered NPCs that exist as interactive entities in the game world. As mentioned in Chapter 3, there are NPCs that do not have diegetic representations but still influence the game experience, such as the nobles from *Crusader Kings II*. These are prime examples of the type of NPC that we have excluded from our studies.

4.5 Games included in the studies

The games included in the different studies can be seen in Table 4.2. These games were selected using different criteria, as outlined in the separate papers. The main focus, however, has always been on the NPCs found within the games. In Papers II and III the focus was on games where the player was capable of interacting with NPCs at a face-to-face level and one-on-one basis. This, however, resulted in a rather limited variability in the games, mostly focused on adventure games, FPSs or RPGs. For Papers IV and V, the focus was on broadening the categories of games in which we looked for different types NPCs. This meant expanding the types of games into other genres, such as Real-Time Strategy (RTS) or other strategy games.

Table 4.2: Games included in the different studies, sorted by title.

Game description					Usage in studies		
Title	Developer	Year	Description		S1	S2	S3
Assassin's Creed: Revelations	Ubisoft	2011	Historical fiction action RPG		X		
Assassin's Creed: Unity	Ubisoft	2014	Historical fiction action RPG			X	X
Bioshock Infinite	Irrational Games	2013	Historical SciFi FPS			X	
Burnout Paradise	Criterion Games	2008	Modern-day racing game			X	
Dragon Age: Origins	Bioware	2009	Fantasy RPG		X		X
Dragon Age 2	Bioware	2011	Fantasy RPG		X		X
Company of Heroes	Relic Entertainment	2006	Historical RTS			X	
Dungeon Defenders	Trendy Entertainment	2011	Fantasy tower defense game			X	
Fable 3	Lionhead Studios	2011	Fantasy RPG		X		X
Fallout 3	Bethesda Softworks	2009	Post-apocalyptic action RPG		X		X
Grand Theft Auto V	Rockstar North	2015 (PC)	Modern-day action game			X	X
inFamous: Second Son	Sucker Punch Studios	2014	SciFi action game			X	X
Mass Effect	Bioware	2007	SciFi action RPG		X		X
Mass Effect 3	Bioware	2012	SciFi action RPG		X		X
L.A. Noire	Team Bondi/Rockstar Leeds	2011	Murder mystery game		X		X
RAGE	id Software	2011	SciFi FPS		X		X
Saint's Row: The Third	Volition	2011	SciFi sandbox adventure game			X	
Star Wars: The Old Republic	BioWare	2011	SciFi MMORPG			X	
The Elder Scrolls III: Morrowind	Bethesda Softworks	2002	Fantasy RPG		X		X
The Elder Scrolls IV: Oblivion	Bethesda Softworks	2006	Fantasy RPG		X		X
The Elder Scrolls V: Skyrim	Bethesda Softworks	2011	Fantasy RPG		X	X	X
Tomb Raider	Crystal Dynamics	2013	Action-adventure game			X	
Tropico 3	Haemimont Games	2009	Strategy/building game			X	
Vampire, the Masquerade: Bloodlines	Troika Games	2004	Fantasy RPG		X		X
Warhammer 40,000: Space Marine	Relic Entertainment	2011	SciFi third person shooter		X		X
WATCH_DOGS	Ubisoft Montreal	2014	SciFi sandbox adventure game			X	X
World of Warcraft: Warlords of Draenor	Blizzard Entertainment	2014	Fantasy MMORPG			X	X

Table 4.3: Research questions in relation to the papers

Research question		Addressed in		
#	Question	S1	S2	S3
Q0	What makes a non-player character believable?	X		
Q1	What types of non-player characters exist within games?		X	
Q2	What are the design elements of the different non-player character types?	X		X
Q3	In what ways do players perceive the type or types of a non-player character?	X	X	X

4.6 Research questions answered

The different studies encompassed by this thesis strive to answer different questions. These questions, as shown in Chapter 1, are:

Q0. What makes a non-player character believable?

Q1. What types of non-player characters exist within games?

Q2. What are the design elements of the different non-player character types?

Q3. In what ways do players perceive and determine the type or types of a non-player character?

The relation between the research questions and the studies included in this thesis can be seen in Table 4.3. In essence, the answers to these questions generally do not come from a single study. Instead, they arise from the intersections of the studies, where more meaningful answers to these questions can be found.

4.7 Ethical considerations

The ethical considerations for this thesis essentially fall into three categories: those pertaining to the respondents, those pertaining to the research assistants, and those pertaining to the artifacts we have analyzed.

The considerations for artifacts are exclusively related to the laws pertaining to showing content from video games to the public. In this case, the games used in the studies had been released to the market and thus were publicly available. This means that, given the inherent inertia of academic publishing

and the burst-like sales curve of games, game developers were very unlikely to suffer any ill effects from our analysis of the games. Simply put, most of the sales will have happened well before our results were published. In addition, the analysis performed for this work is in reality no different from a review in general games media, and unfortunately also less accessible to the public. Finally, most of the work done for this thesis (excluding the work from Paper VI) involves some kind of reproduction of content from games, mostly in the form of videos from games. In addition, some of the papers (Papers III and V) have shown excerpts from games to survey respondents. Under Swedish law, this should formally fall under what is known as *Återgivningsrätten* (SFS 1960:729) or *the right to reproduce* and it is common practice for review sites and similar institutions³.

In regard to research assistants, some of the data collected for Paper II was collected by students whose bachelor theses I supervised. The students also used this data for their own theses, and were voluntary participants in the data collection. The supervision was not dependent on their contributing data to our research projects. All students have since finished their theses. Student help was also used for Paper III, where students tested a research idea as their thesis work, in accordance with the thesis process at the department. The idea was a success, and was used in an expanded and evolved form to finish Paper III. The students completed their thesis, and are acknowledged for their help in the paper. Also for Paper III, the data collection was performed with the help of a friend of mine. That friend has also been acknowledged for his help in the published paper. His assistance came at no cost to himself except for his time.

In the case of respondents, the data for all papers was collected anonymously, and what demographic data there is cannot be used to uniquely identify a user, even if combined. Respondents to the online surveys for Papers III and V were informed of their right to discontinue the survey at any time, and that incomplete answers would be discarded. Furthermore, it was decided that respondents had to be at least 18 years old in order to respond to the survey, in accordance with the age of majority in Sweden. Hence, responses from respondents below 18 were discarded. Additionally, every respondent was provided with a unique key which could be used to identify their response, to be used if the respondent wished to withdraw their response. The key contained no personal identification data, and could not be used to reveal the identity of the respondent. In short, we have done our utmost to provide the respondents with the information they need to give us their informed consent to participate in the study, and have also tried to ascertain that the respondents were in fact capable of giving informed consent. Furthermore, we have given respondents

³It should be noted that this has not been formally tried in a Swedish court, and therefore there is no legal precedents on the matter.

the ability to both abort and retract their participation if they so desired. It should be noted that no respondents chose to withdraw their response.

5. Non-player characters and believability

This chapter will discuss how NPCs are evaluated as believable, and what constitutes believable behavior by NPCs. The chapter will start with a theoretical overview of the ways NPCs are perceived and evaluated as believable actors by players, followed by a description of how this can be evaluated by researchers. It then discusses some of the previous findings about the believability of NPCs.

5.1 The importance and mechanisms of the believability of an NPC

As mentioned in Chapter 3, believability is central to engaging players and achieving immersion. Thus, NPCs need to be perceived as believable. In order to be perceived as believable, NPCs must look and act in accordance with what the player expects from them (Desurvire et al., 2004; Loyall, 1997). These expectations arise from the preconceived notions that the player has about the NPCs, among other things based on their visual appearance and their behavior (Loyall, 1997). Therefore, it is imperative that NPCs be presented in such a way that the player's expectations are controlled and in line with the NPC's intended role within the game. In order to better understand in what ways this can be done in video games, we have performed a number of studies (described in the papers included in this thesis) aimed at eliciting in what ways NPCs actually achieve believability. This stems from the more general descriptions of believability by Loyall (1997) and Mateas (1999), and examines how their findings can be used in the specific context of video games, and even more specifically the concept of "NPC believability."

Much of the believability of NPCs is related to the *social immersion* described by Johansson (2013). Although not part of Johansson's original definition of *social immersion*, it is both feasible and likely that this type of immersion also extends to interactions with other players. Extending Johansson's definition, this type of immersion arises when the social interaction with other entities in the world reaches such a level of fidelity that the player begins to feel a sense of togetherness with the other entities. The player begins to anthro-

pomorphize them, and begins interacting with them as if they were conscious entities—and the NPCs and other entities start fulfilling the expectations associated with the themes described by Dennett (1981) (see Chapter 2). This of course places some requirements on the various entities and NPCs: they must be able to audiovisually portray the behavior needed for social immersion, and they must behave in ways that are conducive to it. As described by Gilbert (1996), this involves fulfilling and enacting the social obligations and entitlements required to maintain the cohesion of the social group. Essentially, by showing that they belong to certain social groups, and are capable of participating in the constant renegotiation of the definition of the social group, the various entities in the world can convince the player that they are in fact socially conscious. Other players, being human and thus inherently social creatures, will likely do this automatically. NPCs, however, will have to be designed with this goal in mind.

Research into NPCs that are capable of achieving better social immersion is currently fairly active, and a subject of constant development (Lankoski et al., 2011; Loyall, 1997; Mateas, 1999; Mateas and Stern, 2003; McCoy et al., 2011). By creating more believable NPCs, we can achieve better player engagement, and thus stronger player immersion.

5.1.1 Findings regarding the mechanisms of believability

In Paper III (Warpefelt, 2015), three factors¹ were elicited. These factors are what players use to identify which role an NPCs has:

- Surrounding area and location of the NPC;
- Actions taken by the NPC;
- The NPC's attributes and visual presentation.

The evaluation in terms of each of these factors is done using a number of indicators as to who and what the NPC is and what they are doing. Fernández-Vara (2011) describes how environments can be used to tell stories through the use of indicators. This also extends to NPCs, where these indicators can be used to convey similar information. As discussed by Bartle (2004) it is imperative that NPCs be perceived as persuasive, and part of this persuasiveness stems from the fact that players start to accept the world as real, as described in Chapter 2 and Chapter 3. In addition to what the player can see, i.e., the

¹It should be noted that Paper III was based purely on the aesthetic visual aspects of NPCs, and because of this there may be additional factors (for example sound and body language) that also influence the evaluation process.

previously mentioned visual identifiers, the behavior of an NPC is also one of the main identifiers for what that NPC is and what the player can expect. As mentioned in Chapter 3, the field of HCI uses the term affordances to describe the interaction capabilities of artifacts found in software. This also extends to NPCs, where the player needs to understand in what ways they both can expect and actually can interact with the NPCs found in the game. In essence, NPCs must afford the roles they are designed to fulfill.

5.2 NPCs and affordances

As discussed in Chapter 3, for players to use affordances, they must first be able to perceive them and be capable of performing the actions implied by the affordances (Mcgreneire, 2000). Although certain objects in the world may afford certain actions, these actions may not be available to the player. Mcgreneire use the example of a flat surface affording support to one player but not to others. The availability may be regulated by the physical properties of the player's avatar, such as weight and size. Similarly, NPCs will afford different actions: a merchant would afford buying or selling items, and a monster would afford fighting. These may also vary depending on the properties of the player interacting with them. The player could belong to a different faction than the NPC, thus changing the affordances of that particular NPC.

The appearance and behavior of an NPC are what clues the player in to what type of role the NPC plays within the game, but also tells them what the NPC affords. As mentioned in Section 2.3, NPCs must have both a ludic function, as well as a narrative framing of some kind for their behavior to make sense, and more specifically for it to be believable. Thus, NPCs need to not only look the part, but also behave in ways that are in line with the player's expectations and that are believable (Desurvire et al., 2004; Loyall, 1997). This is exemplified in Figure 5.1.

