

# Chapter 5

## Using Recommendation Systems to Adapt Gameplay

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### **ABSTRACT**

*Recommendation systems are key components in many Web applications (Amazon, Netflix, eHarmony). Each system gathers user input, such as the products they buy, and searches for patterns in order to determine user preferences and tastes. These preferences are then used to recommend other content that a user may enjoy. Games on the other hand are often designed with a one-size-fits-all approach not taking player preferences into account. However there is a growing interest in both the games industry and game research communities to begin incorporating systems that can adapt, or alter how the game functions, to specific players. This article examines how Web application recommendation systems compare to current games that adapt their gameplay to specific players. The comparison shows that current games do not use recommendation methods that are data intensive or collaborative when adapting to players. Design suggestions are offered within this manuscript for how game developers can benefit from incorporating the lesser used recommendation methods.*

### **INTRODUCTION**

Games are often designed with a one-size-fits-all approach. Each player will get the same experience within the game regardless of their personal playing style. Developers attempt to design games in this way so that a game will reach as many players in their target audience as possible. The demographics that make up these markets however

are varied (Herrmann, 2007). Additionally, as the number of online players grows (Herrmann, 2007) developers will need ways to precisely target their current player markets along with new potential markets becoming available. Developers could create niche games that focus on specific groups of players or they could broaden the appeal of a game by leveraging features that adapt game play to better suit a particular player's needs. Play-

ers who are familiar with personalized content delivered online, via recommendation systems, will come to expect games that mold, or adapt, to their preferences and tastes. This manuscript argues that designing games that adapt to specific players could provide more challenging and engaging experiences for those players. A first step towards building adaptive games is to understand how recommendation systems provide personalized content to users.

Recommendation systems filter user input information in order to provide users with suitable content based on their preferences and tastes (Chen, Han, Wang, Zhou, Xu, & Zang, 2007). This is done by first collecting input information, for instance a user's rating scores for a list of movies on a movie recommendation website. The system then filters that information by making correlations within the data using different filtering methods and searching for patterns between the data and the system's users (Adomavicius & Tuzhilin, 2005; Segaran, 2007; Vozalis & Margaritis, 2003). The system then determines which patterns are the most relevant, for instance if a user ranks action movies higher than movies in other genres this creates a pattern showing that the user most likely enjoys action movies. These patterns are then used to deliver the final recommendation to each user (a user that enjoys action movies will be recommended more action movies).

Adaptive systems operate in a similar fashion as recommendation systems. In an adaptive game, adaptation occurs when a game modifies the player's character, non-player characters, or the game's environment/statistics based on player information the game gathers (Bailey & Katchabaw, 2005; Charles, Kerr, McNeill, McAlister, Black, Kücklich, 2005). Thus instead of a system that recommends related items, an adaptive game will alter the gameplay or game content, in order to fit the preferences of each player. Some current games already offer adaptive features that manipulate gameplay based on the player's skill level (Miller, 2004). There also exists a growing

field of researchers that are building games that model player goals and traits in order to adapt to that particular player (Magerko & Laird, 2003; Thue, Bulitko, Spetch, & Wasylishen, 2007; Torgelius, De Nardi, & Lucas, 2007).

This article will examine how examples of recommendation systems work within the web domain and how the techniques used by those systems can help produce games that incorporate similar techniques for adaptive purposes. Beginning with a theoretical framework the author will examine why recommendation and adaptation techniques are valid practices for producing games. Next, an overview of how recommendation systems work is provided and is compared to other current, game-related, adaptive and recommendation systems. Finally, after determining the missing techniques not employed by adaptive games, when compared to recommendation systems, design suggestions are made in order to relate current examples of recommendation techniques can be used to enhance gameplay.

## **THEORETICAL FRAMEWORK**

While developer motivations for producing games that reach a wider audience are financial, if players do not enjoy playing games that adapt to their preferences then the players will choose not to purchase the game. Beyond financial reasons, there are also pedagogical reasons for adaptive games. Serious games, or games used for educational purposes, that can adapt to specific students could provide personalized learning experiences for each student. How do we know that adaptive games will produce experiences that players will want to play and potentially help those players that are using games as learning tools?

Players play games for different reasons (Lazaro, 2008; Sherry, Lucas, Greenberg, & Lachlan, 2006; Yee, 2007). In theory, having an adaptive game that can cater to a user's specific reasons for playing will provide a better experience for the

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