

Collaborative Interaction in Large Explorative Environments

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ABSTRACT

Building collaborative VR applications for exploring and interacting with large or abstract spaces presents several problems. Given a large space and a potentially large number of possible interactions, it is expected that users will need a tool selection menu that will be easily accessible at any point in the environment. Given the collaborative nature, users will also want to be able to maintain awareness of each other within the environment and communicate about what they are seeing or doing. We present a demo that shows solutions to these problems developed in the context of a collaborative geological dataset viewer.

CCS CONCEPTS

• **Human-centered computing** → **Virtual reality**; *User interface design*.

KEYWORDS

collaborative virtual reality, menu interaction

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1 INTRODUCTION

We present a demonstration of several techniques developed to mitigate problems that arose during development of a collaborative VR geological dataset viewer. In the application, pictured in Figure 1, we wanted remotely located geologists to be able to explore a large dataset (in this case an SRTM scan of the Chicxulub Impact Crater, described elsewhere [4]), and collaborate on interpreting and annotating the data. This presented two main design challenges: designing a menu interface and promoting collaborative awareness.

First, users of VR software that allow a large variety of tasks often require a menu system for selecting various tools to perform the tasks [2]. Common solutions often include integrating the menu into the environment or having a menu button summon an abstract in-world menu at a position near the user [3]. During early development stages, we inferred that static menus placed in a large virtual world could be lost or forgotten as the user moves around. We also consider that putting a large number of tools on a menu near the user's hands could easily become cluttered and hard to manage. Our solution was to create a "spherical dashboard" containing multiple

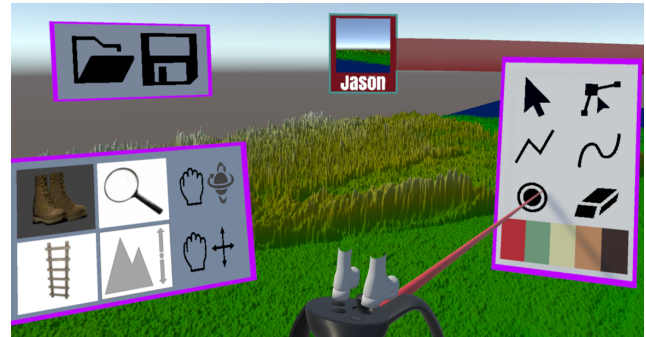


Figure 1: The spherical dashboard interface. Several widgets allow the user to change the current interaction context. The model of shoes over the controller's analog stick indicates that the standard walking movement tool is selected. A name tag for the remote user is placed on the dashboard, displaying the user's name and an image of what they currently see. A leading indicator connects it to the user's avatar to let users know where other users are at all times.

tool widgets floating in front of the user that would follow the user and rotate to keep it in view when the user needs it.

Second, users need tools for communicating with each other across the large environment and for maintaining awareness of other users when they are not in view. Basic tools like voice chat alone are insufficient to keep users aware of each others' locations and current tasks in the environment. Users quickly separate and are unable to find each other, compared to smaller environments where users can more easily find each other and see what others are doing. Several techniques have been developed to guide users to offscreen targets in a 2D environment, but this has not received as much attention in 3D virtual worlds [5]. Our solution involves a widget on the user's spherical dashboard with a tether connecting it to the remote users.

The demo will allow users to connect in VR with an experienced user to try out our proposed interaction methods.

2 INTERFACE DETAILS

2.1 Menu Interaction in a Large Environment

We consider that when users are expected to interact with the environment in many ways, we need to give them ready access to various tools. An initial solution relied on world-space menu panels and widgets to handle interaction and tool selection; a flat menu panel for selecting tools could be placed on the environment where the user was looking, scaled to be viewable from any distance, and a scale widget (similar to those commonly found in game engines or 3D modelers) could be placed on the environment and manipulated

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