5.3 Believable behavior

In Paper I (Johansson et al., 2013) and Paper II (Warpefelt et al., 2013) we described a matrix that can be used to identify how, when, and where the behavior of NPCs starts losing social believability. This matrix, called the Game Agent Model (GAM), can be seen in Figure 4.2 (see p. 61). The GAM is derived from a previous model, called the Carley & Newell fractionation matrix (C&N matrix), which can be seen in Figure 4.1 (see p. 60). This model was originally adapted to the domain of digital games by Johansson and Verhagen (2011) from the original developed by Carley and Newell (1994). The



Figure 5.1: An example of an NPC that provides services. In this case, a barber from *Grand Theft Auto V*

original C&N matrix was created by combining a number of theories from sociology, all related to human behavior, and represents the behaviors that are needed for an agent's overall behavior to be seen as human-like and social. The C&N matrix was used in a number of studies (Johansson and Verhagen, 2011; Warpefelt and Strååt, 2013; Warpefelt and Strååt, 2012) to identify problematic NPC behavior. Using the C&N matrix, however, proved to be unwieldy, as it contains 80 different values and very few of these were actually evident in the games that we analyzed. The GAM was then created to alleviate some of the unwieldiness of the C&N matrix.

Using the GAM, we again studied what makes NPC behavior believable. In the papers (Johansson et al., 2013; Warpefelt et al., 2013) we sorted NPC behavior into different complexity levels, based on the levels from the C&N matrix. The GAM describes five different levels of social complexity, which can be found in situations in which agents² have to act as columns, contrasted with three levels of social competence defined by the rows of the model. The intersections of these situations and competence levels form cells where different values are gathered, initially taken from the C&N matrix but later also expanded with additional values as we identified behaviors specific to NPCs that could not be identified using the existing values. Each value identified a certain

²As mentioned in Chapter 3, agents are essentially software constructs that act by their own volition (for the given value of volition). Not all agents are NPCs, but NPCs are a type of agent.

type of behavior, for example *Adaption*. These values are related to each other, and as one moves to the right in the columns the values become more and more abstract. In fact, the values in the GAM are cumulative and thus depend on their predecessors (further left in the columns and/or further up in the rows). Thus, values in the intersection of *Interact/Cultural Historical* build on values found in, for example, *React/Multiple Agents*. The values in each cell are not necessarily related to each other, but in many cases they will identify similar behaviors (for example *Acquires information* and *Awareness* in *React/Multiple Agents*).

5.4 Findings regarding NPC believability and behavior

In general, we have found that NPCs often manage to portray believable behavior up to a certain level of complexity, after which the illusion collapses and the player's feeling of immersion suffers (Johansson et al., 2013; Warpefelt, 2013; Warpefelt et al., 2013). Due to the cumulative nature of the GAM, these results are not really surprising in themselves. A failure in an earlier type of behavior can easily cascade across the GAM, and given that problematic behaviors start showing up even in the *Single Agent* column, it is not surprising that there are failures in the columns further to the right. Given the large gap in social believability present in the behaviors described in the *Social Goals* and *Social Structural* columns, it is impressive that the static scripting of games still manages to uphold much of the feeling of believability in the behaviors found in the *Cultural Historical* column.

5.4.1 Behaviors identified as problematic for believability

The following sections will discuss the specifics of which behaviors are problematic when it comes to NPC believability, on a per-column level in the GAM (see Figure 4.2). Overall, behaviors identified by the values found in the intersection of *Act/Single Agent* are usually very well developed and portrayed with only almost insignificant issues. The values found in the intersections of the *React* and *Interact* rows and the *Single Agent* and *Multiple Agents* columns often identify behaviors that are generally portrayed in a satisfactory manner, but will often portray failures in believability. Common culprits are behaviors related to the values *Adaption*, *Acquires Information*, *Awareness*, *Models of others*, and *Memory of previous interactions*. The behaviors identified by the values found in the *Social Structural* and *Social Goals* columns were rarely, if at all, in evidence, and when they were in evidence they were almost never portrayed in a believable manner. This area represents a gap in the social capability of NPCs. The values found in the *Cultural Historical* column, however,

identify behaviors that are unexpectedly convincing. In many cases, NPCs will convincingly portray *Advertising* behavior. This believability, however, comes with a caveat. NPCs are generally able to portray these values as long as they are a part of the pre-scripted, static, parts of the game. If they are required to handle more emergent and dynamic situations, they will almost always fail to portray these values in a believable manner. (Johansson et al., 2013; Warpefelt, 2013; Warpefelt et al., 2013)

Due to the cumulative nature of the values in the GAM, the following descriptions move from right to left in the GAM. The description will start the Cultural Historical column and end with the Single Agent column.

Cultural Historical

As can be seen in the GAM (see Figure 4.2) the Cultural Historical column intersects with the React and Interact agent types, but not with the Act agent type. This is due to the fact that all the values in the column are highly related to social and cultural factors (hence the name of the column) and thus it is impossible for an NPC to portray them without being “aware” of other NPCs. The behaviors related to the values in this column relate to the creation and maintenance of social roles, institutions, and the like. They also relate to some behaviors needed to actually have these roles and institutions, such as the maintenance of norms, the sanctioning of norm violations, and other ways of exerting influence over others in the same social and cultural space.

The research for the GAM culminated with Paper II (Warpefelt et al., 2013), and in that paper we found that the behaviors indicated in this cell are rarely in evidence in the games we studied (see Paper II or Chapter 4 for details). If they were found to be in evidence, they were often portrayed in a very static manner: arising only from the scripted or embedded narrative (Calleja, 2009; Jenkins, 2004) of the game. The least uncommon value was *Advertising*, which was portrayed by merchants and similar NPCs.

Overall, the impact and quality of the behaviors related to the values in the Cultural Historical column seem to be based on the quality of implementation of the specific scenarios, as opposed to the behaviors themselves. This means that the quality of the static implementation of the game has had a larger impact than the NPCs’ ability to properly select a behavior, and they essentially work because they are marionettes rather than actors. This approach, however, carries with it some limitations. As long as the player stays within the context of the scenario as it was designed, it is likely that the illusion of the game will hold, and immersion will be maintained. If the player instead decides to act in ways not foreseen by the designer, the illusion can easily shatter, taking the feeling of immersion with it in the fall. The player’s doing something

unexpected, however, will probably cause different behaviors to fail to different extents. For example, the behaviors related to the value *Advertising* are often fairly simple to add to a game: a few animations and some sound files will usually provide the necessary illusion (Warpefelt, 2013). Other values, for example *Roles* and *Norm Maintenance*, are likely more difficult since they require a higher level of social capability on the part of the NPCs.

Unfortunately, if the NPCs are incapable of handling a changeable social context, such as the one mentioned above, the designer must impose restrictions on the game experience. Essentially, the player must be “railroaded”³ into having a certain experience, thus creating what Aarseth (2012) calls a *linear game*. With open-world, “sandbox” games becoming more common, this could potentially become a rather large issue if not taken into account.

Social Goals

The Social Goals column also intersects with the React and Interact agent types. Again, it is difficult to have a social context without being aware of other NPCs. Behaviors related to the values in this column were only extremely rarely in evidence, and when in evidence they were almost without exception tied to the scripted or embedded narrative of the game. Only very few of the values in this column could actually be mapped to NPC behavior, with *Cooperation*, *Group Conflict*, and *Team Player* being the values that were in evidence.

Many of these behaviors were identified in combat situations within the game, where enemy soldiers would help each other and cooperate against the player. Given that there is a fairly long tradition of designing NPCs with this explicit purpose in mind, for example (Orkin, 2006), this is hardly surprising. Furthermore, we have seen similar behavior from NPCs in relation to the player, for example NPCs assisting the player in combat. Again, this is hardly surprising given that there has been quite a lot of research into that area in particular, for example (Tremblay and Verbrugge, 2013). The portrayed behavior manages to be believable in that it is advanced enough to adapt within the given situation. However, the reasons for a combat situation are almost wholly contained within the embedded narrative, and thus the restrictions on the context become akin to the problem of railroading discussed in the previous section. It should be noted that many of the values here were found to be damaging to immersion not so much because of the behavior related to values here, but due to behavior related to values in lower-level columns. This is, of course, a manifestation of the cumulative nature of the GAM.

³“Railroading” is when a DM or other game controller forces the player(s) to take a certain course of action by eliminating all other options.

Social Structural

Like the Cultural Historical and Social Goals columns, this column also intersects the React and Interact agent types. As with the previous two, this is due to the restrictions on social capability inherent in the Act type. Much like the previous two columns, behaviors related to values in this column were rarely in evidence. In Paper II (Warpefelt et al., 2013), we observed evidence of *Mob Action* and *Social ranking*. The latter was, as with the behaviors in previous columns, entirely a product of the embedded narrative. *Mob action*, however, did arise dynamically. In essence, it was created by multiple NPCs deciding to perform the same or very similar actions at the same time. Given that many of these NPCs were probably driven by the same underlying code, this is hardly surprising, but still an excellent example of how seemingly advanced behaviors can arise from simple architectures. Again, many of the behaviors here failed due to shortcomings in regard to behaviors in lower-level columns, as will be discussed in later sections. Essentially, NPCs behavior generally lacks the basic capabilities needed to portray higher order behaviors such as those found in this and columns to the right in the GAM.

Multiple Agents

As with the previously discussed columns, the Multiple Agents column intersects with the React and Interact agent types, for the same reasons as before. This column seems to contain the behaviors that make up the borderlands where NPC behavior starts losing believability. Overall, the behaviors tied to values in this column are usually in evidence, although not always with a positive impact. In fact, many of the problems identified in the later columns are related to failures in believability as related to values in this column. Two commonly occurring values are *Models of Others* (Warpefelt et al., 2013; Warpefelt and Strååt, 2013) and *Memory of previous interactions* (Warpefelt et al., 2013). Failures of NPCs to remember, understand, and model other entities in the world (both NPCs as well as players) are the fundamental cause of many of the cascading problems found using the GAM.

All is not doom and gloom, however. NPCs are able to fairly convincingly portray behaviors related to *Face to face* and to some extent *Turn Taking*. These behaviors are fairly simple to implement, and can often be implemented as parts of the embedded narrative while still allowing the player some freedom to interact with the world. Handling *Face to face* is often as simple as rotating the NPCs to face the entity they're addressing and playing some animations. *Turn taking* is more difficult, but can be managed using scripted conversations or by waiting for player input.

Many of the behaviors related to values in this column are dependent on

behaviors found in the *Single Agent* column, and thus like other more advanced behaviors they fail because of a lack of prerequisite capabilities. There are also some internal dependencies in the column; for example, *Models of others* is a prerequisite for *Social interaction* and to some extent *Group making*.

Single Agent

The Single Agent column intersects with the agent types Act and React. Unlike the other columns, this does not intersect with the Interact agent type. The behaviors related to the values in this column can be performed without being aware of other agents, although they do require the NPC to have a fundamental understanding of the game world. In essence, NPCs can accomplish believability in regards to the values in this column even if they consider the world to be populated by more or less mobile rocks.

In this column, the values related to agents of the Act type are generally never problematic. They rely on self-contained behaviors that can be implemented using fairly simple technologies. Generally, the behaviors described by the values in this cell only require the NPC to be able to play sounds and animations, and perform basic navigation of the world, for example using the common A* algorithm (Hart et al., 1968).

Behaviors related to the values in the cell that intersects with the React agent type are more problematic, but for the most part work fairly well. Many of the problems we have identified in our papers (Johansson et al., 2013; Warpefelt et al., 2013; Warpefelt and Strååt, 2013) arise from limitations in representation. This is exemplified by the distinction between the values *Acquires Information* and *Awareness*. The former is the active collection of information, whereas the latter is its passive equivalent⁴. *Acquires information* thus requires that the NPC act out the actual acquisition of the information in question, and unfortunately this rarely happens. This lack of representation of a behavior makes it look like the behavior is not performed, and thus the NPC seems to be omniscient, which is likely to have a negative impact on believability.

NPCs also have difficulty adapting to changing circumstances, especially ones pertaining to the social context. They are capable of handling simpler social situations, such as combat, but for more complex interactions they will generally be found to be lacking. Even in simpler situations, where, as previously mentioned, much of the prior work has been done, they will sometimes fail to provide believable behavior, and “adapt” themselves into a situation

⁴Those familiar with the third and third-and-a-half editions of Dungeons and Dragons (DND) will recognize this as the difference between the skills *Search* and *Spot*.

where they are worse off. One common problem that we found was that NPCs would move up and occupy positions where their allies had previously been eliminated in a combat scenario. Similarly, they would be unable to detect that the player was using some sort of more advanced tactic, for example a flanking maneuver. Given very simple scenarios, however, NPCs were able to portray behavior related to the value *Adaption* in a convincing manner.

