

Chapter XIII

Adaptivity within Games

Introduction

This book centres on biologically inspired machine learning algorithms for use in computer and video game technology. One of the important reasons for employing learning in computer games is that there is a strong desire by many developers and publishers within the industry to make games adaptive. For example, Manslow (2002) states, ‘The widespread adoption of learning in games will be one of the most important advances ever to be made in game AI. Genuinely adaptive AIs will change the way in which games are played by forcing each player to continually search for new strategies to defeat the AI, rather than perfecting a single technique.’ However, the majority of learning techniques to date that have been used in commercial games have employed an offline learning process, that is, the algorithms are trained during the development process and not during the gameplay sessions after the release of the game. Online learning—that is, learning processes that occur during actual gameplay—has been used in only a handful of commercial games, for example, *Black and White*, but the use of learning online within games

is intrinsically linked to adaptivity and the use of the algorithms in this way needs to be explored more fully.

All game players are different. Each has a different preference for the pace and style of gameplay within a game, and the range of game playing capabilities between players can vary widely. Even players with a similar level of game playing ability will often find separate aspects of a game to be more difficult to them individually and the techniques that each player focuses on to complete separate challenges can also be very different. This is at the core of our reasoning that adaptive game technology can have an important role to play in next-generation games. There are a range of ways in which adaptivity can be advantageous, for example, modifying the difficulty levels, in helping players avoid getting stuck, adapting the gameplay more to the player's preference/taste, improving replay value of the game, or perhaps detecting exploitative player behaviour and modifying the game in response. What we mean by exploitative player behaviour is, for example, when a player uses or abuses an oversight in the game design to an advantage. Often this means that the player finds it easier to succeed in the game but the enjoyment of the game is lessened because the challenge that is face is reduced and the player finds it unnecessary to explore the full features of the game. That is, players will often repeat a successful strategy over and over again because it leads to a predictable win, even if it is boring and ruins the game somewhat. This happens frequently in real-time strategy games such as *Warcraft* or *Command and Conquer*. Bungie, the creators of *Halo*—a game much praised for its AI—acknowledged the importance of dealing with this issue when they reported at the Game Developers Conference in 2002 that they deliberately designed the AI to prevent players from using 'boring' tactics and the game positively rewarded players when they used imaginative or adventurous tactics (Butcher & Griesemer, 2002).

Important issues such as the serious deficiency of game completions by players, teaching players effectively, the problem of 'beginning' (Poole, 2004), as well as the niche quality to current games and their lack of accessibility to a wider group of people (Redeye, 2004) are relatively well known both within the games industry and the games research community. However, this issue is only beginning to be addressed properly and it is especially rare to see the use of dynamic technology within games that is responsive to individual players. One quite well-known and straightforward attempt at this type of technology is 'auto-dynamic difficulty' as realised in *Max Payne* (Miller, 2004). In this game the difficulty level is altered by increasing the numbers of enemies in a room (or their difficulty to be killed) by observing features of the player's game playing. Statistics on a player's average health, shot accuracy, number of times shot, numbers of times died, and so forth may be recorded to help make a decision in-game as to how difficult the game should be for the player. While this was undoubtedly successful for many players of the game it was least successful in cases where the player knew or worked out that this form of adaptivity was occurring. When players discovered the technology they often

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