Chapter 24
Non–Player Characters and Artificial Intelligence

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ABSTRACT

Serious Games rely on interactive systems to provide an efficient communication medium between the tutor and the user. Designing and implementing such medium is a multi-disciplinary task that aims at an environment that engages the user in a learning activity. User engagement is significantly related to the users' sense of immersion or his willingness to accept the reality proposed by a game environment. This is a very relevant research topic for Artificial Intelligence (AI), since it requires computational systems to generate believable behaviors that can promote the users' willingness to enter and engage in the game environment. In order to do this, AI research has been relying on social sciences, in particular psychology and sociology models, to ground the creation of computational models for non-player characters that behave according to the users' expectations. In this chapter, the authors present some of the most relevant NPC research contributions following this approach.

INTRODUCTION

Non-player characters (NPCs) are entities that embody a role in a game context that is usually performed by a person. For example, in a bullying scenario in which a player plays the role of a bullied child, diverse NPCs are needed to play the roles of the bully, the bully's friends and the teacher (Vannini et al., 2011). These characters are controlled by artificial intelligence (AI) algorithms, which generate behaviours based on different human characteristics according to the design goals. The modelled behaviours can range from simple wandering entities that populate a scenario (Thalmann et al., 2004; Ulicny & Thalmann, 2001), e.g., members of a crowd, to more complex and human-like entities that intelligently interact with a player (Gratch et al., 2002; Magnenat-Thalmann & Kasap, 2009).

However, at its core, what is a Non-Player Character? The answer is an autonomous agent (for games) that senses its environment and acts intelligently and independently from the player. In fact, different types of characters[1] represent attempts to mirror human behaviours either at a specific or a holistic level depending on the game's requirements.

Common approaches to modelling of NPCs result in the creation of different types of entities: scripted (Spronck, Ponsen, Sprinkhuizen-Kuyper, & Postma, 2006), reactive, deliberative and hybrid (Wooldridge, 2002). Each of these approaches contains different design purposes and applications. From a designer's point of view, to establish a parallel with real people, we can conceptualise others in different ways according to the context of the situation at hand. For example, if we consider the management of exits in a stadium, we focus on people's steering and the resulting flow behaviours through bottleneck points in the environment. In this situation, people are usually more adequately modelled in NPCs by reactive characters that can exhibit emergent crowd behaviours based on simple rules (Thalmann et al., 2004; Ulicny

& Thalmann, 2001). In another example, if we consider a situation of emotional support for a learning situation, we are interested in the advisor's (character) knowledge, skill and ability to help the user (João Dias & Paiva, 2005). In this case, modelling of the advisor person in an NPC role is better achieved by means of a deliberative or hybrid (combining different types of behaviours) entity that contains the required mental models necessary to respond to the situation. Beyond these examples, several other focused behaviours can be applied, e.g., genetic algorithms (Krovi, Graesser, & Pracht, 1999), to evolve behaviours or machine learning used to exhibit human-like learning capabilities (Spronck et al., 2006).

Another important aspect of NPCs is their form. Given the game-like types of scenarios, the NPCs we discuss in this chapter are usually virtual characters. The visual representation of the characters aims to approximate the experience of player-character interaction with that of human-human interaction. If we combine the virtual characters with the previously described creation of intelligent behaviours, we create intelligent virtual characters. These virtual characters are intended to give the illusion of human behaviour by simulating many human aspects (physical and cognitive) and modalities (perceptions and action) for dynamic social environments. To many, the ultimate goal is the creation of synthetic characters that "are not only believable but also as remarkable and unforgettable, as humans are"[2].

The fundamental contribution of NPCs to serious games stems from the interactive experience they provide to the player. The inclusion of NPCs in virtual environments fosters the creation of highly interactive and socially vivid scenarios that can provide more socially realistic experiences. Such environments aim to achieve "suspension of disbelief" in the players (J. Bates, 1992; Joseph Bates, Loyall, & Reilly, 1994) with respect to the virtual environment and to immerse them in the narrative, tasks and challenges provided by the game designers. In the context of a serious game,

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