

Special Section on Intelligent Tutoring Systems and Gaming-Simulation

Guest Editorial

Gaming-Simulation can be viewed as a hybrid form involving the performance of game activities in simulated context. In this simulated context players have goals, they have to perform sets of activities, deal with constraints on what can be done, and handle payoffs (good and bad) as consequences of the actions. Gaming-Simulation has recently gained considerable popularity as a tool for education and training, both in industrial and academic environments. Gaming-Simulation promotes interest and motivation, presents information and principles, puts players into situations which they must articulate positions, ideas, arguments and facts they have previously learned, or train them skills they will need later. A Gaming-Simulation is a sequential decision-making exercise, with the basic function of providing an artificial but realistic environment that enables players to experience the consequences of their decisions through immediate response. The elements in a Gaming-Simulation (roles, goals, activities, constraints and consequences) are patterned from real life, and the linkages among them simulate the elements of the real-world system. Its objective is to enhance a comprehensive understanding of complex systems and to communicate and develop knowledge and skills. In this way Gaming-Simulation can serve as a precision tool to link a more complex model to the real world.

Systems that exhibit learning capabilities can be classified into categories of systems that apply different learning approaches, such as learning by instructions, learning by analogy and learning by examples. With Gaming-Simulations, however, the players or trainees learn by performance. Therefore, one problem that often arises with simulation games is the lack of sufficient conceptual ability on the part of the player to manipulate the simulation game in order to gain best insight into the processes and procedures involved. Intelligent Tutoring Systems, however, promise to enrich the learning opportunities for players by offering a wider scope for intellectual exploration through individualized player guidance within the learning environment. Therefore, to be completely effective as a teaching or learning tool, a Gaming-Simulation should be supported by intelligent tutoring.

Gaming-Simulation is a pedagogical tool to accomplish learning. However, as an educational tool Gaming-Simulation follows the concept of discovery learning and, therefore, does not necessarily support any direct educational aim. Gaming-Simulations provide the player with the opportunity to develop the skills of hypothesis-testing, logic, and inductive and deductive reasoning. However, the player is simply put in a position where learning takes place through experimentation with a model allowing him to explore the rules of cause and effect, without any helpful and individualized guidance. A business simulation game, for example, aims to teach managerial skills to students through experience during the game play. However, these games usually lack any adaptability to the students who are merely provided with a business environment in which they have to direct and organize the game play themselves. As a consequence, students are left to allocate their own roles. Furthermore, unfamiliar management tasks, such as pursuing sensible market research, are often avoided rather than attempted due to the lack of student support and encouragement, while the feedback to student mistakes is restricted to the reaction of the market and lacks any further remedial explanation or advice. Since the major objective of Intelligent Tutoring Systems is to

make teaching process more adaptable to the individual player, this stream, therefore, suggests that, to be fully effective as a teaching tool, Gaming-Simulation Environment should be supported by an intelligent tutoring facility.

Intelligent Tutoring Systems provide for helpful guidance and make the teaching process more adaptable to the players by exploring and understanding each individual player and his special needs and interests as well as by responding to these in the way a human teacher does. For this purpose Intelligent Tutoring Systems make use of their Domain Model, an explicit representation of the domain-specific knowledge and the problem solving knowledge of the topic which they intend to teach the player. At the same time Intelligent Tutoring Systems are equipped with teaching expertise contained in their Tutoring Model. They have the ability to determine the user's current knowledge state, his missing conceptions and his misconceptions within the teaching domain. They achieve this by collecting feedback from the user during the course of interaction and by being able to analyze this feedback against a wide range of predefined player behaviours. All information about the student is stored in the Student Model. This enables the Intelligent Tutoring System to tailor its instructions according to the needs of the individual student. Most Intelligent Tutoring Systems are also equipped with the ability to help their users clear away any misconceptions and acquire any missing conceptions. These characteristics of an Intelligent Tutoring System could therefore be useful in assisting players with their decision making. They could foster the players' learning as well as monitor and provide feedback on their behaviour and performance during the game play.

In their paper Angelides and Tong propose a hypertext approach to the development of the Human Computer Interface to a Business Gaming-Simulation Environment that incorporates Intelligent Tutoring. The short-term aim of their paper is to show how Human Computer Interface issues that arise from such an integration can be addressed effectively using hypertext and the long-term aim is to highlight the promises of a hypertext based Human Computer Interface to such an environment. Siemer's illustrates how an Intelligent Tutoring System may be embedded with a Gaming-Simulation for a Business Simulation Game. Finally, Paul in his paper examines possible roles for an Intelligent Tutoring System within a Gaming-Simulation and suggests an architecture for a Gaming-Simulation that incorporates Intelligent Tutoring support.

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