Two Handed UI VGIS in a Multiscale Environment

William Brady Fulmer, Zachary Wartell, Ph.D.
fulmerw2@winthrop.edu, zwartell@uncc.edu

William Brady Fulmer – Winthrop University

Introduction

VGIS (Virtual Geographic Information System) is a large project used to view 3D terrain data and other associated data on stereoscopic and monoscopic displays. This project has focused on viewing and selecting 3D weather data within the multiscale stereoscopic environment and the scaling algorithms required to appropriately view the 3D data. Viewing the weather data on a stereoscopic display gives a user a better understanding of the structure of the three dimensionality of the data. The scaling algorithms of a multiscale environment treat scale as a 7th degree of freedom. Therefore, for operations such as zooming, the objects are scaled rather than only moved.

Background

Many studies have been done on 3D object selection and manipulation within a multiscale environment. However, only a few studies have been done in respect to 3D volume selection and viewing. Amy Ulinski, a graduate student from the Future Computing Lab, has done an exclusive study on 3D volume selection techniques. These techniques may later be applied to VGIS. But for now VGIS focuses on volume selection within the multiscale environment and the scaling issues associated with viewing that data.

Research

- Button Mappings
  - Many of the buttons on the two handed cursors were mapped to multiple actions which conflicted making many things not work.
- Tracker Issues
  - Distortion of surrounding metal objects became apparent when using the cursors for volume selection rather than solely for navigation.
  - We reduced the problem by lowering the tracker to bring the cursors closer therefore reducing the exponential distortion.
- Scaling
  - The Scaling algorithms were not consistent or fluid enough for proper navigation
  - We implemented a modified cyclopean scale for use in a head tracked environment.
- Volume Disappearing
  - Volume data was disappearing when zooming past a certain threshold.
  - We found and removed the code that was causing this issue.
- Cursor Jittering
  - The 3D cursors were being rendered relative to the earth.
  - When zooming in really close, they would jitter due to rounding and precision issues
  - We began rendering them relative to the platform; therefore the cursors were always local and more precise.

Impact

- Button Mappings
  - Made volume selection functional
- Tracker Issues
  - Made distortion barely noticeable.
- Scaling
  - Made scaling more fluid and less noticeable within the multiscale environment.
- Volume Disappearing
  - Kept volumetric data visible
- Cursor Jittering
  - Removed jittering which was distracting.

Screenshot of VGIS at startup.
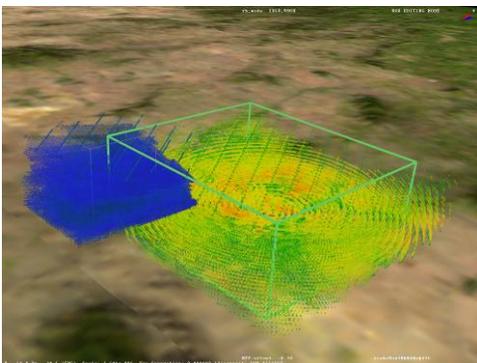
3d Selection of velocity data (blue) and reflectivity data (green).

Conclusions

I learned about:
- VGIS in general as a software package
- DLLs
- Threading
- C Language
- Scaling methods
- Head tracked displays
- Stereoscopic displays
- Cartesian Coordinate System

Made the two handed UI functional and more understandable.

Future Work

- Get scaling functions working optimally
- User studies
- User Interaction Modification