Scalable Personalization of Interactive Experiences through Creative Automation

MARK O. RIEDL
Georgia Institute of Technology – Entertainment Intelligence Lab

Personalization entails the recommendation or tailoring of goods and services. We see personalization in many domains from education to healthcare to marketing. In the arena of entertainment, there are many systems that recommend movies, books, TV shows, and music; however, there is little tailoring of entertainment content. One reason for this is the economies of scale of personalizing entertainment. Computer-based interactive entertainment – computer games – can be ideal platforms for automated tailoring of interactive content in order to deliver on-demand and just-in-time experiences. The automatic generation of tailored interactive experiences, through artificial intelligence player modeling and content generation has the potential to address the challenge of scalable personalization. The ability to dynamically produce unique, tailored experiences that make use of players' individual differences such as tastes, preferences, play styles, range of capabilities can potentially change the way we relate to entertainment media and implications for serious applications such as education and training through tailored serious games.

1. INTRODUCTION

Personalization is rapidly becoming an important factor in education, healthcare, and marketing. Personalization can entail recommendation of existing products and services, or explicit tailoring of products and services based on the needs and desires of the user. In the realm of entertainment, recommendation systems are commonplace for books, TV shows, movies, and music. Tailoring of entertainment media is less common. Unlike other forms of entertainment media in which the content of the experience is static once produced, computer-based interactive entertainment such as computer games holds great potential for personalization. Although personalization of interactive experiences is in its infancy, the ability to dynamically produce unique, tailored experiences that make use of players' individual differences such as tastes, preferences, play styles, range of capabilities, and others, is compelling (Charles et al. 2005; Medler 2008). Indeed, we are now at a unique point where modern computer technology, simulation, and artificial intelligence have opened up the possibility that more can be done *on-demand* and *just-in-time*.

- *On-demand entertainment* refers to the possibility that one can request, at any time, an entertainment experience that is significantly different from any previously consumed.
- *Just-in-time entertainment* means that entertainment artifacts should be customized or configured based on information that is only available just before it is needed, affording the creation of unique entertainment experiences based on a user's their needs, wants, and abilities.

As we approach a world in which on-demand and just-in-time entertainment is the expectation, we must address the question of scaling: can we deliver entertaining experiences to more people, and simultaneously tailor those experiences to each and every individual? One way to achieve on-demand and just-in-time interactive experiences is to turn to automation.

Interest in automation in the context of interactive entertainment is on the rise. John Laird and Michael van Lent (2001) justified interactive entertainment as a domain of study in AI when they posited that computer games could act as test-beds for achieving human-level computer intelligence. There is an additional perspective on AI for games: increasing the engagement and enjoyment of the player. This perspective is consistent with the perspective of computer game designers. For designers, AI is a tool in the arsenal of the game to be used in lieu of real people

when no one is available for a given role. Scaling of tailored experiences requires intelligent systems that can take progressively more responsibility for the player's experience by automating tasks such as design of level, NPC behaviors and dialogue, plot and quests, and game mechanics themselves. These tasks have historically been the domain of human creative designers, actors, dungeon masters, and so on. The decisions that need to be made about the player's experience, however, can only be made in a just-in-time and on-demand fashion; the system needs to know (a) who the user is, (b) what the user needs, preferences, and desires are, and (c) what the user is doing at any given moment. Achieving scalable personalization requires work towards practical human-level computational creativity.

In the context of optimizing the content that a player experiences, there are two problems that need to be addressed: player modeling and algorithms that can optimize interactive experiential content – plots, quests, levels, non-player character dialogues, etc. – based on the model. Building and using models of player behavior in interactive entertainment is becoming increasingly prevalent. Player modeling in games has been used to maximize coherence (cf. Magerko 2006), interest Sharma et al. 2007; Li and Riedl 2010), and enjoyment (Seif El-Nasr 2007; Thue et al. 2007).

Personalization of interactive experiences can potentially change the way we relate to entertainment media by affording on-demand and just-in-time experiences. Personalization of interactive experiences also has implications for serious applications such as education and training. While learner modeling has been explored in previous work, the creative automation techniques highlighted above for games and entertainment media open up new possibilities for educational games that dynamically adapt their content and for training scenario generation (Niehaus and Riedl 2009); just as one-on-one tutoring is highly effective in education, tailored serious games and training scenarios can be a key element in scaling up personalized learning.

REFERENCES

DARRYL CHARLES, MICHAEL MCNEILL, MOIRA MCALISTER, MICHAELA BLACK, ADRIAN MOORE, KARL STRINGER, JULIAN KÜCKLICH, AND APHRA KERR. 2005. Player-Centred Game Design: Player Modelling and Adaptive Digital Games. In Proceedings of 2005 Conference of the Digital Games Research Association (DiGRA).

BEN MEDLER. 2008. Using Recommendation Systems to Adapt Gameplay. International Journal of Gaming and Computer-Mediated Simulations, 1(3), 68—80.

JOHN LAIRD AND MICHAEL VAN LENT. 2001. Human-Level AI's Killer Application: Interactive Computer Games. AI Magazine 22(2), 15—25.

BOYANG LI AND MARK RIEDL. 2010. An Offline Planning Approach to Game Plotline Adaptation. In *Proceedings of the 6th Conference on Artificial Intelligence for Interactive Digital Entertainment Conference*.

BRIAN MAGERKO. 2006. *Player Modeling in the Interactive Drama Architecture*. Ph.D. thesis, University of Michigan.

CHIP MORNINGSTAR, C. AND F. RANDALL FARMER. 1991. The Lessons of Lucasfilm's Habitat. In M. Benedict (Ed.) Cyberspace: First Steps. MIT Press.

JAMES NIEHAUS AND MARK RIEDL. 2009. Scenario Adaptation: An Approach to Customizing Computer-Based Training Games and Simulations. In *Proceedings of the AIED 2009 Workshop on Intelligent Educational Games*.

MAGY SEIF EL-NASR. 2007. Interaction, Narrative, and Drama Creating an Adaptive Interactive Narrative Using Performance Arts Theories. *Interaction Studies* 8(2).

MANU SHARMA, MANISH MEHTA, SANTIAGO ONTANÓN, AND ASHWIN RAM. 2007. Player Modeling Evaluation for Interactive Fiction. In *Proceedings of the AIIDE 2007 Workshop on Optimizing Player Satisfaction*.

DAVID THUE, VADIM BULITKO, MARCIA SPETCH, AND ERIC WASYLISHEN. 2007. Interactive Storytelling: A Player Modeling Approach. In *Proceedings of the 3rd Artificial Intelligence and Interactive Digital Entertainment Conference*.