Anti-heuristics for maintaining immersion through believable non-player characters

Henrik Warpefelt
Dept. of Computer and Systems Sciences
Stockholm University
Isafjordsgatan 39, 16440
Kista, Sweden
hw@dsv.su.se

Björn Strååt
Dept. of Computer and Systems Sciences
Stockholm University
Isafjordsgatan 39, 16440
Kista, Sweden
bjor-str@dsv.su.se

1. INTRODUCTION

While many of today's games focus on the aural and visual experience of game play, some researchers, for example Bartle [2] and Castronova [4], state that believable behaviour in non-player characters (NPCs) could greatly contribute to making the game world feeling alive and plausible. In order to do this, NPCs must exhibit varied and believable behaviours. If they do not, the player will soon begin to see patterns in how the NPCs act - as explained by Johansson & Verhagen [6]. The sense of the world being alive and real is called immersion – which is described by Bartle [2] as "*the sense that a player has of being* in *a virtual world*". This relates to what Ermi & Mäyrä [5] call "*imaginative immersion*" and Adams [1] calls "*narrative immersion*" – i.e. the player's sense of being involved in a story. NPCs can help uphold the illusion of the game by portraying realistic and believable behaviour. This should be done in a way that is consistent with the story and the world of the game, regardless of the underlying technology used to imbue the NPC with action potential.

The believability of NPCs has been studied by Lankoski & Björk [7], who used a method based on analysis through design patterns, in order to identify and describe immersion-breaking behaviour in a single NPC in the game *Oblivion*. Unfortunately, the limited data set precludes generalization from Lankoski & Björk's study. This study takes a wider approach on the effects that NPCs have on immersion, and aims to identify NPC behaviours that have an adverse effect on the player's sense of immersion, and to provide generalized descriptions of these behaviours.

2. PREVIOUS WORK

In order to achieve immersion-strengthening behaviour, current weaknesses in NPC behaviour must first be identified, described and be made explicit. One prominent model for describing characters whose behaviour is human-like is the *Carley & Newell Fractionation Matrix* [3], which is based on a combination of theories from sociology relating to human behaviour. The matrix describes a continuum of complexity for an artificial entity, ranging from single task entities to virtual humans using 80 different values. Johansson & Verhagen [6] used this matrix as a part of their proposed method for analyzing NPCs.

In a previous study, described in [8], we examined a possible method for discovering and analyzing immersion breaking NPC behaviour in games. In that study we used the Carley & Newell fractionation matrix to analyze scenarios in games, and compared the differences games using a simple algorithm for determining euclidean distance. When we performed the study we discovered that there are indications of immersion breaking behaviour, often deriving from repetitive or illogical behaviour. If we are able to describe how these behaviours are manifested and make them explicit, we will able to more easily rectify them.

3. METHOD

The methodology of this study is derived from our previous study [8] and as such uses the Carley & Newell matrix. Similarly to our approach in [8], we have taken a "black box" approach to the analysis of NPCs. We simply accepted the behaviour of the NPCs at face value rather than to try to understand what the actual implementation was telling the NPC to do, much like a player without knowledge of game development would. Unlike the study in [8] we did not use the euclidean distance between games as a comparator, but instead focused on providing thick descriptions of the situations. While some counting of occurrences was done, it was instead used to determine the most significant behaviours in the study overall.

The data for this study was collected by recording game play in 14 games as video, continuing until no new behaviours were exhibited by the NPCs in the game. We observed a wide variety of situations, encompassing all kinds of behaviour – ranging from street conversations to combat. These videos were then analysed in two stages using the values from the matrix described in [8]. The studies were separated by 6 weeks and performed by a two researchers per study who strived for consensus. The approach of doing two separate studies, each using multiple researchers, was taken in order to ascertain the validity of the study by applying multiple layers of triangulation.

During the analysis process, each scenario encountered in the videos was described in text and evaluated for possible immersion-breaking behaviour according to the aforementioned matrix. The intermediate data created in the previous step was then used to determine the most significant immersion breaks, more specifically the types of behaviour that were violated in at least 5 games during either study. At this stage, a game's exhibition of a certain immersion breaking behaviour was only counted once. Hence, if a game ex-

hibited a certain behaviour seven times it was still only counted once for the purposes of selecting the most significant behaviours, i.e. the values that occurred in the largest number of games.

Lastly, the scenario descriptions of the immersion breaking behaviours were examined in order to find similarities between them. The similarities were then reformulated into a set of heuristics that can be used to identify immersion breaking behaviour.

4. STUDIED GAMES
The studied games were all big-budget, "AAA" titles not older than 10 years. In the games, the player only controls one character at a time, but may of course have several helpers. These critera were chosen in order to ensure that the games incorporate fairly recent technology, and had the necessary funds to actually put money into the development of the NPCs within the game. We decided not to analyze lower budget or independent titles, since they are less widespread, and thus, possibly, making any problems found less general.

The games included in this study were *Assassin's Creed: Revelations*, *Dragon Age: Origins*, *Dragon Age 2*, *Fable 3*, *Fallout 3*, *Mass Effect*, *Mass Effect 3*, *L.A. Noire*, *RAGE*, *Morrowind*, *Oblivion*, *Skyrim*, *Vampire: The Masquerade: Bloodlines*, *Warhammer 40000: Space Marine*.

5. ANTI-HEURISTICS
After analysing the differenct situations[1] in the aforementioned games, we discovered a number of common weaknesses related primarily to certain values found in the matrix. While there were other occurrences, the anti-heuristics were derived from the most frequent ones, resulting in this list:

1. Ensure that the NPC always knows everything that is happening in the world. It should be omniscient!

2. Ensure that the NPC is seemingly unaware of things that it should feasibly be aware of.

3. Ensure that the NPC is seemingly unaware of what others are doing that could affect the NPCs, its friends or the environment.

4. Ensure that the NPC is seemingly unaware of actions performed that directly involve or affect it.

5. Ensure that the NPC always reacts in such a way that it makes its present situation worse.

6. Ensure that the NPC, through lack of reaction, never improves its situation.

These anti-heuristics may seem to cover overlapping areas, but that is wholly intentional. The rules are intended to be used together, and as such each individual rule does not contribute a lot of new knowledge. In this case, the total really is more than the sum of its part

The anti-heuristics sometimes contradict each other, and this is once again intentionally so. In the case of awareness, there seems to

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[1]Samples of these are available online at `http://www.youtube.com/playlist?list=PLPmxvKzF6p8VGekfzjSEpOELlpfmnHc38`

be a certain part of the awareness spectrum that makes a character seem believable.

6. CONCLUSION AND FINAL THOUGHTS
The identified breaches of immersion occurred frequently and were often very obvious, and they occurred in a wide variety of games (representing roughly ten years of development). Given that some of our findings are seemingly obvious, and were found by simply playing the game, the developers cannot be unaware of these issues. We understand that there are practical and financial limitations on how much effort can be put into creating believable NPC in games, but we have chosen not to include this consideration in our work. The goal was, as mentioned, to find NPC behaviours that negatively affect immersion, without taking any heed to the underlying system.

Using this fairly straight forward and simple method we were able to isolate several immersion breaking errors, and while we presented a small set of anti-heuristics this list could easily be expanded using the same method. These anti-heuristics (ours and potential new ones) can then be of use to both researchers and game developers, since they allow for quick identification of potentially immersion-breaking situations. Since there are similar studies, notably Lankoski & Björk in [7], comparing the results of these to ours could possible help refine the heuristics and enable us to identify even more problems with NPC behaviour.

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