

Creating User Interface for a Serious Flood Mitigation Game Environment

Luana Liao

Secondary Student Training Program
The University of Iowa

<https://hydroinformatics.uiowa.edu/>

Ibrahim Demir, Associate Professor, PhD in Environmental Informatics

Zhouyayan Li, Graduate Student

Introduction/Background

The purpose of this study was to develop a simulation for flooding near Olin, Iowa. By creating a simulation, we hope to better understand how reservoirs can be built to protect areas from excessive flooding in heavy rainfall.

Flood simulations have been created before, hoping to improve economic estimations of direct flood damage to human infrastructure. They often visualize simulations in a geographic information system (GIS) environment that “allows the identification of flood-prone areas,” much like used in this study. (Pistrika 2010) In particular, a Google Maps API was implemented to create a GIS environment on a website.

There have also been disaster simulations used within a game-based environment. Game initiated learning has been indicated to stimulate learning for participants, and they have successfully helped high school participants better understand real-world flooding problems associated with typhoons. (Tsai 2014)

This study hopes to combine the elements of a flood simulation and serious game to help the general public understand the benefits of implementing reservoirs.

The project is divided into two sections: one creates the interface of the game while the other uses HTML canvas to read through arrays with elevation data in order to simulate the movement of water in a flood. This study seeks to create a functional and intuitive user interface.

Research Objectives

1. How can the creation of simulations help professionals or the general public understand the benefits of implementing reservoirs to mitigate flooding?
2. How effective are reservoirs for protecting areas from excessive flooding?

Method

The website was created with JavaScript, HTML, CSS, and Google Maps API. Most of the programming is done in JavaScript (JS), as it has functions like event listeners which can perform actions once they receive signal of a specified interaction with the webpage. For instance, there are several buttons on the website like “Add.” After a player specifies what sized reservoir they would like to create, if they left click on the “Add” button that was created in the HTML document, JS will go through Google Maps API to create a pentagon in the center of the screen.

To summarize, HTML creates content inside a document. CSS, which stands for Cascading Style Sheets, is used to format the document content. You can use it to center elements, or in the case of the “Add” button I described above, it was used to change the background color of the button when a user hovered over it with their mouse. Finally, JS interacts with the Google Maps API to create polygons on the webpage.

This process is repeated for a multitude of elements on the webpage, culminating in a functional user interface that facilitates player interactions with the website.

However, the game is still in a stage of development; though the player may create reservoirs, the data is not used yet because the interface was not combined with the simulation components that one of my SSTP colleagues is working on. The simulation is beyond the scope of this project, but you'll likely be able to read more about under Ishan Goyal's research brief.

Results

As mentioned above, the interface is mostly developed, but still needs to be combined with the simulation component. There is a start screen and toolbox that lets players create reservoirs within a given budget and time limit, but the flood simulation cannot start. And though the interface is functional, there are plans to add more game-like elements to make the webpage more enjoyable to interact with. For example, we may consider allowing the user to decide what difficulty they'd like to play at (which could lower both the budget and time allotted before the "flood" begins.)

Conclusions/Implications

When completed, the game will educate people about the benefits of implementing reservoirs. They will hopefully understand the process behind the selection of appropriate places to build reservoirs, and why it's important to consider size, proximity to the water shed, and potential impacts to human settlement.

References

- Pistrika, A. (2010). Flood damage estimation based on flood simulation scenarios and a GIS platform. *European Water*, 30, 3-11.
- Tsai, M.-H., Wen, M.-C., Chang, Y.-L., & Kang, S.-C. (2014). Game-based education for disaster prevention. *AI & SOCIETY*, 30(4), 463–475. <https://doi.org/10.1007/s00146-014-0562-7>