5.4.2 Conclusions about NPC behavior and its impact on believability

As outlined in Section 5.4.1, believable NPC behavior still requires that the social context of the game be strictly controlled and framed, and that there is a very strong relation with the embedded narrative, greatly relying on pre-scripted events. This leads to a “railroading” of the player, and could potentially limit the ability of games to portray more complex scenarios. With the increasing popularity of sandbox-style games, where the player is free to roam around the world and make their own story, the ability of game designers and developers to foresee all the possible actions a player can take in regards to an NPC begins to break down as the number of behaviors become subject to what is essentially a combinatoric explosion. Although there is quite a lot of research being done into the field of NPC behavior, much of it is still centered on the lower-order behaviors in the GAM. Unfortunately, for NPCs to be able to advance and become more socially capable, the focus must to some extent shift towards creating and supplying the necessary underlying technologies and techniques that will support higher-order behaviors, for example the ability for NPCs to dynamically form their own ranking systems, roles, and to abide by and maintain norms.

It is, however, important to note that not all NPCs must be able to provide the full gamut of behaviors described in the GAM in order to appear believable. In many cases, the role of a specific NPC may not require it to be very socially capable at all. In fact, games are chock full of NPCs whose only purpose is to fight the player regardless of the circumstances. As mentioned at the start of this chapter, NPCs will need to be framed in different ways depending on their role, and they will be typed as belonging to different roles depending on their appearance, placement, behavior, and many other factors. In order for roles to be used as a meaningful tool, however, there is a need for a concrete and descriptive typology using which NPCs can be described in more formal terms.

6. A typology of non-player characters

This chapter will describe the typology that has been produced as a product of the research for this thesis. This typology combines results from all the three studies encapsulated by this thesis (see Chapter 4 for details) and is intended to provide a holistic view of the different types of NPCs that we have identified in games. In essence, this chapter uses the typology from Study 2 as a frame for the understanding of the results from Study 1 and Study 3. It also uses terminology and typologies from previous research (see Chapter 3) to describe the characteristics of the different types of NPC.

6.1 The typology

The types below above all describe different functions provided by NPCs in games. The typology has three levels: a higher level with meta-types which provide an abstract description of several types of NPC, a middle level which provide more detailed descriptions of specific types of NPC, and a lower level with subtypes which provide special cases to the types.

As will be explained below, a few of these types are basically renamed versions of the types originally created by Bartle (2004). Most, however, are new creations. The types that are essentially unchanged have had the Bartle type appended in *italics* in the list below. Each of the types in the list will be discussed in detail in the following sections, starting with Section 6.4. The typology contains a number of types of NPCs, as can be seen in the list below. An alternative representation of the typology, used in Paper VI, can be seen in Figure 6.1.

- Functions
 - Vendor (*Buy, sell and make stuff*)
 - Services (*Provide services*)
 - Questgiver (*Dispense quests, or clues for other NPCs' quests*)
- Adversaries

- Enemy (partially *Guard places* and *Get killed for loot*)
 Subtype: Boss
- Opponent
 Subtype: Manipulator
- Friends
 - Sidekick (partially *Do stuff for players*)
 - Ally (partially *Do stuff for players*)
 - Companion (partially *Do stuff for players*)
 - Pet
 - Minion
- Providers
 - Storyteller (*Supply background information*)
 - Loot provider (partially *Get killed for loot*)

Metatype	Type	Subtype
Functions	Vendor	
	Services	
	Questgiver	
Adversaries	Enemy	Boss
	Opponent	Manipulator
Friends	Sidekick	
	Ally	
	Companion	
	Pet	
	Minion	
Providers	Storyteller	
	Loot provider	

Figure 6.1: The NPC typology

6.2 Type descriptions

6.2.1 Description format

Each type will be described from three perspectives:

- Functions provided within the game
- Visual presentation and placement
- Behavior

These perspectives will be interpreted using the theories presented in the previous chapters. The functions provided will be described in terms of the actual affordances, and in terms of the narrative types presented in Chapter 2. The descriptions will also link with the types described by Bartle (2004) for convenience. The visual presentation will be described using the findings from Paper III, specifically two of the categories that players use to identify NPC roles: the surroundings and location of the NPC, and the attributes and the visual presentation of the NPC. The attributes identified in this typology are essentially the identifiers for indexical storytelling described by Fernández-Vara (2011). The behavior will in turn be described in terms of the GAM described in Chapters 3 and 5.

6.3 The basic type of all NPCs

One of the types in Bartle's typology is *Make the place look busy*, which are NPCs that exist only to populate the world. These usually have no or very limited interactability and a very limited behavioral repertoire. They basically become indicators in the indexical storytelling described by Fernández-Vara (2011). When we analyzed the data we have collected about these NPCs, we found that they were more often than not defined by what they were not or what they did not have, rather than by what they were and what they had. Furthermore, all NPCs, to some extent, act as indicators in the indexical storytelling. Thus, this should not be considered a type so much as a basic feature of NPCs. For this reason, we have excluded the type from our typology.

6.4 Functions

NPCs of the *Functions* meta-type are NPCs that provide the player with access to the UI of the game through diegetic means, as well as various services that are needed to make the game playable. Players expect to encounter them in shops or other visible areas, preferably behind counters or near cash registers (where appropriate). Furthermore, they should be dressed to fit their professions: e.g., blacksmiths in fantasy games should wear roughspun shirts and heavy leather aprons and a pharmacist in a modern game should have a white coat. Additionally, their immediate areas should signal what their trade

is. Players expect these NPCs to be easy to locate and to be fairly stationary, usually roaming only very short distances. Lastly, these NPCs are rarely expected to be of a martial persuasion, and should thus be unarmed. There is a certain overlap between *Vendors* and *Services*, where some NPCs will provide both. An example of this would be a blacksmith both selling forged items and providing repair services.

6.4.1 Vendor

The NPCs of the *Vendor* type are found in many of the games, notably the ones that were RPGs or were influenced by RPG.

Functions provided within the game

The functions of these NPCs are fairly obvious: they buy, sell, and make items. They primarily take the form of vendors, who will buy and sell goods. Some of these vendors will also act out the creation of items, for example blacksmiths from *Skrim*. This type of NPC will rarely provide any active narrative connection, although they are often also of the *Questgiver* type (see Section 6.4.3 below). They do not readily map to any of the types described by Propp (1968), but in the terms of Aarseth (2012) they are very likely to be either shallow characters or bots. The former case is more common in single-player RPGs, whereas the latter is more common in MMORPGs. This type of NPC is largely unchanged from the typology presented by Bartle (2004).

Visual presentation and placement

NPCs of this type will often be somewhat visually distinctive, so as to be better visible to the player. Their attire and surroundings will match their trade. A blacksmith selling weapons and armor would therefore probably be found near a forge or anvil, with swords and armor visible in the immediate area. The NPC would be dressed in rough clothes and wear a leather apron, or other clothing commonly associated with working with hot metal. The location they're placed is often some sort of shop, and will often include the various accoutrements found in shops, such as a counter and possibly a cash register. In Paper III, it was also noted that NPCs of this type generally had some free space around them, which made them more visible.

Behavior

NPCs who buy, sell, and make stuff will generally be stationary or roam in a smaller area, making them easier for the player to find. Although often un-

armed and not of a particularly martial persuasion, they may be able to transition to the *Enemy* type (see Section 6.5.1) if attacked. Otherwise, they will at least exhibit behavior from the *Single Agent/Act* cell in the GAM, i.e., using language and tools, and basic navigation in the world. In more complex cases, they will also remember the player to a certain extent, thus acting on the *Memory of previous interactions* value from the GAM, and also be capable of basic *Social interaction* and fulfilling the *Face to face* value by turning towards the player they are addressing. This latter is more common in single player RPGs, for example *Skyrim*, than in MMORPGs. In some cases they will exhibit *Advertising* behavior, in that they will act like hawkers and yell out what wares they have available. If stolen from, they will generally act with hostility (thus transitioning to the *Enemy* type) and either call for the guards, attack the player, or both.

6.4.2 Services

Similarly to the previous type, NPCs of this type are found in many of the games, but again notably in RPGs and the like. This type has many similarities with the *Vendor* type, and in many cases they are fulfilled by the same NPCs. Although this type of NPC is very similar to the *Vendor* type, it provides a rather different function and is therefore classified as a separate type. That said, these sometimes overlap, most notably in cases where they provide repair services.

Functions provided within the game

The functions provided by these NPCs are fairly straightforward. Instead of selling the players goods, they sell services. Examples of this would be repairing the player's items, stabling their pets, transporting players, or providing them with access to secure storage (for example a bank container). As with the *Vendor* role, this has remained largely unchanged from the typology originally presented by Bartle (2004). Similarly, they do not really map to a Propp type, and they are often bots or shallow characters in Aarseth's parlance.

Visual presentation and placement

As with the NPCs of the *Vendor* type, NPCs of this type will be placed so that they draw the player's attention, something which includes extra space and the relevant accoutrements. Additionally, the NPCs will often be outfitted in such a way that their role is evident from their appearance.

Behavior

Identical to the *Vendor* type.

6.4.3 Questgiver

As with the other *Functions* types, NPCs of this type are usually found in RPGs and MMORPGs, but also in some other genres where RPG elements are common, for example the FPS *RAGE* (see Section B.8).

Functions provided within the game

The functions provided by this type of NPC are fairly obvious: they handle the quest aspects of the game. In relation to Propp's typology, this makes them *Dispatchers* or *The princess's father* in that they actually send the player on a quest. In many cases, famously in MMORPGs, they will also act as a Proppian *Helper* or *Donor*. They may transport the player to where the quest takes place, or provide them with a doohickey (magical or otherwise) that allows them to complete the quest. If the game has multi-part quest chains, they will also act as checkpoints as the player advances along the quest chain. They will also often provide the player with rewards for completing quests, thus fulfilling the Proppian role of *Donor*.

In the terms of Aarseth (2012), they can range from very deep characters central to the narrative, to simple quest dispenser bots who stand in one place and continually ask that a simple task be performed. They thus span the gamut of Aarseth's typology.

This type is very strongly related to the *Dispense quests (or clues to other NPCs quests)* type defined by Bartle (2004). In fact, it is essentially a renamed version of Bartle's type.

Visual presentation and placement

As with their siblings of the *Vendor* and *Services* types, *Questgiver* NPCs are to some extent a way of providing diegetic access to the quest UI, and thus are presented similarly. NPCs of this type are often placed in areas where they are visible, with empty space around them, and often close to "natural" routes for players. They are given clothes, equipment, and accessories that make them stand out from the surrounding area. Unlike their cousins, *Questgiver* NPCs are not necessarily artisans, but can have all manner of professions. Thus, there are few similarities in regards to the specifics of dress for NPCs of this type. That said, their appearance is usually more elaborate and unique than other NPCs, to make them stand out. This can extend to the technical aspects of

appearance, where important NPCs have higher polygon counts or more high-resolution textures than the more generic NPCs. It should be noted that there seems to be very little coherence in how *Questgiver* NPCs should be designed, and to a large extent this type seems to be indicated by UI elements.

Behavior

NPCs of the *Questgiver* type will usually remain stationary, or move around a small area, much like NPCs of the *Vendor* or *Services* types. This makes it easier for players to find and interact with them. In some cases, locating the NPC will be part of a quest, in which case the NPCs may roam over a larger area. Otherwise, their behavior will be identical to that of *Vendor* or *Services* NPCs.

6.5 Adversaries

The types associated with the *Adversaries* metatype are the hostile or opposing NPCs found in games. There are two types of *Adversaries* NPCs: The fighting *Enemy* type and the competitive *Opponent* type. These types are quite different, both in behavior and in representation.

6.5.1 Enemy

NPCs of the *Enemy* type are found in most of the games that we have analyzed, simply because combat is a very common feature in AAA games. These NPCs provide what Linderoth (2013) calls *performative challenges*, where the object of the challenge is immediately obvious and the difficulty lies in actually being able to complete the challenge. NPCs of this type will often drop loot if killed or otherwise defeated. If NPCs are attackable in a game, they will almost always transition into this type when attacked. There exists a more powerful subtype of this type, often called a *Boss*. These NPCs will be tougher, have more powerful abilities, and be more visually distinctive than their more mundane siblings.

