MOTUS

An Earthquake Data Viewer and Visual Aid

Team Name: The Quakers

Team Leader: *Jeff Derricott*
Team Members: *Hart Henrichsen and Anthony Rosas*

CEE 514 | Dr. Daniel Ames

Objective:

The objective of this project will be to create a tool that can benefit BYU's earthquake engineers and industry sponsors alike. Currently Dr. Franke's PRISM UAV Group has collected vast amounts of imagery data from earthquake affected areas around the world. There is no particularly great way of viewing where the data has been collected. This group will create a web application that can be used to view where the PRISM UAV group has collected data, as well as perform various spatial analyses on the data using GIS software capabilities. Ultimately, a user will be able to filter their view of plate boundaries, fault line types, earthquake types/magnitudes and see how correlations between areas around the globe. With this information, someone would be able to understand how an earthquake of a given magnitude will affect an area without preexisting data by correlating with a similar area that does have preexisting data.

Data:

The Data we need for this project should already exist. The first major dataset we need is a shape file that includes all known earthquakes throughout the world. Along with where the earthquake happened the data should also the date, magnitude, deaths, and economic impact (amount of damage in dollars). We hope to be able to connect to a preexisting app so that Earthquakes will be updated automatically. We will also need a data set of known faults on the Earth. This dataset must include the fault type and should list if the fault is active or not. A plate boundary data file will be used in conjunction with the fault dataset to add another filter option. The final dataset we will be using will be Dr. Franke's UAV data. Each study, that will be displayed as a polygon on screen, will include photographs, point clouds, results of the study,

and recommendation of the future. This data will be downloadable to the user as discussed in the user interface section and the licensing section.

Workflow:

The workflow will follow the procedure outlined in Figure 1. As the group becomes more familiar with Tethys we will be able to improve and modify the workflow.

