Serious Game Design and Development: Technologies for Training and Learning

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Section 1
Design Principles for Serious Games

This section provides several different perspectives on designing and developing serious games. Each chapter offers a design principle or strategy that can be employed to enhance the effectiveness of serious games. Several also include lessons learned drawn from specific serious game development efforts.

The authors describe a strategy for developing mini games that car. be embedded in game-based training. They also present descriptions of several case studies that used mini-games as part of the learning strategy.

This chapter discusses the importance of narrative in serious games. These authors contend that narrative aids can help in game design in several ways, including: increasing the player's motivation to remain in the game; stories can embed learning objectives; narrative can tie together elements in the game into a coherent whole.

This chapter describes the goals of usability and how it is traditionally performed using two popular methods. It goes on to discuss appropriate usability measures for serious games.

This chapter describes a recent experience developing a serious game for U.S. Navy recruits to describe a multi-disciplinary approach to serious game design. They describe their process in terms of the selection of training requirements, the domain and the gaming platform; knowledge acquisition; story development; game design; initial instructional design; assessment strategy; software development, introductory video; and review, refinement and testing.

This chapter describes the development of a multiplayer card game that was first developed as a paper prototype. The chapter provides a post-mortem of the iterative design process that included development of varying levels of simple prototypes for initial design and playtesting, followed by evaluation of game balance and refinement. They also cover the process they employed to digitize the game, and expand the game to cover additional learning objectives.

This chapter discusses a game design architecture that exploits the pedagogical potential of a rich graphical environment using a kinesthetic interface. The authors conclude by describing directions for future testing and application of the kinesthetic input devices in serious games.

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Section 2
Applications of Serious Games

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Our conception of Serious Games is the use of games for any non-entertainment purpose, although the preponderance of attention has been given to educational or learning games. In this section, we have included several chapters that are not strictly educational in nature to highlight the fact that other applications are possible. That said, we believe that the potential application of games to learning (across settings and age groups) is vast and only beginning to be tapped.

The author addresses three key issues in educational game design: (1) designing the course of instruction so that it is both rigorously correct and constantly engaging, (2) ensuring that the system adapts to the background and interests of individual learners, and (3) evaluating the expertise of learners in ways that make sense to them and to future employers.

This chapter describes the use of a video game to conduct empirical investigations designed to build theoretical models of socio- psychological variables that influence dynamic decision making. Specifically,

an investigation on decision making in a dynamic and complex situation, the solution of international conflict and the achievement of peace, using PeaceMaker, a popular video game, is presented.

     Mihai Nadin, antE - Institute for Research in Anticipatory Systems
          University of Texas at Dallas, USA

This chapter centers on the hypothesis that the aging process results in diminished adaptive abilities resulting from decreased anticipatory performance. To mitigate the consequences of reduced anticipatory performance, the addresses brain plasticity through game play.

     YolandaA. Ran kin, IBMAImaden Research Center, USA
     Marcus W. Shute, Clark Atlanta University, USA

The authors report their efforts to re-purpose a recreational game as a serious game to promote learning in the context of Second Language Acquisition. They outline the process of game transformation, which leverages the entertainment value and readily accessible developer tools of the game.

Section 3
Games in Healthcare

Given the number of high quality proposals we received in the healthcare area, we decided to create a separate section to highlight this important area. The chapters in this section offer a sampling of the types of Serious Games being developed in this area. These include: games being used in the therapeutic process, games to promote healthy behaviors, games to train healthcare professionals and pervasive health games. These applications, as well as others related to healthcare, have the potential to play an important role in the future of healthcare in ihe U.S. and across the world.

     Ross Shegog, UT-School of Public Health, USA

The chapter introduces serious game developers to processes, theories, and models that are crucial to the development of interventions to change health behavior, and describes how these might be applied by the serious games community.

     Claudia L. McDonald, Texas A&M University-Corpus Christi, USA.

The author describes Pulse!! The Virtual Clinical Learning Lab—a project designed to explore the use of games in health care by developing a reliable and valid learning platform for delivering medical curricula in virtual space. She uses the Pulse!! example to describe lessons learned in the general area of collaboration, including issues such as funding, technology and evaluation.

Anya Andrews, Novonics Corporation, Training Technology Lab (TTL), USA
Rachel Joyce, University of Central Florida, USA
Clint Bowers, University of Central Florida, USA

The chapter addresses the mental health training and education needs of modern "at risk" populations and discuss the potential of serious games as effective interventions for addressing those needs.

Martin Knoll, University of Stuttgart, Germany

The author describes the potentials of serious game applications in a health context to improve user's motivation, education and therapy compliance. He focuses on "Pervasive Health Games", which combine pervasive computing technologies with serious game design strategies.

Jeanne D. Johnston, Indiana University, USA
Lee Sheldon, Indiana University, USA
Anne P. Massey Indiana University, USA

The authors investigated the effectiveness of a prototype Alternate Reality Game —called The Skeleton Chase - in influencing physical activity and wellness of college-age students.

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Section 4
The Way Ahead: The Future of Serious Games

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This section includes chapters that focus on looking toward the future of serious games. Specifically, it addresses how to establish a science of serious game design that is meant to stimulate research and applications. In addition, it includes a commentary on the way ahead in Serious Games.

Alicia Sanchez, Defense Acquisition University, USA
Jan Cannon-Bowers, University of Central Florida, USA
Clint Bowers, University of Central Florida, USA

The authors offer a simple framework for organizing variables important in the learning process and then discuss findings from psychology and education as a basis to formulate a research agenda for game-based training. The goal of the framework is to stimulate researchers to conduct systematic, appropriately controlled experiments that will provide insight into how various game features affect motivation and learning.

The author summarizes the major themes that emerge from the previous chapters and offers some observations and presents suggestions for the way ahead in Serious Games and their application to important societal challenges.