Functions provided within the game

This type of NPC will attack the player with various weapons—be they *mêlée* or ranged—and using a variety of tactics to make the scenario challenging to the player. They basically fulfill the *Get killed* part of Bartle's *Get killed for loot* type. Narratively, these NPCs pose as opponents to the player, and could thus to some extent be classified as the *Villain* type described by Propp (1968).

In many cases, however, these NPCs are not actually fully realized characters. In fact, they are often essentially nameless soldiers or monsters. *Enemy* NPCs that are of the *Boss* subtype are sometimes *Proppian Villain*. NPCs that are primarily of this type are often of simply *bots* (Aarseth, 2012). As previously mentioned, NPCs may however transition to this type from other types.

Visual presentation and placement

In most cases, NPCs who are primarily of this role will be portrayed as actual faceless enemies. They will commonly wear masks, hoods, balaclavas or similar attires. In cases when they are not actually masked, their appearance will be very generic, often to the point of being clone-like. Furthermore, they will be equipped with indicators as to their role or profession, uniformed soldiers with weapons or monsters with fangs and claws. Where relevant, these NPCs will be armed. They will be found in various places in the game, notably often guarding something or hindering the player from progressing further in the game. If they are of the *Boss* subtype, they will likely have a higher degree of graphical fidelity than the average thug, with more elaborate gear. *Boss* characters will also often be bigger than average, and will be placed alone or with a few companions in an arena-like area. In some genres, for example RTS games, these NPCs often take on non-human forms, for example, as vehicles.

Behavior

NPCs of this type will generally attack the player on sight, and in some cases they will even seek out the player to attack them (common in RTS games). The player should be able to dispatch them fairly easily, although not too easily. NPCs of the *Boss* subtype will be more difficult to dispatch, and will often exhibit more advanced behaviors in terms of combat. They will use more complicated tactics, and use more advanced abilities when they fight the player.

They are overall capable of convincingly portraying behavior from the *Single Agent* column in the GAM, and will sometimes successfully portray behaviors from higher-order columns, famously *Mob action* or *Cooperation* from the columns *Social Structural* and *Social Goals*, respectively. This type of NPC will generally be able to adapt to what the player does in combat, thus fulfilling the requirements of the *Adaption* value. That said, they are also somewhat prone to failure in terms of this value, and this has a cascading effect that also impacts higher-order behaviors, for example *Models of others* and *Crisis response*. Furthermore, in many cases, their believability may be adversely affected by the NPCs's not properly acting out behaviors related to the values *Acquires information* and *Awareness*. These NPCs will often seem either completely oblivious until actively provoked, or will seem to have an almost

superhuman detection ability. In order for the behaviors related to these values to seem believable, they must be acted in such a way that the player understands why they were detected. This is especially important in games with stealth elements.

6.5.2 Opponent

NPCs of the *Opponent* type providing mechanical challenges are found in many games, but feature prominently in games where combat is not the main mode of conflict, or not present. In our research we primarily encountered these NPCs in racing games. There exists a subtype of this type, the *Manipulator*. These NPCs provide mechanical challenges to the player by performing social manipulation and trying to trick the player.

Functions provided within the game

These NPCs will act in ways that make it more difficult for the player to perform challenges that require them to manipulate the game mechanics, for example movement or timing puzzles, or complicated social situations. In terms of connection to the narrative, these are much like their combat brethren, in that they could possibly portray the *Villain* as described by Propp (1968). In general, we have found that this type of NPC will usually be a faceless “enemy,” and in many cases (for example racing games), they are not necessarily even humanoid. The faceless *Opponent* NPCs probably have little impact on the actual narrative, and thus do not really qualify as a Proppian *Villain*. *Manipulator* NPCs however, work within the social realm and can thus take on a more important role in the narrative. In most cases, *Opponent* NPCs are usually just *bots*, although there are some exceptions. Famously, *Donkey Kong* from the eponymous 1981 Nintendo arcade game (see Section B.5) would provide a mechanical challenge by rolling barrels downhill for the player to dodge, and could perhaps qualify as a *shallow character* (Aarseth, 2012). He also qualifies as a *Villain* in Propp’s typology since he is explicitly pointed out as the “bad guy” in the narrative. Similarly, *Manipulator* NPCs will probably need to be more advanced in terms of social behavior in order to be perceived as believable.

Visual presentation and placement

NPCs of this type will usually be bots, and thus, like their combat cousins, be fairly anonymous. Often they are simply represented by fairly generic vehicles or cloned enemies. Exceptions exist, but are strongly tied to the narrative importance of the NPC. This is most relevant for *Manipulator* NPCs.

Behavior

NPCs of this type will then either hinder the player from moving, chase them, or force them to alter their plans. These NPCs will affect performative challenges (Linderoth, 2013) but can also affect explorative challenges (Linderoth, 2013). Overall, their behavior is as capable as NPCs of the *Enemy* type.

Manipulator NPCs, however, will often exhibit more complex behaviors. They generally exhibit behaviors from the *Cultural Historical* column, and since their main purpose is to deceive the player they need to be perceived as more socially capable than other *Opponent* NPCs.

6.6 Friends

These types of NPCs represent the player's various companions, or, to some extent, squires. They help the player with various tasks, and act as the general allies in the world. In some cases, they also provide the player with a greater narrative connection or an ability to better express their character. There are five types of *Friends*: *Sidekick*, *Ally*, *Companion*, *Pet*, and *Minion*.

6.6.1 Sidekick

NPCs of this type are evident in most games where there are quests, for example RPGs. However, they also occur in games from other genres, for example *Elizabeth* from the FPS *Bioshock Infinite* (see Section B.1).

Functions provided within the game

NPCs of the *Sidekick* type provide the player with help through advice, directions, and resources. This can be done both in combat and out of combat. In the typology of Propp (1968), this would equate to a *Helper* in that they provide assistance or transportation. Basically, the role of this type of NPC would be to provide the player with help that isn't directly related to fighting enemies. This type of NPC also does this autonomously, and cannot be directly controlled by the player. This makes it similar to the *Ally* type, but with the difference that this type of NPC does not actually fight in combat and that they have a much higher level of narrative connection.

In terms of Aarseth's typology, this type of NPC requires a level of narrative connection that exceeds that of simple *bots*. Thus, an NPC of this type will be either a *shallow* or *deep character*.

In terms of (Bartle, 2004) types, this type is somewhat related to his *Do stuff for players* type, although it does not encompass the more active parts of

the type described by Bartle, instead focusing on the non-combat aspects of the type.

Visual presentation and placement

Given that they are often more narratively connected than the average faceless enemy, this type of NPC will be more visually elaborate, and ideally placed where the player will find them, much like NPCs of the *Questgiver* type.

Behavior

NPCs of this type will probably refrain from combat, but still react to what other NPCs and the player are doing. Because of this, they need to exhibit behaviors associated with values in the *React/Multiple Agents* cell in the GAM. Because of their design criterion, i.e., assisting the player, they will probably also qualify for *Team player* in *Interact/Social Goals*.

6.6.2 Ally

NPCs of this type were found in many games, but primarily in RPGs, MMORPGs, and FPSs.

Functions provided within the game

This type of NPC is essentially a friendly version of the *Enemy* type. NPCs of this type will fight much like their hostile siblings, but with the intent of helping the player. In many cases these NPCs are primarily put there for narrative reasons, and their actual impact on combat is negligible. In other cases, they actually fight together with the player, heal them, and inflict additional damage. The important thing to note here, however, is that NPCs of this type act autonomously, and are not in any way controlled by the player.

In terms of the typology created by Propp (1968) this type of NPC could be a *Helper* in that they assist the player. This will be generally be the case, since most of these NPCs will be *bots* (Aarseth, 2012). If one of these NPCs were to be elevated to one of Aarseth's more advanced character types, however, they could potentially rise to be a Proppian *False hero*, and become the player's rival or reluctant ally.

In essence, this acts as one half of Bartle's *Do stuff for players*, in that the NPCs of this type will assist the player in combat. Note, however, that these NPCs are autonomous, a distinction not made by Bartle's type.

Visual presentation and placement

Generally NPCs of this type will be generic in appearance, and not placed in such a way that the player's attention is drawn to them. If, however, these NPCs are given a larger narrative role they will also be given more distinctive identifying markings, clothing, equipment, and the like.

Behavior

As with the *Enemy* type, the requirements for believability are fairly low—mostly centered around the *Single Agent* column. In addition, they must be better able to differentiate friends from foes, which could imply an understanding of *Clan Wars*, *Cooperation*, or *Team Player* (*Interact/Social Goals* in the GAM). If the NPC instead is of the more narratively advanced type, they will also need to be able to exhibit *Power Struggles* and similar values. In practice, this means that NPCs of this type will follow the player's lead in most situations, and wait before advancing to the next area or stage. In order to cement their role as a warrior, they may fulfill some traditional warrior tropes, such as boasting about their fighting prowess or emitting a fierce battlecry.

6.6.3 Companion

This type of NPC is generally found in games where companions are common, for examples RPGs and MMORPGs.

Functions provided within the game

Functionally, this type of NPC is very similar to the *Ally* type, with the main difference being that these NPCs can be controlled by the player, either directly or by giving orders. In all other aspects, they are functionally the same as the *Ally* type. This means that they are often Proppian *Helpers*. Additionally, these NPCs are more likely to be important to the narrative, and thus more often reach the more advanced character types described by Aarseth (2012). In terms of Bartle (2004) types, this is another aspect of the *Do stuff for players* type.

Visual presentation and placement

These NPCs are generally more narratively anchored, and are thus often given more distinctive appearances and unique names. Otherwise they will be designed similarly to *Ally* and *Enemy* NPCs. In some cases these NPCs are summoned by the player, and may take on various appearances.

Behavior

These NPCs generally behave as NPCs of the *Ally* type, but their focus is solely on helping the player. They will in most cases follow the player around unless specifically ordered not to. Their actual behavioral repertoire will differ, depending on what type of character they are supposed to be. A demonic companion may for example shoot fireballs, whereas a tiger would claw at enemies. In some cases, the companion can be a pack mule and carry items for the player.

6.6.4 Pet

NPCs of the *Pet* type exist to provide the player with the ability to express themselves and to customize their character. They are very commonly found in MMORPGs, but can also be found in other games. They are often available as downloadable content or additional purchases for games, and are quite often collected as vanity items.

Functions provided within the game

A *Pet* NPC does not fulfill any functions within the game beyond letting the player express themselves. They have no narrative impact, and thus do not belong to a Proppian type. As for the types of Aarseth, their behavior is simple enough for them to never need to be anything beyond a *bot*.

Visual presentation and placement

Pet NPCs are often small and cute, and look harmless. They are often comedic and whimsical in nature (for example a seagull) or serve as a fourth wall breaking reference to other parts of the game or franchise.

Behavior

These NPCs follow the player around, but do little else. They do not engage in combat and are often immune to damage.

6.6.5 Minion

NPCs of the *Minion* type are almost exclusively found in strategy games, notably RTS games. They are the units created by the player, and are essentially mass-produced and disposable avatars.

Functions provided within the game

These NPCs are the entities by which the player in a strategy game try to achieve victory. They essentially occupy a strange middle ground between NPC and *avatar*, where they represent the player's physical representation in the game world, but are not their singular representation.

Depending on their type, they will fulfill different functions within the game, for example being defensive or offensive units. Due to their limited impact on the narrative of the game, and their inherent disposability, they do not really fit into the typology created by Propp. In Aarseth's typology, they are essentially *bots*, in that they are extremely generic and almost wholly faceless.

Visual presentation and placement

Although there are humanoid versions of this type of NPC they are often exist in the game world in non-humanoid forms, for example as vehicles. Players often identify the allegiance of this type of NPC based on the color coding on the NPC, but will infer abilities from the visual representation, for example, assuming that a unit that looks as if it is heavily armored will be tough, and that a unit with a large gun will do a large amount of damage.

Behavior

These NPCs will act with some manner of autonomy, and enact the role they are visually constructed to represent. Their behavior can, however, be wholly or partially controlled by the player. In most cases, players will give them abstract orders such as "Guard this spot" or "Go here," and these NPCs will sometimes to some extent try to follow these orders with some semblance of volition. This could include things such as attacking hostile entities that they encounter.

