Computer Technology for Serious Games in Education: A Literature Review

Carlos A. Osorio-Sandoval, Christian Koch, Walid Tizani
University of Nottingham, UK
carlos.osoriosandoval@nottingham.ac.uk

Abstract. Serious games are games which purpose differs from entertainment. The quick development of computer and gaming technology has brought attention to them, but a current state-of-the-art on its application had not been addressed in literature. In this paper, we identified trends in the application of computer and gaming technology in serious games for education. Game engines, augmented reality, virtual reality, mobile devices and building information modelling are the trending technologies used by researchers and developers in the field. Some insights on the way in which these technologies are being implemented are provided. We found that by applying these technologies it is possible to achieve some of the characteristics that stakeholders look for in serious games for education: immersion, ubiquity, high quality graphics, interoperability and quick game content development.

1. Introduction

It has been difficult for researchers to define games, or even to list the conditions that a system or an object must meet to be considered a game. Although several attempts have been made, there is neither a definition, nor a single necessary or sufficient condition in literature that satisfies everyone. In fact, the idea of "family resemblance" developed by Wittgenstein (1958) was originally explained using games as an example. By examining different types of games, we see a complicated network of similarities overlapping and crisscrossing: sometimes overall similarities, sometimes similarities of detail (Wittgenstein, 1958). There is no essence among them (Mayer, et al., 2016) and they seem to share no single characteristic (Duke, 1974).

For example, voluntarism is an aspect of games recognized by many of the most cited authors that have attempted to describe them (Huizinga, 1949; Suits, 1978), yet, when talking about games for educational purposes, Becker (2010) points out that in any formal education setting the tasks that learners are given to do are typically not voluntary.

Despite this debate, it is true that we recognize a game when we see it (Crookall, 2010), and that even children learn what games are fairly easily (Mayer, et al., 2016).

Even though serious games are a more specific kind of games, the above disagreement concerning both its definition and characteristics remains the same. The only boundary that appears to be true amongst the various researchers and developers that address serious games seems to be that its purposes differ from entertainment. Nevertheless, according to Sawyer (2008), there are at least 13 other terms used to refer to these games.

Regardless, the field of serious games has been growing rapidly, and drawing attention of several stakeholders from a broad spectrum of areas. Laamarti, et al. (2014) carried out a survey of published articles related to serious games using online archives from 1995 to 2013 and found out an exponential growth in the number of research papers published in the field with more than 1200 articles in 2013 alone. Current figures continue to rise with more than 2000 articles published in 2016 (De Lope & Medina-Medina, 2016).