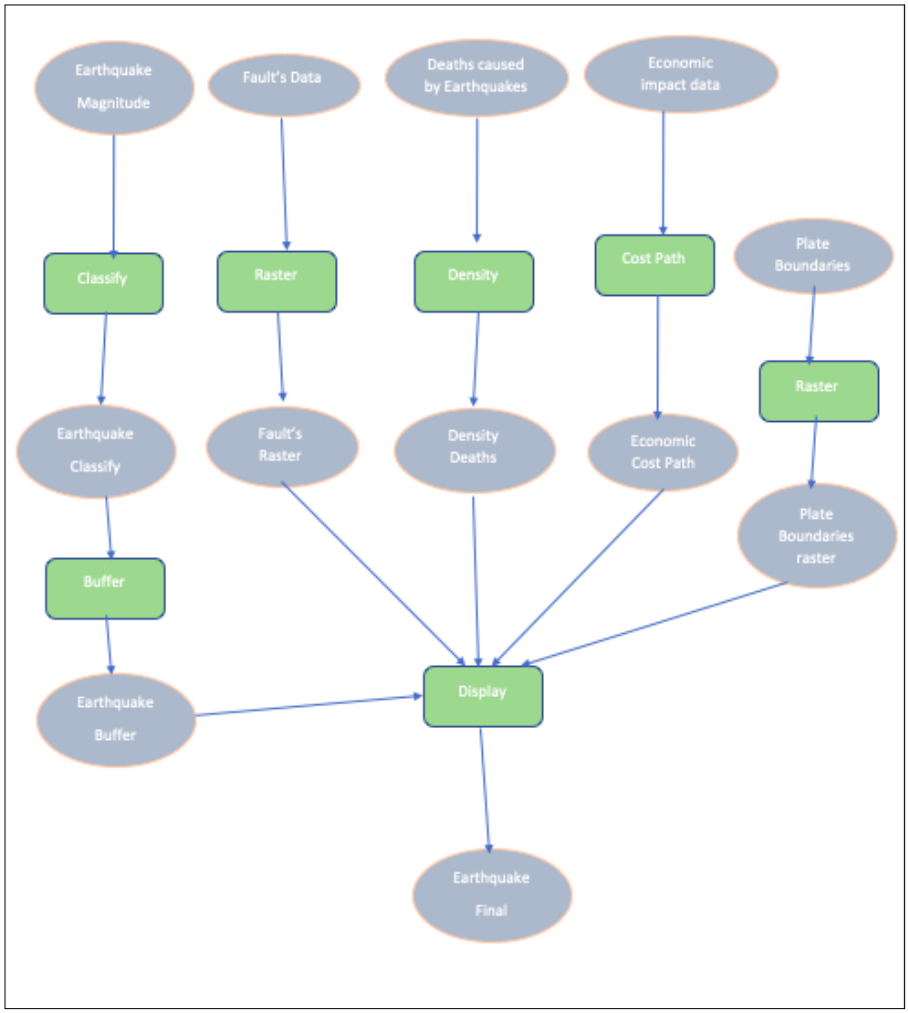

Figure 1: Project general workflow chart.

Front-End User Interface Functionality:

The goal of this app is to create a simple to understand and use interface for any user. Our main focus will be Dr. Franke and his research assistants, but users without their technical

experience should be able to quickly learn how to use the app. Using the Tethys' basic framework, the left hand side will contain menus of what data should appear on the map. The menus will be "Faults", "Plate Boundaries", "Earthquakes", and "UAV Data".

The faults menu will allow users to change the faults that are displayed. Users will be able to select faults by their type: convergent, divergent, or transform; if the fault appears on a tectonic boundary; or based off how active the fault is. When a fault is selected on the map, a popup box will appear with information about the fault. This popup will list they type of fault as well as the historic data of earthquakes within a buffer of that fault. This data will include the average magnitude, deaths, and economic impact for each earthquake.

The earthquake menu will allow users to filter specific earthquakes by magnitude, deaths, economic impact, and year. The map will display earthquakes as a circle, with size increasing with magnitude. The color of each marker will vary due to the deaths caused by the earthquake. By selecting one of these markers, a popup box with the earthquake's information will appear. The information in the box will include the date of the earthquake, magnitude, deaths, and economic impact.

The UAV menu will allow users to limit what type of information they see. UAV data includes files that can be downloaded, photos of the after effect of earthquakes, and structural reports after earthquakes. On the map, the UAV data will be displayed as a partially translucent polygon for each study. These studies cover specific areas after an earthquake. When a user selects one of these polygons, a popup box will appear with the study's data. The information given will vary based of what is selected in the menu. The popup box will have a link to download data directly or redirect to another site, depending on how publicly available the data is.

As an example, a user could be looking for earthquake data in an area where little data exists. They hope to find if the local code will suffice during an earthquake. By showing only earthquakes of similar magnitude to ones in the region, the user can gain an understanding of what type of fault the region must prepare for. After discovering what type of fault caused the earthquake, the user can find data from similar earthquakes to get a prediction of how an earthquake of a similar magnitude and type will affect other areas with similar conditions. The user will be able to download data and get reports of earthquakes similar to their specific region and get expert recommendation.

Storage on GitHub:

The code for this application will be stored open source on GitHub and will be downloadable for anyone. However, if we are able to allow access to places such as DesignSafe (a government cloud storage for digital model disaster data), other potential more protected forms of storage will be required, on or off GitHub. Determining the storage method on GitHub will be more mapped out as the group becomes more familiar with GitHub and finalizes the framework of the application.

Code Licensing:

The code will be licensed with GPL, and will be accessible to anyone. However, there may be a few challenges as we handle accessing government agency websites for data and validate user subscriptions. If there are issues with licensing the access to these websites on GPL we will do some sort of hybrid licensing with MIT for portions, linked to the GPL content.

Project Management:

Each team member will be given different responsibilities based on skill and interest. In Table 1, the list of jobs and assignments are presented.

Table 1: Project Management

Job	Assignment
Proposal Leader	Jeff Derricott
Design Leader	Hart Henrichson
GIS Leader	Anthony Rosas
Web Design Leader	Jeff Derricott
Web Programming	Hart Henrichson