NPCs of this type need to be able to gather information about the world and understand what other entities in the world are, so they will have to be able to portray some of the behaviours in the intersection of *Single Agent* and *React* in the GAM. As with the *Enemy* type these NPCs could be said to portray higher-order behaviors such as *Mob action* or *Cooperation* in that they belong to a certain side in a conflict.

6.7 Providers

The *Providers* meta-type is largely a carry-over from the original typology established by Bartle (2004). These types were not clearly identifiable as independent types based on our respondent data, but we know that they exist, and

are fairly often in evidence, based on our previous studies, for example, Paper IV (Warpefelt and Verhagen, 2015). For this reason, it was decided to include these types in the typology.

6.7.1 Storyteller

This type of NPC was evident in most games where one would actually find humanoid NPCs, or at least NPCs that behave as sentient beings and are interactable.

Functions provided within the game

NPCs of this type perform the active role of providing the player with key snippets of narrative, helping them build their alterbiography¹ (Calleja, 2009). This is of course in addition to the basic narrative impact all NPCs have, as described in Section 6.3.

These NPCs can take many forms in the typology created by Propp (1968), and pretty much every interaction with an NPC has the potential to portray some narrative exposition, and it can be delivered piecemeal by different NPCs. In fact, the player may also be given narrative exposition if their avatar has a monologue or speaks to another character in the game.

In terms of the types described by Aarseth (2012), this type of NPC will less usually belong to the *bot* type, but will instead be a *shallow* or *deep character*. Although it is feasible that one of the *Bots* could deliver narrative exposition, doing so is likely to provide at least some back story for the character, thus rendering them if nothing else a borderline case for at least a *shallow character*.

In relation to Bartle's original type *Supply background information*, this type is more aimed at providing clues to the scripted narrative (Calleja, 2009) of the game. Instead of providing background, the focus is to provide the player with the narrative anchoring, which need not necessarily be things that have happened in the past, but also very current events and things that need immediate attention.

Visual presentation and placement

Because this type can be instantiated by pretty much any character, it is impossible to provide visual identification information. It should be noted that in Paper IV (Warpefelt and Verhagen, 2015) we determined that this type often

¹The concept of the alterbiography was described in Chapter 3.

coincides with the type *Questgiver*, which means that these NPCs will in some cases have unique appearances and perhaps more visible placements.

6.7.2 Loot provider

The *Loot provider* type is a difficult one to describe. Basically, this is a function that can be provided by any NPC, and thus there is very little to be said about it in regard to defining characteristics. In many cases, NPCs only provide loot after they have been killed or otherwise removed as an active agent. It should be noted that there is a large co-occurrence between NPCs of this type and NPCs of the *Enemy* type, as described by Bartle (2004).

6.8 Discussion

The typology described in this chapter does provide a deeper and more complete understanding of NPCs and their different roles than the separate parts that it encapsulates. This also allows us to understand NPCs as the holistic constructs that they are, rather than as individual components in different sub-systems. The whole is greater than the sum of its parts, as it were.

In terms of behavior, we have identified the areas in which NPCs tend to fail to uphold believability. Based on the content of this chapter and Chapter 5, and as show in Figure 6.2, we see that there exists a gap in the social capabilities of NPCs. Basically, this represents the area where the NPCs we have studied are incapable of changing with the social context and upholding social believability. It should be noted that the *Cultural Historical* column in the GAM presents an interesting aspects of this problem. NPCs are somewhat capable of portraying behaviors from that column, but only in very static contexts. Fortunately, many of the behaviors exhibited in relation to the values in this column are framed in such a way that they can be portrayed as a pre-scriptedd event and still be perceived as believable. This lessens the need for NPCs to be adaptable to new social contexts, and makes them seem more believable.

This typology also identifies the different indicators used to describe the types of NPCs that exist within games. This provides insight into how players would identify the relevant NPCs, and by extension how this would color their expectations of them in terms of affordances and behavior. Basically, it allows us to design NPCs as HCI artifacts.

Lastly, the typology also identifies the roles these different types of NPCs take in the narrative in relation to the framework described by Propp (1968), as well as the level of agent complexity required as described by Aarseth (2012). What this teaches us is that there are some cases where these typologies allow

	Single Agent	Multiple Agents	Social Structural	Social Goals	Cultural Historical
Act	Goal directed Route following Uses language Uses tools	N/A	N/A	N/A	N/A
React	Adaption Acquires information Crisis response Interruptability Awareness Models of self Rapid emotional response Navigation	Learns from others Models of others Turn taking	Class difference Mob action Social ranking	Disillusionment	Advertising Institutions Roles
Interact	N/A	Face to face Group making Social interaction Memory of previous interactions	Coercion	Clan Wars Cooperation Group conflict Patriotism Power struggles Team player	Etiquette Norm maintenance Sanctions

Figure 6.2: The Game Agent Model (GAM) with the different areas of capability marked. Green = high believability, yellow = medium believability, orange = limited believability, red = only occasional believability

us higher descriptive power, but unfortunately also that some of the NPC types that act more as diegetic UI than characters are difficult to describe in terms of Proppian types. Aarseth's typology, however, provides us with an interesting insight into how computationally complex and narratively connected these NPCs need to be in order to be perceived as believable. This shows that not all NPCs are created equal, and that some are essentially "disposable" in terms of the narrative.

Unfortunately this typology may, all in all, also suffer from the problems related to the design patterns described by Žavcer et al. (2014). The types are very similar to patterns, and may vary between too formal and too informal. Although this has been somewhat alleviated by applying the formalization techniques behind the *design pattern canvas* introduced by Žavcer et al., the question of quality raised by Alexander et al. (1977) may still be present. Because of this, the types described in this chapter may need to be further contextualized to be given greater dependability. For this reason, I have introduced the model described in the following chapter.

7. A model of non-player characters

This chapter describes a model of NPCs, originally presented in Paper VI (Warpefelt and Verhagen, 2016a). The NPC model describes how believability arises in the combination of different NPC types as set in different situations. Thus, it builds on parts from the theories in the previous publications, as will be explained in this chapter.

7.1 Structure

The NPC model is a two-dimensional model, and can be found in Figure 7.1. It is derived from the GAM (see Chapter 4 and 5 for details), and uses the agent capability types from the GAM as the rows, and the narrative types described by Jenkins (2004) as the columns. The cells of the model describe the intersection of the agent complexity with the level of behavioral emergence that the NPC is capable of portraying. These cells have been populated with the types from Chapter 6, where each type or subtype is mapped to a certain cell, depending on what level of behavioral emergence is required to portray them. As with the GAM, the NPC model is cumulative. This means that an NPC type must not only be able to fulfill the behaviors associated with the cell it is in, but also those of the cells above that cell. Unlike the GAM, it is independently cumulative across the columns. Hence, an NPC type in the cell *React/Embedded* must be able to perform all the behaviors related to the *Act* and *React* cells in the embedded *Embedded*, but not the *Emergent* column. A type in *Interact/Emergent*, however, needs to perform the behaviors from both columns. A type in the *React/Emergent* column, however, needs only be able to perform the behaviours associated with *Act/Embedded*, *Act/Emergent*, *React/Embedded*, and *React/Emergent*.

The agent types from the GAM were chosen because they provide us with the level of social capability for each level, and allow us to connect to values in the GAM. The narrative types described by Jenkins (2004) allow us to differentiate between behaviors that are a part of the designed experience of the game, such as pre-scripted behaviors, and behaviors that arise dynamically

as the game is played. This division was chosen over that of Calleja (2009) due to the fact that Calleja's concept of the autobiography requires a higher degree of assumption about the player's interpretation, whereas the distinction between embedded and emergent behaviors is more easily identified.

The model described in this chapter provides a description of how these NPC types achieve believability, and what type of social complexity they are required to, and capable of, portraying.

7.1.1 Embedded and emergent behavior

As mentioned, this model uses the terminology established by Jenkins (2004) to distinguish different types of behavior. Jenkins uses these terms to differentiate the parts of the narrative that have been implemented by the game developer (the embedded narrative) from the parts that arise as the player plays the game (the emergent narrative). In this model, we use the term *embedded* to describe the parts of the social structure that have been implemented by the developer, and the term *emergent* to describe the parts that arise from gameplay. Basically, being emergent means that the player can have a meaningful effect on the social context. This would, for example, mean being able to make characters switch factions or use social manipulation instead of brute force. In many cases, especially combat, we see behavior that may seem to be emergent (NPCs reacting to and adapting to the player) but that is in fact inherently embedded. Although a case could be made for combat situations being inherently emergent, the social context is often immutable in that enemies are enemies, allies are allies, and hostilities are very much constructed by the embedded narrative of the game. The player cannot really influence this distinction, and thus the *social context* is inherently embedded.

It should also be reiterated that this model defines the bare minimum an NPC needs to be able to perform in order to be perceived as believable. Thus, it is fully possible that there are in fact games where the social situation is changeable in regards to predefined factions (one possible example could be *Crusader Kings II*, as described in Section B.4). These games, however, have already attained a higher level of social capability than the bare minimum.

7.2 Cell descriptions

The cells in the NPC model will be described starting with the rows (*Act*, *React*, and *Interact* agents) and how each of them intersect with Jenkins's narrative types (*Embedded* and *Emergent* contexts). Each cell contains a number of types from the typology described in Chapter 6, where the placements represents the minimum required complexity to successfully implement a believable

	Embedded	Emergent
Act	Vendor Services Storyteller Questgiver Pet	
React	Ally Enemy Opponent Minion	
Interact	Sidekick Companion Manipulator	

Figure 7.1: The NPC model

version of this type of NPC. It is fully possible that there are more advanced of examples of these NPCs, but this model only presents the bare basics.

7.2.1 *Act*

The *Act* agent type describes very simple behaviors. To be able to perform these, an NPC does not need to be aware of any other agents in any way, they simply need to be able to perform a number of very simple functions.

Embedded

This cell represent the most basic type of NPC. As its being placed in this box indicates, the NPC will perform simple actions when prompted by some kind of outside stimuli, but does not need to be aware of the existence of other agents.

In this cell we find types normally related to many of the diegetic UI functions provided by NPCs, namely *Vendor*, *Services*, and *Questgiver*. These NPCs need to minimally stay in one place or area, and provide a UI pop-up when interacted with, maybe using some basic tools and providing some sound cues so as to better connect them to the narrative. This can then be used to give the player access to goods, services or quests. Although these NPCs are likely to benefit from a more advanced implementation, e.g., *Questgiver* NPCs, they will still be able to fulfill their role with just a bare-bones implementation. We also find the *Storyteller* type in this cell, based on the fact that at the bare min-

imum such an NPC must provide some narrative exposition through the use of language. They need not necessarily interact with the player: they only need to regurgitate pre-defined lore when prompted to do so.

It should be noted that although the *Pet* type can be said to be more capable of navigating the world than is implied by the *Route following* value, the navigation is only aimed at following the player. Thus, a *Pet* NPC would not exhibit any degree of volition in their own movement, and their movement is essentially *Route following* with regards to a mobile goal.

Emergent

No types strictly match this cell. In fact, it is unlikely that there are any.

7.2.2 *React*

The *React* agent type largely represents the bulk of what NPCs are capable of portraying both in an embedded and an emergent context. The vast majority of the NPC types will be located somewhere in this row.

Embedded

This cell represents the most commonly occurring social capability that one will experience when interacting with NPCs. In this cell, we find almost all combat-related NPC types. These NPCs exhibit behaviors related to the *Single Agent* column of the GAM, which is to say that they exhibit a basic ability to discover, react to, and take action with or against other entities in the world. In some cases, we also see that they are capable of portraying more advanced behaviors, such as modelling the intentions of others or understanding very basic turn-taking in social interactions. They do not, however, portray convincing, deep, and complex social interaction. Nor do they need to. They are often simply there to provide the player with opponents or enemies, or to make the world feel more alive by acting as allies or minions to the player. Although their behavior is very much emergent in terms of the game mechanics, their actual *social* emergence is low. In most cases, these NPCs are portrayed in very static ways, and have a predefined allegiance that will not change in any meaningful way. In most cases, these NPCs also need to be defeated by force, rather than by guile or social influence. Providing players with access to the latter two types of interaction would have the potential to make some genres, for example stealth games or RPGs, more enjoyable and give them greater social depth.

