

Building UCAR Augmented and Virtual Reality (AR/VR) Capacity for Engaging Communities

UCAR Administrative Opportunity Award

Purpose/Overview

The UCAR Exchange suggested that UCAR consider setting up an Augmented Reality/Virtual Reality (AR/VR) visualization group that brings together programming, visualization and design expertise to work on organization-wide projects. This proposed project will pilot a process to collaboratively brainstorm and rapidly develop prototypes of AR/VR products. Staff will come together for brainstorming and storyboarding ideas to develop into rapid prototypes which could become marketable apps or demonstrations for engaging with possible sponsors.

This group will bring together the expertise at UCAR to strengthen our position, develop skills, and build education and outreach products through AR/VR. To date, this work has been compartmentalized within individual programs/labs. This project focuses on bringing together programs/labs to build joint capacity for visualizing our plethora of atmospheric data in near real-time in AR/VR for educational uses like universities, K-12 education, and public outreach. This project leverages expertise in data visualization and access at Unidata, 3D conceptual visualization and educational development at COMET and scientific research and entrepreneurial approach to product development at RAL.

Objectives

The project will:

- Foster collaboration among UCAR/NCAR groups (those with AR/VR skills as well as those who would like to add this exciting technology to their projects),
- Test processes to rapidly and inexpensively prototype potential new products, and
- Document business development opportunities for UCAR/NCAR within the AR/VR application field.

Vision

AR/VR technology is still new in terms of applications to Earth System Science, yet holds great promise for introducing individuals to our science. This effort will result in a more robust approach to implementing this technology to visualize atmospheric datasets in three dimensions to support education efforts at universities, K-12, and with the public. With demonstration prototypes, marketing these technologies to our sponsors becomes easier, providing more opportunities for future funding. This AR/VR group can provide guidance on best practices to or

collaborate with other groups on future proposals. The framework for real-time data in an AR/VR world provides the basis for others to build their own apps with our AR/VR-ready data, furthering the use of atmospheric data and providing education and outreach possibilities beyond what we have developed.

Stakeholders

Core Team Members:

COMET:

- Tsvetomir Ross-Lazarov, Instructional Designer
- Bryan Guarente, Associate Scientist
- Gary Pacheco, Web Developer
- Steve Deyo, Graphic Artist

Unidata:

- Ward Fisher, Software Engineer

RAL:

- Jonathan Vigh, Project Scientist

The team will invite additional members from other labs and programs at UCAR/NCAR. The UCAR/NCAR internal community will be invited to two brainstorming sessions to share their ideas on possible AR/VR applications using our datasets.

Expected Outcomes

The expected outcomes include:

- Formation of a core collaborative group of UCAR/NCAR staff with expertise and/or interest in developing AR/VR applications
- Documentation of a rapid prototyping process for developing AR/VR products that may be useful across UCAR/NCAR
- One or more prototype AR/VR products that may be promising for seeking additional funding and development (perhaps through the UCAR Exchange), be usable within ongoing educational resource development, data flows and data sharing, and/or to showcase our capabilities in the AR/VR space for existing and potential sponsors.

High-level Requirements

The core team will meet once per month during the 6-month project duration to share their expertise and best practices around how to create AR/VR applications most efficiently as well as demonstrate AR/VR capabilities. To determine a rapid prototype project that uses currently available data, the team will facilitate a UCAR/NCAR brainstorming session. To facilitate a productive brainstorming session, the core team will both invite people from across UCAR/NCAR and provide a way for interested people to sign-up to participate, ensuring

participation from a diversity of stakeholders. The brainstorming sessions will last two hours and will be highly interactive. The core team will choose a few products to rapidly prototype, based on feasibility and data availability, and seek 3 additional people to join the coding team from different programs/labs. Collaboratively, the coding team will create the rapid prototype products over a 2-month time period. These prototypes will be shared back with the UCAR/NCAR community in the second session where feedback will be gathered on the prototype products and further brainstorming can occur on how this can be used within each division at UCAR/NCAR. The final month of the project will be focused on completing prototype products, documenting the processes used, and determining next steps/funding sources to encourage further collaborations in the AR/VR product space.

Budget

This budget summary shows the costs for the project. With the cost share from UCP, the total request for this project is \$76,811.

Salaries	\$43,751	
Benefits	\$23,844	
Materials & Supplies	\$630	
Purchased Services	\$1,500	
Overhead	\$11,086	
Total		\$80,811
Cost share		\$4,000
Total Request		\$76,811

Timeframe Requirements

We propose a six month effort with the following milestones:

1. Month 1: Initial Core Team meeting and monthly schedule of core team meetings

2. Month 2: UCAR/NCAR-wide brainstorming session to gather ideas for prototype products; identify prototype products to develop; identify 3 additional people to join the coding team to create the prototype products
3. Month 3-4: Collaboratively complete coding for prototype products with people from COMET, Unidata and other programs/labs
4. Month 5: Share prototype products with UCAR brainstorming group for feedback and assessment
5. Month 6: Make revisions to prototype products as needed; share finished prototype products; document rapid prototype processes; identify next steps as applicable for prototype products

One-time activity or a pilot project?

This is a pilot project that will help identify both expertise across UCAR/NCAR in the AR/VR application space and a rapid prototype process to streamline idea-to-prototype timelines. The collaboration during this project will likely forge partnerships across UCAR/NCAR labs and lead to new business development opportunities in the AR/VR application space while strengthening our abilities to lead the way in AR/VR work in the Earth Science community.

Anticipated scope of the follow-on:

Potential business development opportunities and future applications of AR/VR may include:

- AR/VR apps with possible monetization for cost recovery and to help fund future work.
- Develop a 3D AR app for the NCAR visitor area to help users visualize the 3D structure of the atmosphere.
- Visualization of satellite data from the lesser-known channels to show the user some of the extra information weather forecasters can use to visualize the atmosphere.
- Visualization of NWP forecasts in 3D (may be georeferenced). Showing current and future data in a 3D space can really help a user identify their risks as well as see some of the human-added value that forecasters bring to NWP forecasts.
- Visualization of any meteorological data set in 3D or over the real atmosphere. For example, pointing an AR app to a lenticular cloud could generate a 3D animation of the wind flow around and through the cloud. Essentially, making the “invisible” processes in the atmosphere visible in Augmented reality.
- Visualizations of conceptual models. For example, point the camera at a thunderstorm and use visual and radar velocity data, etc. to determine if it is a supercell and what the associated flow structures are.
- Workshops for internal UCAR/NCAR staff who want to learn how to work in AR/VR or how to use Unity. This could be a workshop series over an entire year with 1-hr workshops spread out, or intensive learning sessions (day-long events), or week long courses on AR/VR or Unity.

Co-sponsorship

UCP will co-sponsor this effort with \$4,000 toward developing partnerships with other UCAR groups and building relationships that will lead to collaboration on future proposals that apply AR/VR technology to Earth System Science education.