Chapter 5.15

Usability and Affordances for Teaching and Learning in Second Life

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ABSTRACT

This chapter presents a summary of research undertaken at the University of Hertfordshire into the usability and affordances of three-dimensional (3D) virtual environments (VE) used in teaching and learning. Our earlier experimental work identified important variables related to individual differences and how these affected task completion, learning, and attitude to the environment. More recently the results of these laboratory-based empirical studies have been applied to teaching and learning in the Second Life virtual world. The results of two studies are presented with undergraduate Computer Science students. In the first study the affordances of the Second Life environment for project group working and teaching was evaluated. In the second study small groups of learners developed real world games and modified these for play in Second Life. Based on experiences from these studies, a set of recommendations related to the use of 3D virtual environments in teaching and learning is presented.

INTRODUCTION

From the moment of birth people develop a wide range of skills that equip us for life in a three dimensional (3D) world. A major limitation of the present day computer is the two dimensional interface it provides us with. What could be more natural than to use the power of the modern computer to develop 3D interfaces within which the range of our natural skills could be used to enhance our experiences and to assist in completing tasks? Crossley and colleagues (1997) suggest that 3D virtual environments (VEs) provide a more natural

manner of interaction. Recent advances in computer technology and lower prices have led to the development of a range of 3D VEs including computer desktop VEs to become popular (Li & Ting 2000, Mills & Noyes 1999). These are currently being used for commercial, social and educational applications. Currently these technologies and their applications are used in a variety of areas such as entertainment, engineering, architecture, medicine and science. The current interest in and success of 3D films such as Avatar (2009) and the wide variety 3D computer games environments available shows how commercially important these developments are likely to become.

A fairly recent development has been the use of the Second Life virtual environment (http://secondlife.com/) in education and training. Since its establishment in 2003, many hundreds of organisations have become involved in setting up educational and training applications using this system. It seems clear that there is a strong rationale for the increased use of virtual systems in education and training (deFreitas, 2006; 2008). There is currently a great deal of interest in the use of virtual worlds for teaching and learning. There has been a significant amount of research into the affordances of three dimensional virtual worlds in teaching and learning. For example, deFreitas (2006; 2008) emphasizes the importance of learning through engagement and empowering factors such as learner control within three dimensional virtual worlds.

As such systems are becoming more widespread it is suggested that they possess problematic design and human factor issues that need to be addressed (e.g. Mills & Noyes, 1999; Stanney et al., 1998). The importance of navigation in non-immersive 3D VEs is well known and has been well studied (Darken & Silbert 1993, Li et al 1999, Stoakley et al 1995). In the study reported here it was decided to investigate issues related to the factors that facilitate or hinder T&L in virtual worlds and to put forward empirically based practical recommendations which it is hoped will

contribute to the existing body of knowledge in this area.

Usability and Affordance

It is important that the users of 3D virtual systems are able to use such systems effectively and efficiently to achieve their goals. Usability inspection is the generic name for a set of ways of evaluating user interfaces to understand how systems may be designed to improve interaction and achievement of goals (Rosson & Carroll, 2002). They can be fairly informal methods according to Nielsen (1993). Rosson and Carroll (2002) state that a range of techniques are employed, ranging from laboratory-based keystroke analysis to understanding the social context of users. In the research reported here an experimental approach was employed initially to understand basic usability issues in 3D virtual systems. A laboratory based study was undertaken to this end and it is presented in the section following this.

An affordance is the design aspect of an object which suggests how the object should be used (Norman, 1988; 1999). The idea that the properties of objects might lend themselves to particular uses originated from the work of Gibson (1979). The social context of usability and the idea of affordances are closely related (Kreijins & Kirschner, 2001). In the research presented here, the fuller social context of usability (Ross & Carroll, 2002) and the affordances of the Second Life 3D VE in teaching and learning were explored by means of a studies involving learners undertaking group working in software development and with learners developing computer games in Second Life. These studies are explained in later sections of this chapter and recommendations based on the findings are presented.

Laboratory Based Study

In this section is presented a summary of usability experiments that were performed over a consid-

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