Emergent

Although some values may approach this level of complexity NPC (notably enemies in later FPS games) it does not pose a bare minimum for believability. Instead, it should be seen as the desired end state for many of the NPC types, especially the *Enemy* and *Opponent* types. This would involve making them better able to model the intentions and desires of other agents, and to provide them with an understanding of who is on which side. Currently, this is largely pre-defined by the embedded narrative, and does not arise emergently.

7.2.3 *Interact*

The *Interact* agent type represents the forefront of what NPCs are capable of portraying. Most of the types from the typology do not require this level of sophistication to be recognized as believable, but can often benefit from it. Particularly rare is an NPC that can portray *Emergent* behavior that requires an *Interact* agent.

Embedded

This level of complexity is rarely found in games, and as a result many NPCs of the *Companion* type are found to be lacking in believability. In particular, the failing point is often the *Memory of previous interactions* value from the GAM. Given that *Companion* and *Sidekick* NPCs spend so much time with the player, they will need to fortify the social interaction by discussing previous encounters and interactions in order to be believable as a social creature. This is largely due to the inherent narrative connection. Note, however, that these NPCs need not be able to change their social allegiance to the player of their own volition, and thus they need not be able to portray *emergent* social behavior.

The *Manipulator* subtype is a very interesting case. It is the type that would probably benefit the most from being able to carry out *emergent* social behavior. In many cases the interview subjects in *L.A. Noire* (see Section B.7) come close to crossing the border between embedded and emergent behavior, but due to their very limited scope and their fairly limited interactability they do not quite make the transition.

Emergent

This cell basically contains no NPC types. In most cases, types related to this cell would need to be able to perform a wide range of behaviors, primarily those related to direct social interaction with the player. For example, they

would need to emergently interact with the player in some form of social exchange, for example a conversation. This involves being able to follow the etiquette demanded by the situation, and to obey the norms and to sanction any violations of the norms. We have not been able to identify a fully convincing and generally capable version of this type of NPC, although, as mentioned, some of the interview subjects from *L.A. Noire* come close.

There is the possibility that some NPCs of the *Enemy* and *Ally* type can transition into this space, in that they will be able to better perform behaviors related to *Cooperation*, *Team player*, and *Patriotism* as defined by the GAM. This, however, is currently something that is far off.

7.3 Discussion

As described in Papers I and II (Johansson et al., 2013; Warpefelt et al., 2013), NPCs are largely capable when it comes to simple tasks, but lack the capacity to perform more socially complex behaviors. As can be seen in the model (see Figure 7.1) and the descriptions above, NPCs are still largely focused on portraying the behaviors that are strongly correlated with the embedded social context of the game. Although some advances have been made, these are either very much limited in scope (for examples the interview subject in *L.A. Noire*) or not very convincing (*Enemy* and *Ally* NPCs). Although this model could be interpreted as painting a rather bleak picture, it should be noted that the placement of the various types only indicates the minimum behavioral complexity needed to achieve believability. Although this requires that the social context also be designed in certain ways, it does not mean that these NPCs will destroy the gaming experience for most games on the market. Instead, it should be seen as encouraging that some NPC types are moving towards being capable of more complex behaviors, even if the change is slow and gradual. If games continue to develop, and new game genres with more social content arise, it is very possible that we will see new NPC types arise that can fill up the empty cells in the *Emergent* column, or maybe see some of the old types migrate to the right as players' expectations rise.

8. Conclusions

This chapter contains the conclusions of this thesis. The thesis describes a theoretical work, aimed at providing a more complete understanding of what NPCs are, what makes them believable, and in what ways they impact immersion.

8.1 Research questions

In Chapter 1 we introduced three research questions:

- Q0. What makes a non-player character believable?
- Q1. What types of non-player characters exist within games?
- Q2. What are the design elements of different non-player character types?
- Q3. In what ways do players perceive and determine the type or types of a non-player character?

Each of these will be explored below. Since Q0 is the overarching question from which all the other questions stem, it will be discussed last.

8.1.1 What types of non-player characters exist within games? (Q1)

This question can be said to have been quite thoroughly answered by the typology provided in Chapter 6. Although there is always room for improvement, this typology should be able to describe the NPCs players encounter in current games. The work was primarily done in Paper III (Warpefelt, 2015), Paper IV (Warpefelt and Verhagen, 2015), and Paper V (Warpefelt and Verhagen, 2016b). It was completed in this thesis, as shown in Chapter 6. This typology has also been used to frame the answers to the further questions.

8.1.2 What are the design elements of different non-player character types? (Q2)

This question has been explored in Paper II, Paper III, and Paper V. It has to some extent been answered, but more work is needed for this question to be

completely answered, as discussed in Section 8.4 below. The results of the research into this question have been presented as a part of the typology in Chapter 6. Specifically, we have developed a method for describing the believability of NPCs in Paper II (Warpefelt et al., 2013) and used that method to provide descriptions in relation to the roles described in the typology in Chapter 6. In Paper III (Warpefelt, 2015) we identified a number of characteristics of different NPC types, which gave us an understanding of the ways players observe and understand characters. This could then be used in Paper V (Warpefelt and Verhagen, 2016b) to further identify the criteria found in the player descriptions of types.

8.1.3 In what ways do players perceive and determine the type or types of a non-player character? (Q3)

This question was primarily answered in Paper III (Warpefelt, 2015), where we identified the three criteria by which players visually identify what type of NPC they are looking at: surroundings and location of the NPC, actions taken by the NPC, and the NPC's attributes and visual presentation. Using these criteria we have been able to describe the identifying characteristics that separate the different NPC types from each another. Additionally, we have also applied the results from Paper I (Johansson et al., 2013) and Paper II (Warpefelt et al., 2013) to also provide behavioral understanding. This was collated in this thesis, and presented as part of the typology in Chapter 6.

8.1.4 What makes a non-player character believable? (Q0)

This is the main question of this thesis, and it encapsulates the research done into all three questions above. In essence, the abstract answer to this question can be found in the theoretical background given in Chapters 2 and 3 of this thesis. This answer, however, only scrapes the surface of what actually makes an NPC believable, and leaves out much of the specifics. Fortunately the research into Q1–Q3 provides us with the specifics of how believability is created, and in what ways NPCs can achieve believability. The model found in Chapter 7 further provides us with the actual contextualisation of the different contributions in this thesis: specifically the GAM (described in Chapter 5 and the typology (found in Chapter 6). By bridging these results we gain a deeper understanding of how believability is created, not only on an abstract level, but also in relation to specific design elements.

8.2 Theory versus practice

This thesis has taken the theoretical approach to describing NPCs, but it would also have been possible to attack the problem from a more practical standpoint. This would then involve implementing and testing different types of NPCs, and experimenting with NPC behavior, appearance, and representation. During the research for this thesis, there was an initial attempt to do this. Unfortunately, the implementation turned out to be more difficult than anticipated due to the requirements of the NPC implementation not having been sufficiently explored—in particular, in what ways different NPCs can be expected to behave, and in what ways this should be represented in a gaming prototype. This then led to this more theoretical approach, which is intended to provide the basis needed to actually realize more believable NPCs.

Although it may have been possible to create a scaled-back prototype, this would have greatly lessened the dependability of the results, since many of the key components of believability and immersion would have been lacking in representation or fidelity. This could potentially also lessen the level of transferability and credibility since the research would have been performed in a context very different from the big budget, commercial games studied in earlier research (for example Papers I–V and their predecessors). That said, there exists a fairly substantial body of work on how to procedurally generate believable NPCs for games in these smaller contexts, for example the work done by Holmgård et al. (2014). If the research presented in this thesis can be integrated with the approaches from the Procedural Content Generation (PCG) community, we could potentially see a dramatic increase in the ability to procedurally generate believable NPCs that can act in more complex contexts, for example the aforementioned big-budget games.

Ideally, these results would also be of use for the game industry, since it would allow them to computationally generate characters for their games, thus saving on development costs.

8.3 The state of NPCs

In the work done for this thesis we have found that NPCs are capable of being believable. This should not come as a surprise to anyone familiar with modern video games. That said, we now know to what extent they are capable of fulfilling their roles, and in what ways their roles are perceived.

In modern games, NPCs have achieved a visual, aural, and animatory fidelity that is all-around excellent. As previously mentioned, they are capable of portraying believable behavior. Unfortunately, this level of believability is only achieved in fairly restricted social contexts, and thus largely restricted to

social contexts that can be heavily pre-scripted.

The way NPCs are designed is also very much tied to what their intended purpose is in the game, as can be seen in the typology described in Chapter 6. There seems to be a certain design language to NPCs: designers often design NPCs to act in similar ways if they are of a similar type. This is also evident across games in the same or similar genres, and to some extent also between very different genres. It is unknown if this phenomenon arises by pure chance, or if NPCs are consciously designed in certain ways.

8.4 Future work

The work done for this thesis has provided quite a lot of insight into the characteristics of NPCs, but that does not mean that it is the definitive answer to the question of exactly what NPCs are. As with all studies, there is still work to be done.

There are several paths for progressing further from the research described in this thesis. From Study 1, we have learned that NPC behavior can be deconstructed using structured observations, and that it does fall into certain categories that are interdependent. That said, the descriptions we identified in Study 1 are probably too abstract for an actual implementation of an NPC and for use in combination with PCG. The “glue” needed to marry these two approaches is still missing. Therefore, an analysis of the “micro behaviors” that make up the more complex behaviors described in the GAM, for example *Adaption*, would greatly help in creating more socially believable NPCs. This is currently a subject of research in the field of Believable Agent (BA), for example by Dignum et al. (2013), and further research into this subject would thus steer the research more towards that area. This path of research would also be greatly strengthened if game industry designers could be involved. This would allow us to identify how design issues with NPCs are solved in the current practice of the game industry. This would probably both hasten the development of the technology as well as strengthen the end product.

The typology of NPCs that was produced for Study 2 could be regarded as fairly comprehensive, but as with any categorization, it will result in some abstraction that may not correctly reflect the world. It will also, much like the preceding work by Bartle (2004), age and perhaps become outdated. Thus, it would be best to regularly revisit this typology in order to keep it updated to the current standards found in games. That said, the typology created by Bartle was still very useful even a decade after its inception, and only really suffered due to the great paradigm shift in online games from MUDs to MMORPGs.

Study 3, which deals with the design elements of NPCs, is by far the least developed of the three. Although it has a fairly large theoretical grounding, it

only captures the after the fact perspective of NPC design, and it would greatly benefit from a more holistic perspective. Including game designers in this research could shed much additional light on how NPCs are designed—not only from the perspective of the player but also from the perspective of the designer. In addition, this would allow us to map the intended designs to their outcomes, something that would probably be of extreme usefulness to the gaming industry as a whole. Furthermore, as mentioned in Chapter 4, UI components may influence the player’s understanding of NPCs, and this is something that must be explored. Ideally this should be done by ascertaining to what extent UI components will affect the player’s interpretation of an NPC, and then examining in what ways UI components affect the interpretation. Furthermore, it would be beneficial to see what would be the effects of conflicting UI component and NPC attributed indicators. It is also possible that overly intrusive UI components may in fact be immersion breaking, and that diegetic indicators may be more conducive to an immersive game experience. Thus, this is an issue that requires close scrutiny.

Finally, this thesis presents a view that is very much focused on the European, and to some extent US, perspective of NPCs. It is very feasible—perhaps even likely—that other demographics will interpret NPCs differently, especially with regard to visual representation and what constitutes socially believable behavior. As described by James and Fletcher (2015), genre preferences vary between cultures, and it is therefore not unfeasible that this would also extend to the way game design elements are understood.

If the research described above is performed, the types found in the typology in Chapter 6 could be used as categories of NPCs that can be generated. By identifying the various design attributes of these NPCs and their various combinations, one can use the inherent nature of combinatoric explosion to create a wide variety of varied NPCs from a fairly small data set. Furthermore, it is entirely possible to apply this to various other parts of the game, for example using the grammar introduced by (Propp, 1968) along with the types of the NPC typology to create in-game narrative. This avenue of research could potentially be very useful for game designers within the games industry, and certainly warrants further exploration. In addition, the development of generated NPCs carries with it the potential for creating new NPC types that can populate the *Emergent* column in the NPC model found in Chapter 7.

