An Architectural Learning Environment

Andrè Brown¹, Mike Knight², Martin Winchester
School of Architecture, The University of Liverpool, UK.
http://www.liv.ac.uk/abe/caadru
¹ andygpb@liverpool.ac.uk, ² m.w.knight@liverpool.ac.uk

This paper contributes to the discussion on Virtual Learning Environments, particularly those aimed at the study of Architecture and allied or parallel disciplines. The campus at the University of Liverpool has been modeled and from this an interactive environment has been created that replicates the actual built form and landscape of the actual campus. We reflect on the appropriateness of such environments, compared to more conventional web based techniques for the delivery of educational information.

Keywords: Virtual learning environment; virtual campus; virtual environment.

Introduction

There has been debate about the issue of space versus place in the context of interactive learning environments (for instance in Maher and Clark, 2005; Kalay et al. 2004). The nature of the environment that best facilitates information exchange and learning is still the source of debate, and an interesting area for development, particularly in the context of the particular needs of architectural education (Schön, 1987). A number of consequential issues arise. Given the nature of the discipline should the virtual representation of a learning environment embody three dimensional spatial representations? What is the value and importance of representing ‘place’ in such environments?

Some previous work

In previous studies we have looked at some of the issues raised by the desire to create effective virtual environments for architectural education (Brown et al.2001, and Brown et al., 2002). The environment reported here represents a significant advancement on the work described in the two papers above.

In addition other researchers have looked at issues Maher and Clark (2003) have studied such interactive learning environments in the context of 3D Virtual Worlds that are accessible globally over the Internet, specifically Active Worlds. Such environments are being used by users from a variety of disciplines and in a variety of cultural contexts. Kalay et al. (2004) have considered such environments and have studied and developed environments that both make a representation recognisable as a replication of the real world, and one that takes a semi-abstract form representative of the field of study. Holmgren et al. (2004) showed how a community space for interaction and exchange of information can be created with this kind of environment.

In the work presented here we describe a Virtual Learning Environment that has been constructed from a 3D model of the learning environment that the students are familiar with, their own school of
architecture and the surrounding University campus. Figures 1 and 2 illustrate the typical kind of representation that has been created for the Virtual Liverpool University Campus.

The learning environment that has been created has portals that link it to web sites, and other visual and audio information in digital format. Figure 2, for instance, shows how lectures can be accessed as digital movies once the user has navigated to the lecture theatre. Figure 1 shows a recognisable representation of the entrance hall with digital notice boards that can become portals to web sites with further information.

Creating the environment

We describe here, how this customised virtual environment was created, using games engine technology. The environment is modeled as a 3D representation, and our intention is to compare this 3D representation with the more conventional 2D representation offered by a more conventional web site Virtual Learning Environment (VLE). In act we could consider the conventional web site to be 2.5 or 3D, as interaction allows the user to access other virtual layers of information. In the same way our environment could be considered as 4D, since from the 3D environment parallel layers of information (such as conventional web sites) can be accessed via the portals.

As shown in figure 2, and in later figures, from the environment the portals are accessed by clicking on part of the 3D model. In the case of figure 2 the portal is accessed by clicking on the screen, and this activates a digital video. In other cases, as mentioned, web sites can be accessed.
The first part of the process in creating the 3D virtual learning environment was to create a conventional 3D model of the buildings and spaces to be represented (figure 3).

What is important in creating the model is to recognise that when imported into the 3D environment non planar surfaces become memory hungry, so the model has to be created judiciously. In this case, surfaces that will never be seen from the eyeheights used to perambulate around the model are excluded.

Once imported into the games ‘world’ various effects, lighting and rendering can be controlled (see lower window of figure 4).

In the illustration in figure 4 in the upper part of the panel a piece of design work has been applied to the wall of the virtual design studio. This can now be made into an active link. For instance, in this case clicking on the design representation on the wall opens a web site describing the whole design project.

In order to do this in the games environment, a ‘trigger’ must be set, and the lower part of the panel in figure 4 shows the model construction map being set to build in that trigger. It is clear from the illustration that the logic and techniques used to render the model and accomplish effects such as setting a trigger to open a portal are very different to the techniques used in conventional architectural modelling.
In addition as mentioned above, file size is crucially important in establishing a virtual environment that is responsive in real time. One technique used to keep file sizes as small as possible was to create external views as stage sets. Thus views out made up of a set of screens mounted on a plan of the surrounding area. The screen were chosen only to show those parts of the external environment that could be seen, and being two dimensional, with a simple surface texture, were very efficient in terms of memory requirements.

Figure 5 shows the array of screens used and the placing of the ‘stage set’ screen for one of the dominant external features, the Metropolitan Cathedral. Figure 6 shows the effect created by the technique.

With the Learning Environment constructed it will now be possible to undertake a comparison of the effectiveness of the environment compared to the University's conventional web-based learning environment, which uses ‘Blackboard’ as it's engine. The Second Life environment will also be investigated as a comparator.
Closing remarks

A core issue that the work described raises is whether having a recognisable representation of a familiar environment makes navigation and comprehension of the location of information easier, so that access to richer sources of information can be more easily located and accessed. Study of the environment in the coming year should help establish the effectiveness.

The second point that the paper makes is to illustrate that it is possible to build such environments for remote and multi-user access from scratch rather than building with a set of predefined components as in environments such as Active Worlds. It seems to us particularly appropriate to do this for an architectural learning environment. The building blocks approach offered by environments such as Active World and Second Life limit the potential to create environments that are more appealing and design-erly. They do though, suffer from the limitations of visual appearance that games engine representations are constrained by, in order for the graphical tricks used in such environments, to work.

Acknowledgements

We wish to acknowledge the work of students at the University of Liverpool who have contributed significantly to this project, and in particular those who have contributed to work represented here; Kier Alexander, James Christian, Chris Cox and James Humphrey.

References
