

Scientific Visualization Project Proposal

Carson Sorenson
Connor Geslin
Brennon Netz

Project Title

Visualizing Natural Disasters

Overview

Our project aims to get a better look into natural disasters. We want to show how some of the natural disasters form and their various stages of development. Using some of the tools and software we have learned in this class we will demonstrate our proficiency by creating interesting and meaningful visualizations. We can show the natural disasters in the early, middle, and late stages of development.

Why is this project important?

This project is important because it will help us work in a group and become better acquainted with creating visualizations that provide insight and knowledge into natural disasters. By creating meaningful visualizations we will be able to improve our skills in ParaView and VTK. We hope to give a detailed analysis of our visualizations to show we have a keen understanding of the subject at hand and the data sets that we will be using.

What are the objectives of the project? What are the questions you want to answer?

The main objective of this project is to create visually appealing and informative visualizations of the datasets we have chosen. Another objective is to become comfortable and confident in the tools/applications we are choosing to create the visualizations with.

The questions we want to answer are: What does a tornado look like? What are the speeds of the tornado at specific areas of the tornado? Where is the tornado moving the fastest? What effects does a volcanic eruption have on our atmosphere? Are the effects localized or can they be seen across the globe? How long do these effects stay in our atmosphere, and are there any long-lasting effects?

We hope by using the datasets we have found and the tools we have learned so far in class we are able to answer all of these questions using visualizations.

What would you like to learn by completing this project?

The main purpose of this project is to learn how to take a dataset, import the dataset into different visualization software, and convey an interesting and interactive visualization that provides insight into that particular data. Another thing our group would like to learn is how to better collaborate with each other in a fully virtual environment. Due to class only being provided via Zoom, we have the added challenge of only being able to collaborate online. We hope to take advantage of all of our skills in order to create a better final product.

What data will you be using for your project?

There are several open-source datasets available that simulate natural disasters. The first dataset that we are interested in exploring comes from the following source: <https://cgl.ethz.ch/research/visualization/data.php>. This dataset contains a synthetic model of a tornado. We hope to use this dataset to model streamlines and stream surfaces to visualize the speed and direction of a tornado.

The next dataset will come from <http://www.viscontest.rwth-aachen.de/data.html>. This dataset was used for the 2014 IEEE Scientific Visualization Contest. The data consists of three main data modalities and two support data sets. The main data we will be using is the Atmospheric Infrared Sounder (AIRS). AIRS uses satellites to measure the thermal emissions of the atmosphere. It has excellent horizontal resolution and near-global coverage. The AIRS dataset will be useful in the detection of sulfur dioxide and volcanic ash.

If you are doing a programming project, list the hardware and software you will be using.

Our main programming resource will be ParaView. We hope to utilize ParaView with both datasets to show a meaningful view of a tornado, and visualization over time of the effects volcanoes have on our atmosphere.

We will also utilize VTK and create python scripts to create interactive visualizations. Our goal is to create widgets that will help us visualize what the atmosphere looked like directly after an eruption and allow the user to look at the atmosphere over time.

What is your project schedule? What will you do to complete this project?

During the first two weeks, we will spend the time figuring out how to download each dataset, and how to get it showing up correctly in ParaView and VTK. We will start to explore the data and get other ideas of what we could accomplish with the data.

During the next two weeks, we will focus on generating more meaningful visualizations of the data. When the project update is due on April 4, we hope to have a ParaView state file to turn in for each dataset, and a python script that allows the user to interact with the visualizations.

After the project update, we will further refine our visualizations and do more exploration of the data until the project is due.

To complete this project, we will split the work up equally into three parts. We will communicate daily and have a centralized GitHub repository where we can store all of our progress.

When the project is completed, what are the metrics to be used to evaluate how successful your project is?

Metrics that we will use as a team to evaluate the success of the project are the total of number visualizations created for the dataset. Another metric building off of the previous is the quality of said visualizations. If they have multiple parts and are interactive for the user or the people seeing the visualizations .

What are the expected outcomes of your proposed project? What do you plan to hand in?

The expected outcomes for this project are to create visualizations that are appealing and provide better insights into natural disasters. We hope to show the effects of a natural disaster and share any informative statistics we are able to find via a visualization.

We will turn in our source code which will include ParaView state files and Python scripts, along with documentation on how to download the data and run the scripts. Additionally, we will turn in a video demo showing all of our results.