Learning Recycling from Playing a Kinect Game

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ABSTRACT

The emergence of gesture-based computing and inexpensive gesture recognition technology such as the Kinect have opened doors for a new generation of educational games. Gesture-based-based interfaces make it possible to provide user interfaces that are more nature and closer to the tasks being carried out, and helping students that learn best through movement (compared to audio and vision). For younger students, motion interfaces can stimulate development of motor skills and let students be physically active during the school day. In this article, an evaluation is presented of a Kinect educational game where students learn to recycle using body gestures. The focus of the evaluation was to investigate potential advantages using gesture-interfaces in educational games, how the game affected the students’ engagement, motivation and learning, and if there were any social preferences for playing the game. The results show that elementary school students get highly motivated and engaged playing a Kinect recycling game. The students also report that they learn from playing this game and prefer such game-based learning to traditional lectures. Finally, the students preferred playing this game as a multi-player game, where the boys preferred to play competitive while the girls preferred playing collaboratively.

Keywords: Educational Game, Game-based Learning, Kinect, Gesture-based Computing, Motion-based Interfaces

1. INTRODUCTION

Games when done right are powerful learning machines, and the use of games and game technology can enhance learning (J. P. Gee, 2005). In K-12 education, games have been found to improve academic achievement, motivation and classroom dynamics (Rosas et al., 2003), and similar results have also been found in higher education (Sharples, 2000). Most existing educational games use traditional game controls such as mouse and keyboard, or gamepads. The emergence of gesture-based computing and inexpensive gesture recognition technology have opened up for experimenting with new ways of interacting in educational games (Dede, 2009). Gesture-based educational games can be beneficial in many areas. Firstly, it is possible

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to provide user interfaces that are more natural and closer to the task to be achieved (Johnson, Levine, Smith, & Stone, 2010). Second, gesture-based educational games allow students to use their body while they are playing which will reduce physical passivity. Third, students that learn the best through physical movement get stimulated. Unfortunately, there are few educational tools and practices to support the latter. Thus it is important to also stimulate the students that learn the most through kinesthetic. Fourthly, gesture-based educational games opens the opportunity to learn complex phenomena through multiple perspectives and provide a foundation for situated learning with more authentic context (Dede, 2009).

This article presents a gesture-based educational game that uses Kinect to teach elementary school students recycling. In the game, the students work at a recycling plant and are responsible for moving various items of waste from a conveyor belt into the correct recycling bins by engaging pistons. The goal is for the students to place all waste correctly, as more and more waste comes down the conveyor belt that gradually runs faster. The game ends, when three items of waste have been missed. The game offers a single player, a collaborative, and a competitive game mode. The article presents the results from an evaluation of this game on an elementary school where 57 students played the game. The focus of the evaluation was to investigate the potential advantages of gesture-based educational games, to see how this game affected the students’ engagement, motivation and learning, and investigate what social preferences the students had for playing the game. The data from the evaluation was collected through a questionnaire, observations and interviews.

The rest of the article is organized as follows. Section 2 presents the related work, the Kinect Recycle game, and the research methodology. Section 3 presents the results from the evaluation. Section 4 discusses the results from the evaluation. Section 5 concludes the paper.

2. MATERIAL AND METHOD

This section presents related work, the Kinect Recycle Game, and the research goal, the research questions and the research method.

2.1. Related Work

The related work section is divided into four subsections. The first subsection gives a brief introduction to game-based learning, the second subsection focuses the motivation for gesture-based computing, and the third subsection covers various usage of gesture-based interfaces, while the last subsection specifically focuses on Kinect.

2.1.1. Game-Based Learning

Game-based learning is a research field that has received increased attention in recent years. Traditionally digital learning games have been used to teach facts using multiple-choice questions, but games can also be used to teach skills, judgment, behaviors, theories, reasoning, process, procedures, creativity, language, systems, observation, and communication using various approaches (Prensky, 2005). The most common game-based learning approaches focus on drilling facts, but they can also be used to train skills through solving problems, to do reasoning presenting cases where the students have to analyze to find the right answer, and for training judgment where the students have to respond to ethical or manage decisions.

Compared to mainstream entertainment games, learning-oriented games more often have negative associations related to produced for few platforms (mostly Windows), simplistic games, single player and offline play, low production value, not typically marketed to users but rather to parents and teachers, and more focus on relevant for formal curriculum than being fun (Kirriemuir & McFarlane, 2004). This is especially a problem if the learning games trying to reproduce mainstream digital games, ending up in games that are poor copies of better pure entertainment games that try to squeeze learning into an existing game concept. We did not
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