# A user interface for landscape modelling in a virtual environment using a head mounted display

Virtual landscapes are an important component in representing natural environments for applications such as computer games, film, simulation and training. With the recent increase in the availability and accessibility of head mounted displays (HMDs from now) to the public there is likely to be a demand for tools that allow developers to create landscapes for use with such devices i.e. for virtual environments. Therefore, we wish to allow landscape modelling for virtual environments to be carried out in virtual environments.

We propose to modify an existing landscape modelling desktop application for use with a HMD. We will modify the application interface such that existing tools will be usable in a HMD based virtual environment. We will then perform user based testing to ascertain the usability of the modified application in comparison to the desktop version.

There is existing research comparing the usability of software when used with traditional desktop interfaces to being used with HMDs. This includes research in navigating environments using traditional interfaces compared to HMDs where users had to perform a series of navigational tasks. Since it will be necessary for users to navigate the environment they are modelling we can draw on the findings of such studies to inform our interface design.

Research on use of Computer-Assisted Drawing software and other 3D modelling applications in virtual environments will provide guidance for interface features to be used and avoided.

There is literature on the landscape modelling application we intend to modify as well as on similar applications, such as landscape modelling from a first-person point-of-view(POV). This will help determine the interactivity the interface should support, additional interactive possibilities to add to the interface and the functionality that the application should provide.

There are large bodies of work about user-based usability testing which we will draw on to determine the precise method of testing we will perform.

The existing landscape modelling application we intend to modify provides the user with several tools. The ability to add and modify geometric constraint points and curves to a landscape allows users to create landscape features such as hills, ridges and valleys. Coherence controls allow users to fix parts of the landscape preventing later changes elsewhere from affecting it. Copy/paste functionality allows landscape regions to be moved to new locations and elevations. Type constraints which can be painted onto the landscape to define areas of a certain type such as ‘swamp’, ‘dirt’ etc. To interact with these tools users have access to a combination of sketching, painting and 3D widget interface elements.

The modified application will need to provide these tools as well as incorporating interface elements designed to work with a HMD. Additionally, it is likely that new tools or features will need to be added to provide sufficient usability in a virtual environment designed for a HMD. For example we can draw on existing research to provide an effective navigation system. HMD specific considerations such as minimizing sudden view point jumps, to avoid motion sickness, will also be need to be made.

Once the development of the modified application has progressed to the point of a working prototype we will carry out user-based usability testing. This will involve comparing the Desktop system to the HMD system using standard usability measures. Test participants will be drawn from students, preferably those with experience using 3D virtual environment tools such as Unity or other game engines. Based on research findings, participant availability and time constraints we may incorporate multiple iterations of usability testing while modifying and improving the application based on user feedback.

We will then draw conclusions based on these tests as to whether we have successfully translated the desktop application into an HMD environment. Broadly we intend to discover the following. Were the tools in the original application successfully incorporated in the modified version? Is the interface with the virtual environment easy to understand and fast to learn? Does being in the user’s POV help with design decisions? How does the speed and accuracy of modelling differ between the original and modified versions of the application?

During this project we will create a virtual environment interface for landscape modelling. We will determine whether we have successfully modified the desktop application into a virtual environment application. We will observe which tasks translate well to a virtual environment and which do not as well as which interface elements are effective in a virtual environment.

We hope our findings will be useful for designing effective interface elements for virtual environments using state of the art technology. We also hope to help in finding what sort of tasks are suited to virtual environments using HMDs especially in the context of HMD based developer and 3D modelling tools.