An Interactive Web-based GIS System to Evaluate Hurricane Inundation Impacts

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Introduction

The use of web-based geographic information systems (GIS) in a coastal environment can be benecial for both coastal and scientic communities. With the collection of data from numerous sources and social media (e.g. FEMA API's) and with access to model produced results for coastal inundation, we can generalize and interact with models to evaluate the impact of coastal events in an interactive and visual manner.

System design

Bellow the diagram of the complete system from data collection to interaction with the user is given.

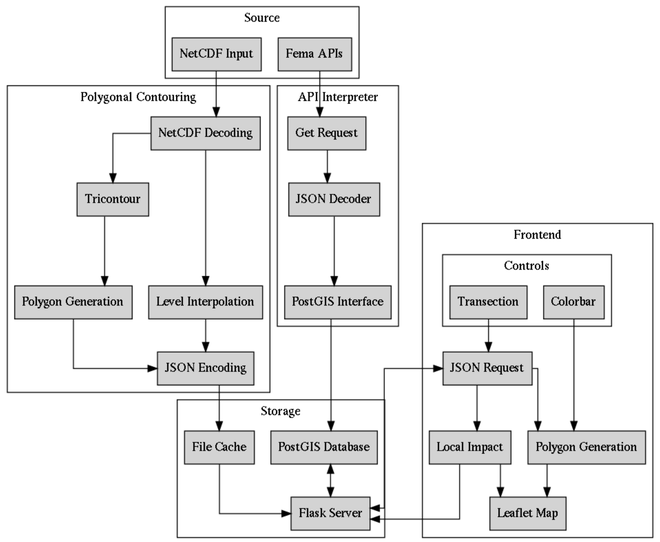

Figure 1: Flowchart of the system.

Data collection

Data from numerous sources including databases from The Federal Emergency Management Agency (FEMA), social media sources such as Instagram, and rst hand collected model produced data from the NOAA's storm surge model results (ESTOFS), are collected to be used in later stages in the system.

Model data processing

- A maximum water surface elevation point cloud read from model NetCDF le.
- the model values are grouped and vectorized to a collection of polygons for various strom surge levels (to save space and ease data processing).
- These polygons are then encoded into a JSON le including some general information about it's size, value, and resolution.

Backend

- A PostGIS server accomodates all the data generated from model results and observations.
- A Flask web server is used to serve the compressed information from database to frontend. It also provides access to number of methods for interacting with the collected data.
- The Shaply Python package is utilized to provide general definitions of polygons and other geometrical objects for interacting with data such as gnerating transects or calculating the area of an inundated land-use.

Frontend

The graphical interface is written in pure HTML / JavaScript using Leaflet package to provide an intuitive way of interacting with the data. It allows the user to foremost graph inundation and ood levels, as well as transect values, select regions, and compare with land use information.

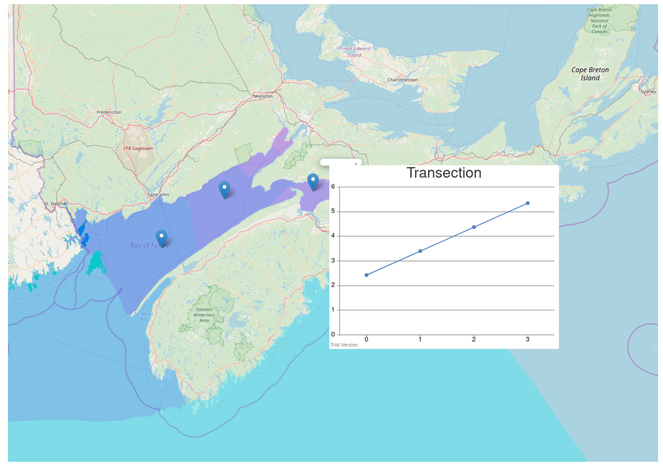

Figure 2: Frontend screenshot.

Outlook

We are planning to further develop:

- A more advanced polygonal area selection
- A flexible colorbar UI elements
- A direct NetCDF caching
- Implement a seamless connection to data APIs (e.g. FEMA, NOAA)

Github Organization
https://github.com/earth-sys-ai