8.5 Concluding remarks

On examining NPCs from a fairly large number of games, over a large period of time, it is evident that the believability, social ability, and immersion-strengthening aspects of NPCs have improved greatly over the last decade or

so. Furthermore, games have become even larger productions, rivaling even Hollywood movies in income, with games such as Rockstar's *Grand Theft Auto V* hitting sales figures in excess of US\$1 billion (IGN, 2013). Unfortunately, these enormous productions are also very expensive, with *Grand Theft Auto V* costing UK£170 million (approximately US\$260 million) to develop and market (The Scotsman, 2013). Producing the vivid and living worlds that are common in modern-day video games is extraordinarily expensive, and failure to reach sales figures fast enough can lead to the demise of a studio. Thus, each of these projects carries with it a huge risk for the developing studio.

Much of the risk, however, can be mitigated using technology. The gaming industry has long used PCG to create content for games, famously through the use of the vegetation generating algorithm *SpeedTree* (IDV, 2015). If used to dynamically create social content and living worlds, NPCs could hold one of the keys to strengthening the believability and immersion of games, as well as developing new forms of games. The GAM and the NPC model described in this thesis present an essentially utopian vision for NPC believability. As can be seen in this thesis, however, even partial expansions of the limitations identified by this work have the potential to lead to very large increases in NPC believability. If we were to further develop the technologies driving NPCs, primarily the social capability of NPCs, we could see a revolution in how games are designed. Bartle (2004) discussed how online games (for example MMORPGs) need to be populated to seem alive. If the computer-controlled denizens of games such as these could become more socially capable without massive developer effort, this would increase the richness of the game world and provide us with better games. Thus, the research into NPCs, their social believability, and the technology that drives it must be continued.

A. Value definitions for the Game Agent Matrix

This appendix provides the definitions for the values found in the GAM, sorted in order of appearance if read top-down and left-to-right. The GAM itself can be found in Figure 4.2 on p. 61.

A.1 Value definitions per column

A.1.1 Single Agent

Goal directed – Strives towards a goal in the long or short term.

Route following – Able to transport itself across open ground between two points in the world.

Uses language – Use of spoken or written language

Uses tools – Use of implements in order to seemingly achieve some sort of goal, for example a sword or a hammer.

Adaption – Able to adapt to changing social circumstances in the world at the given time.

Acquires information – Observes the world and seemingly gathers information on which to act.

Crisis response – Reacts rapidly to a crisis, for example if it is being attacked or if there is a fire.

Interruptability – Able to stop doing what it is currently doing when another task takes priority.

Awareness – Aware of things in its immediate vicinity.

Model of self – Knowledge of its own existence as an entity, physical or mental.

Rapid emotional response – Emotional response to actions taken by others in the world, for example the killing of innocents.

Navigation – Able to dynamically adjust its route through the world in order to take into account unexpected obstacles.

A.1.2 Multiple Agents

Learns from others – Learning from the actions of others, both by example and by direct teaching.

Models of others – Awareness of the existence of other agents, where they are and what they are doing.

Turn taking – Awareness of whose turn it is. Avoids speaking over others unless socially prompted to do so.

Face to face – Turns towards the entity it is addressing.

Group making – Dynamic creation of smaller groups.

Social interaction – Dynamic and meaningful interaction on a social level.

Memory of previous interactions – Remembers previous interactions of note, both direct (conversations) and indirect (seeing each other at a significant event).

A.1.3 Social Structural

Class difference – Acts on a difference in social ranking and class.

Mob action – Dynamic formation of larger groups with very low cohesion.

Social ranking – Acts on a difference in social ranking, affecting things like credibility and who has the most social power.

Coercion – Forced actions.

A.1.4 Social Goals

Disillusionment – Loss of belief in ideals.

Clan wars – Competition between groupings in the same area.

Cooperation – Ability to dynamically cooperate with other entities in order to achieve goals.

Group conflict – Conflict between groupings with different values and interests.

Patriotism – Strong dedication to parent group, for example the place of residence or clan.

Power struggles – Struggle for power between entities and groupings.

A.1.5 Cultural Historical

Team player – Concept of being part of a team, and acting for the good of the team at cost to itself.

Advertising – Advertises products and services.

Institutions – Roles and organizations with large amounts of formal or informal power and a historical connection, for example kings or universities.

Roles – Roles within society, for example police officers and farmers.

Etiquette – Observance of social rules and conventions.

Norm maintenance – Maintenance of norms and rules within society.

Sanctions – Application of sanctions on entities and groupings that break the rules, laws or norms of society.

B. Games included in the studies

This appendix provides descriptions of the games used as examples in this thesis. Table B.1 provides an overview of the games, and the sections below provide short descriptions of the respective games.

B.1 Bioshock Infinite

Bioshock Infinite is a SciFi FPS set in an alternate reality America in 1912. The player takes on the role of Booker DeWitt, a soldier and former Pinkerton agent, tasked with finding a young woman named Elizabeth. The game takes place in a floating city called *Columbia*, run as a totalitarian, theocratic police state by its dictator Zachary Hale Comstock. The game is mostly a fairly normal FPS with strong SciFi influences, including anti-gravity, time travel, and various other super science tropes. The player controls Booker as he fights his way across Columbia, battling various types of soldiers and clockwork automatons. The narrative of the game is told partly through cut scenes, which are seamlessly integrated into the game play, and by providing exposition in the form of other characters talking to Booker. The player can also collect sound recordings and view short movies that provide additional insight into the pre-defined narrative of the game.

B.2 Burnout Paradise

Burnout Paradise is a modern-day arcade racing game set in the fictional “Paradise City,” where the player races against opponents. The game is an open-world game, and the player can partake in different challenges as they rank up. The game has several game modes and allows the player to both drive cars and ride motorcycles. The game does not feature hyper-realistic physics, crashes, or damage systems. Instead, it is aimed at providing high-tempo racing at the expense of ultra-realism.

Table B.1: Games used as examples in the thesis

Title	Developer	Year	Type
Bioshock Infinite	Irrational Games	2013	SciFi FPS
Burnout Paradise	Criterion Games	2008	Arcade racing game
Company of Heroes	Relic Entertainment	2006	World War II RTS
Crusader Kings II	Paradox Development Studio	2012	Grand strategy
Donkey Kong	Nintendo	1981	Arcade platformer
Grand Theft Auto V	Rockstar North	2015	Action game
L.A. Noire	Team Bondi/Rockstar Leeds	2011	Murder mystery game
RAGE	id Software	2011	FPS
The Elder Scrolls V: Skyrim	Bethesda Softworks	2011	Fantasy RPG
Warhammer 40000: Space Marine	Relic Entertainment	2011	SciFi third person shooter

B.3 Company of Heroes

Company of Heroes is a World War II RTS. The player controls either American or German forces and uses them to capture supply points to acquire resources. These resources are then used to construct a base, and to produce units, and to perform actions that afford the player with some advantages or special abilities. It features destructible terrain, and a cover system for units.

B.4 Crusader Kings II

Crusader Kings II is a grand strategy game set in medieval Europe. The player controls a noble dynasty, and competes with other nobles to gain political influence and control over territory. The end goal is fairly open-ended, and the player is free to choose their own path through the game, as well as their own goals. The game takes place on a map of Europe, and the only movable units are armies and transport ships. It features a complex system of character traits and interrelation.

B.5 Donkey Kong

Donkey Kong is an early platform game, where the player controls the protagonist *Jumpman* across a number of platforms and ladders to rescue *Pauline*, who has been captured by the eponymous giant ape *Donkey Kong*. All the while the player has to dodge barrels rolled down by the Donkey Kong. The game is one of the earliest and arguably most famous examples of the platformer genre.

B.6 Grand Theft Auto V

Grand Theft Auto V is a modern day open-world action game set in the fictional city of “Los Santos,” a parody of Los Angeles. The player takes on the role of three different protagonists, and performs missions ranging from stealing cars, to assassinations, to big heists. The game is story-driven but allows the player to roam around freely in the world, either in various vehicles or on foot. It contains a mix of many elements, from racing vehicles (cars, motorcycles, boats, aircraft) to traditional shooter elements. The narrative is primarily provided via cut-scenes, but is also presented through communication between characters on missions, much as in *Bioshock Infinite*.

B.7 L.A. Noire

L.A. Noire is a murder-mystery game set in 1950’s Los Angeles. The game is similar to the *Grand Theft Auto* series in that it is an open-world game. It allows the player to roam the world in a very similar manner. The main narrative is told through a number of cases, which are introduced with cut scenes, followed by the player’s exploring and solving the case. The game also provides some background narration through cut scenes shown throughout the game, which become relevant later in the game. As with its *Grand Theft Auto* cousins, the game contains a combination of shooter, driving elements, and puzzle solving. The player is significantly more limited in their ability to be anti-social, however, and is generally not allowed to harm or kill other characters in the game, with the exception of running them over with their car.

B.8 RAGE

RAGE is a post-apocalyptic SciFi FPS. The player takes the role of a man who was put into suspended animation before the apocalypse, and who wakes up to a post-apocalyptic desert world. The game is overall a fairly standard FPS, but includes some elements from RPGs, primarily allowing the player to upgrade

their weapons, and racing. The story is primarily told through different quests, which contain exposition performed by various characters. The game employs a semi-open world, where the player is largely confined to a region but can roam freely within that region.

B.9 The Elder Scrolls V: Skyrim

Skyrim is a fantasy RPG, set in the “Skyrim” region of the world “Tamriel.” The game, and its predecessors, are known for their strong narrative. It allows the player a large degree of freedom in their character creation, and employs a skills-based character system (as opposed to a class-based system). The narrative is told using an introductory cinematic, and then as scripted events and exposition that the player primarily experiences while they are in control of their character. The game employs an open-world approach.

B.10 Warhammer 40,000: Space Marine

Space Marine is a third-person action game set in the *Warhammer 40,000* universe. The player takes the role of *Captain Titus*, a heavily armed and armored super soldier of the *Imperium of Man*. The game employs standard tropes for third person shooters and is totally linear. The narrative of the game is told as a series of cut-scenes, and to some extent as scripted events and in-game narration.

References

- Aarseth, E. (2012). A narrative theory of games. In *Proceedings of the International Conference on the Foundations of Digital Games*, pages 129–133, New York. ACM.
- Adams, E. (2010). *Fundamentals of Game Design*. New Riders Publishing, Berkley, CA, USA, 2nd edition.
- Alexander, C., Ishikawa, S., and Silverstein, M. (1977). *A pattern language: towns, buildings, construction*, volume 2. Oxford University Press.
- Almeida, M. S. O. and da Silva, F. S. C. (2013). A systematic review of game design methods and tools. In Anacleto, J. C., Clua, E. W. G., da Silva, F. S. C., Fels, S., and Yang, H. S., editors, *Entertainment Computing–ICEC 2013*, volume 8215 of *Lecture Notes in Computer Science*, pages 17–29, Berlin. Springer-Verlag.
- Bartle, R. (2004). *Designing Virtual Worlds*. New Riders Publishing, Indianapolis, IN, USA.
- Baudrillard, J. (1994). *Simulacra & Simulation*. University of Michigan Press, Ann Arbor, MI, USA.
- Björk, S., Landgren, S., and Holopainen, J. (2003). Game design patterns. In *Proceedings of the 2003 DiGRA International Conference: Level Up*.
- Boellstorff, T., Nardi, B., Pearce, C., and Taylor, T. (2012). *Ethnography and Virtual Worlds: A handbook of method*. Princeton University Press.
- Callega, G. (2009). Experiential narrative in game environments. In *Proceedings of the 2009 DiGRA International Conference: Breaking New Ground: Innovation in Games, Play, Practice and Theory*. Brunel University.
- Carley, K. and Newell, A. (1994). The nature of the social agent. *The Journal of Mathematical Sociology*, 19(4):221–262.
- Coleridge, S. T. (1817). *Biographia Literaria*. Retrieved January 17, 2016, from Project Gutenberg <http://www.gutenberg.org/ebooks/6081>.
- Csikszentmihalyi, M. and Csikszentmihalyi, I. S. (1992). *Optimal experience: Psychological studies of flow in consciousness*. Cambridge University Press.
- de Condorcet, M. (1785). Essay on the application of analysis to the probability of majority decisions.
- Dennett, D. C. (1981). *Brainstorms: Philosophical essays on mind and psychology*. MIT press, Cambridge, MA, USA.
- Desurvire, H., Caplan, M., and Toth, J. A. (2004). Using heuristics to evaluate the playability of games. In *CHI '04: Extended Abstracts on Human Factors in Computing Systems*, pages 1509–1512, New York. ACM.
- Desurvire, H. and Wiberg, C. (2008). Master of the game: Assessing approachability in future game design. In *CHI '08 Extended Abstracts on Human Factors in Computing Systems*, CHI EA '08, pages 3177–3182, New York. ACM.

