Chapter 24
A Brief Review of Game Engines for Educational and Serious Games Development

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ABSTRACT

Gamification is the use of game design elements to enhance the teaching-learning process and turn a regular, non-game activity into a fun, engaging game. Simultaneously, serious games are proposed as an efficient and enjoyable way of conducting cognitive assessment, as they combine a serious intention with game rules and targets. In this scenario, game engines have emerged as information technologies for serious games and educational games development; however, this development has usually been performed without a guide to identifying game attributes to be present in the game. To address this gap, we present an analysis of the most used game engines to identify game and learning attributes supported for serious and educational games development. Findings from this analysis provide a guide of the most popular game engines that offer the largest support for game attributes, which were also classified by game categories.

INTRODUCTION

Gamification is the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals (Burke, 2014). Through gamification not only can we create a mindset that encourages students to try new things, to not be afraid of failing (Chung-Ho & Ching-Hsue, 2013), but also students can engage in enjoyable experiences for a learning purpose. The gamification of learning is an educational approach to motivate students to learn by using video game design and game elements in learning environments. Gamification is today considered as an essential driver of innovation in the educational domain, and thus it is important to understand how serious games can be best designed and used as an organizational learning environment (Boughzala, Michel & de Freitas, 2015). Serious games are aimed at a population that is familiar with online games, particularly Generation Y, who are more playful, outgoing, major consumers of training and coaching, and cannot be recruited in the same way as previous generations (Morley, Figueiredo, Baudoin & Salierno,2013; Twenge, Campbell, Hoffman & Lance, 2010). The advantage of serious games as a learning tool mainly relies on their ability to balance entertainment, interactivity, and replay ability of the typical games with the learning objectives of a specific educational goal.

In education, game-based learning is a motivating factor, as games are often attractive for their rules, reward systems, and environments (Prensky, 2005). Gamification is the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals (Burke, 2014). Through gamification we create a mindset that encourages students to try new things, to not be afraid of failing (Chung-Ho & Ching-Hsue, 2013), and it also allows them to engage in enjoyable experiences for the purpose of learning. From this perspective, gamification appears as the use of game mechanics in environments and applications that are not playful to generate and transfer knowledge, thus enabling the development of competencies in human talent; it is related to decision-making activities. At the same time, games have become a very useful tool to bring in knowledge management from the practice of simulated environments in the context of various knowledge fields (Deterding, Dixon, Khaled & Nacke, 2011; Deterding, Sicart, Nacke, O'Hara & Dixon, 2011; Morford, Witts, Killingsworth & Alavosius, 2014; Yamabe & Nakajima, 2012).

An innovative implementation for learning is the use of serious games (SG), commonly motivated by the need to educate and report about or shape a specific topic (Michael & Chen, 2005). A serious game is a game in which education, in its various forms, is the primary goal, rather than entertainment. The advantage of serious games as a learning tool relies on their ability to balance entertainment, interactivity, and replay ability of typical games with the learning objectives of a specific educational goal. Likewise, serious games offer developers ways of reducing or mitigating some costs regarding game technology and content development, and they also keep teams busy between larger, retail-oriented projects. In addition, serious games provide opportunities of experimenting a new gameplay style, and even new types of educational distribution. Knowledge fields where serious games have been adopted include education, medicine, corporations, and military, among others (Susi, Johannesson & Backlund, 2007).

There are two types of game engines, HTML5-based frameworks and proprietary engines. The two allow for the development of Web-based, native mobile, and hybrid applications by using game strategies and techniques (Nagle, 2014). However, due to an extensive variety of both game engines, their selection for developing a particular educational application may be troublesome. In this work, we thus seek to support the selection process of the most suitable game engine(s) for a particular educational application, taking into account activities required for its development. In general, this paper presents an

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