Meteorological Data Visualization in Multi-User Virtual Reality

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Due to their complexity and size, visualization of meteorological data is important. It enables the precise examining and reviewing of meteorological details and is used as a communication tool for reporting, education and to demonstrate the importance of the data to policy makers. Specifically for the UCAR community it is important to explore all of such possibilities.

Virtual Reality (VR) technology enhances the visualization of volumetric and dynamical data in a more natural way as compared to a standard desktop, keyboard and mouse setup. The use of VR for data visualization is not new but recent developments has made expensive hardware and complex setups unnecessary. The availability of consumer of the shelf VR hardware enabled us to create a very intuitive and low cost way to visualize meteorological data.

A VR viewer has been implemented using multiple HTC Vive head sets and allows visualization and analysis of meteorological data in NetCDF format (e.g. of NCEP North America Model (NAM), see figure). Sources of atmospheric/meteorological data include radar and satellite as well as traditional weather stations. The data includes typical meteorological information such as temperature, humidity, air pressure, as well as those data described by the climate forecast (CF) model conventions (http://cfconventions.org). Other data such as lightning-strike data and ultra-high-resolution satellite data are also becoming available. The users can navigate freely around the data which is presented in a virtual room at a scale of up to 3.5 X 3.5 meters. The multiple users can manipulate the model simultaneously. Possible mutations include scaling/translating, filtering by value and using a slicing tool to cut-off specific sections of the data to get a closer look. The slicing can be done in any direction using the concept of a 'virtual knife' in real-time. The users can also scoop out parts of the data and walk though successive states of the model.

Future plans are (a.o.) to further improve the performance to a higher update rate (for the reduction of possible motion sickness) and to add more advanced filtering and annotation capabilities. We are looking for cooperation with data owners with use cases such as the above mentioned. This will help in further improving and developing our tool and to broaden its application into other domains.