- Desurvire, H. and Wiberg, C. (2009). Game usability heuristics (PLAY) for evaluating and designing better games: The next iteration. In Ozok, A. A. and Zaphiris, P., editors, *Online Communities and Social Computing*, volume 5621 of *Lecture Notes in Computer Science*, pages 557–566. Springer-Verlag, Berlin.
- Dignum, F., Dignum, V., and Jonker, C. M. (2013). The social meaning of physical action. In Correia, L., Reis, L. P., and Cascalho, J., editors, *Progress in Artificial Intelligence*, volume 8154 of *Lecture Notes in Computer Science*, pages 468–479. Springer-Verlag, Berlin.
- Ermi, L. and Mäyrä, F. (2005). Fundamental components of the gameplay experience: Analysing immersion. In *Proceedings of the 2005 DiGRA International Conference: Changing Views: Worlds in Play*.
- Fernández-Vara, C. (2011). Game spaces speak volumes: Indexical storytelling. In *Proceedings of the 2011 DiGRA International Conference: Think Design Play*. DiGRA/Utrecht School of the Arts.
- Gamma, E., Helm, R., Johnson, R., and Vlissides, J. (1994). *Design patterns: elements of reusable object-oriented software*. Pearson Education, Reading, MA, USA.
- Gibson, J. J. (1977). The theory of affordances. In Shaw, R. and Bransford, J., editors, *Perceiving, Acting, and Knowing: Towards an Ecological Psychology*. Lawrence Erlbaum Associates, Hillsdale, NJ, USA.
- Gilbert, M. (1996). *Living Together*. Rowman & Littlefield, Lanham, MD, USA.
- Hart, P. E., Nilsson, N. J., and Raphael, B. (1968). A formal basis for the heuristic determination of minimum cost paths. *IEEE Transactions on Systems Science and Cybernetics*, 4(2):100–107.
- Heeter, C., Egidio, R., Mishra, P., Winn, B., and Winn, J. (2009). Alien games: Do girls prefer games designed by girls? *Games and Culture*, 4(1):74–100.
- Hevner, A. R., March, S. T., Park, J., and Ram, S. (2004). Design science in information systems research. *MIS Quarterly*, 28(1):75–105.
- Holmgård, C., Liapis, A., Togelius, J., and Yannakakis, G. N. (2014). Evolving personas for player decision modeling. In *2014 IEEE Conference on Computational Intelligence and Games*, pages 1–8. IEEE.
- IDV (2015). SpeedTree. <http://www.speedtree.com/>. Accessed Feb 26 2016.
- IGN (2013). GTA 5 sales hit \$1 billion in 3 days. <http://www.ign.com/articles/2013/09/20/gta-5-sales-hit-1-billion-in-three-days>. Accessed Feb 26 2016.
- Isbister, K. and Schaffer, N. (2008). *Game Usability: Advice from the Experts for Advancing the Player Experience*. CRC Press, Boca Raton, FL, USA.
- James, B. and Fletcher, B. D. (2015). Defining the global ludo polychotomy. In *Proceedings of the 2015 DiGRA International Conference*. Digital Games Research Association.
- Jenkins, H. (2004). Game design as narrative architecture. In Wardrip-Fruin, N. and Harrigan, P., editors, *First Person*, pages 118–130. MIT Press, Cambridge, MA, USA.
- Johansson, M. (2013). *Do Non Player Characters dream of electric sheep?: A thesis about Players, NPCs, Immersion and Believability*. PhD thesis, Stockholm University, Stockholm, Sweden.
- Johansson, M., Strååt, B., Warpefelt, H., and Verhagen, H. (2013). Analyzing the social dynamics of non-player characters. In Meijer, S. A. and Smeds, R., editors, *Frontiers of Gaming Simulation*, volume 5621 of *Lecture Notes in Computer Science*. Springer-Verlag, Cham, Switzerland.
- Johansson, M. and Verhagen, H. (2011). Where is my mind—the evolution of NPCs in online worlds. In *Proceedings of the 3rd International Conference on Agents and Artificial Intelligence*, pages 359–364.

- Juul, J. (2001). Games telling stories. *Game Studies—The International Journal of Computer Game Research*, 1(1).
- Kitto, S. C., Chesters, J., and Grbich, C. (2008). Quality in qualitative research. *Medical Journal of Australia*, 188(4):243–246.
- Lankoski, P. (2004). Character design fundamentals for role-playing games. In Montola, M. and Stenros, J., editors, *Beyond Role and Play: Tools, Toys and Theory for Harnessing the Imagination*, pages 139–148. Ropecon, Espoo, Finland.
- Lankoski, P. and Björk, S. (2007). Gameplay design patterns for believable non-player characters. In Akira, B., editor, *Situated Play: Proceedings of the 2007 Digital Games Research Association Conference*, pages 416–423, Tokyo. The University of Tokyo.
- Lankoski, P., Johansson, A., Karlsson, B., Björk, S., and Dell’Acqua, P. (2011). AI design for believable characters via gameplay design patterns. In *Business, Technological, and Social Dimensions of Computer Games: Multidisciplinary Developments*, chapter 2, pages 15–31. IGI Global, Hershey, PA, USA.
- Lincoln, Y. S. and Guba, E. G. (1985). *Naturalistic Inquiry*. SAGE Publications, Newbury Park, CA, USA.
- Linderoth, J. (2013). Beyond the digital divide: An ecological approach to gameplay. *Transactions of the Digital Games Research Association*, 1(1).
- Longino, H. E. (1998). Values and objectivity. In Curd, M. and Cover, J., editors, *Philosophy of Science: The central issues*, chapter 2, pages 170–191.
- Loyall, A. B. (1997). *Believable Agents: Building Interactive Personalities*. PhD thesis, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA, USA.
- Mackay, D. (2001). *The Fantasy Role-Playing Game*. McFarland & Company, Publishers, Jefferson, NC, USA.
- Malone, T. W. (1982). Heuristics for designing enjoyable user interfaces: Lessons from computer games. In *Proceedings of the 1982 Conference on Human Factors in Computing Systems*, CHI ’82, pages 63–68, New York. ACM.
- Mateas, M. (1999). An Oz-centric review of interactive drama and believable agents. In Wooldridge, M. J. and Veloso, M., editors, *Artificial Intelligence Today*, pages 297–328. Springer-Verlag, Berlin.
- Mateas, M. and Stern, A. (2003). Façade: An experiment in building a fully-realized interactive drama. In *Game Developers Conference, Game Design Track*.
- McCoy, J., Treanor, M., Samuel, B., Mateas, M., and Wardrip-Fruin, N. (2011). Prom Week: Social physics as gameplay. In *Proceedings of the 6th International Conference on Foundations of Digital Games*, pages 319–321, New York. ACM.
- McGrenere, J. (2000). Affordances: Clarifying and evolving a concept. In *Proceedings of Graphics Interface 2000*, pages 179–186.
- McMahan, A. (2003). Immersion, engagement and presence. In Wolf, M. J. and Perron, B., editors, *The Video Game Theory Reader*, chapter 3, pages 67–86.
- Murray, J. H. (1997). *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*. The Free Press, New York.
- Myers, M. D. (2009). *Qualitative Research in Business & Management*. Sage Publications, London.
- Nielsen, J. and Molich, R. (1990). Heuristic evaluation of user interfaces. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 249–256, New York. ACM.

- Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic Books, New York.
- Orkin, J. (2006). Three states and a plan: The A.I. of F.E.A.R. In *Proceedings of the Game Developers Conference*.
- Propp, V. (1968). *Morphology of the Folktale*. University of Texas Press, Austin, TX, USA, 2nd edition.
- Scharkow, M., Festl, R., Vogelgesang, J., and Quandt, T. (2015). Beyond the “core-gamer”: Genre preferences and gratifications in computer games. *Computers in Human Behavior*, 44:293–298.
- SFS 1960:729 (1960). *Lag om upphovsrätt till litterära och konstnärliga verk* NEED FIX. Stockholm: Justitiedepartementet.
- The Scotsman (2013). New GTA V release tipped to rake in £1bn in sales. <http://www.scotsman.com/lifestyle/technology/new-gta-v-release-tipped-to-rake-in-1bn-in-sales-1-3081943>. Accessed Feb 26 2016.
- Thomas, W. I. and Thomas, D. S. (1928). *The Child in America*. Alfred A. Knopf, New York.
- Tremblay, J. and Verbrugge, C. (2013). Adaptive companions in FPS games. In *Proceedings of the 8th International Conference on the Foundations of Digital Games*, pages 229–236. FdG.
- Verhagen, H. (2000). *Norm autonomous agents*. PhD thesis, Stockholm University, Stockholm, Sweden.
- Verhagen, H., Johansson, M., and Eladhari, M. P. (2011). Model of social believable NPCs for teacher training. In *Proceedings of the 16th International Conference on Computer Games*, pages 270–274. IEEE.
- Vermeulen, L., Van Looy, J., De Grove, F., and Courtois, C. (2011). You are what you play? a quantitative study into game design preferences across gender and their interaction with gaming habits. In *Proceedings of the 5th International Digital Games Research Association Conference*.
- Waggoner, Z. (2009). *My Avatar, My Self: Identity in video role-playing games*. McFarland Publishing, Jefferson, NC, USA.
- Warpefelt, H. (2013). *Mind the gap: Exploring the social capability of non-player characters*. Licentiate thesis, Stockholm University, Stockholm, Sweden.
- Warpefelt, H. (2015). Cues and insinuations: Indicating affordances of non-player character using visual indicators. In *Proceedings of DiGRA 2015: Diversity of Play: Games—Cultures—Identities*. Digital Games Research Association.
- Warpefelt, H., Johansson, M., and Verhagen, H. (2013). Analyzing the believability of game character behavior using the Game Agent Matrix. In *Proceedings of the Sixth Bi-Annual Conference of the Digital Games Research Association: Defragging Game Studies (DiGRA 2013)*. Digital Games Research Association.
- Warpefelt, H. and Strååt, B. (2013). Breaking immersion by creating social unbelievability. In *AISB 2013 Convention. Social Coordination: Principles, Artefacts and Theories (SOCIAL.PATH)*. The Society for the Study of Artificial Intelligence and the Simulation of Behaviour.
- Warpefelt, H. and Strååt, B. (2012). A method for comparing NPC social ability. In Prakash, E., editor, *Proceedings of the 5th Annual International Conference on Computer Games and Allied Technology (CGAT 2012)*, pages 58–63. Global Science & Technology Forum.
- Warpefelt, H. and Verhagen, H. (2015). Towards an updated typology of non-player character roles. In Blashki, K. and Xiao, Y., editors, *Proceedings of the International Conference on Game and Entertainment Technologies 2015*. International Association for Development of the Information Society.

- Warpefelt, H. and Verhagen, H. (2016a). A model of non-player characters. In *Forthcoming*.
- Warpefelt, H. and Verhagen, H. (2016b). A typology of non-player characters. In *Forthcoming*.
- Weber, B., Mateas, M., and Jhala, A. (2011). Building human-level AI for real-time strategy games. In *Proceedings of the AAAI Fall Symposium on Advances in Cognitive Systems*, volume 11, pages 329–336.
- Winn, J. and Heeter, C. (2009). Gaming, gender, and time: Who makes time to play? *Sex Roles*, 61(1):1–13.
- Žavcer, G., Mayr, S., and Petta, P. (2014). Design pattern canvas: An introduction to unified serious game design patterns. *Interdisciplinary Description of Complex Systems*, 12(4):280–292.