Project Title: Flood Damage Detection and Community Awareness System

Summary:

In the last ten years, there has been approximately three million seven hundred fifty thousand natural disasters. According to the data published by the World Health Organization, in just nineteen years floods, which constitute half of these natural disasters and are caused by heavy rains as a result of global warming has affected more than two billion people worldwide and resulted in the death of more than seven hundred thousand people. Many of these are due to the lack of adequate aid. Deaths and damage to infrastructure including buildings, bridges, sewage systems, roads and canals are among the primary effects of floods.

Flood, which constitutes eighty percent of natural disasters, is the most common disaster in the world. With the mixing of sewage water in flood waters, it polluted the water which causes the spread of typhoid, giardia, cholera and many other diseases. It gives damage to roads and transport infrastructure which can make it difficult to provide assistance or emergency medical care to those affected.

Floodwaters typically flood farm land, makıng the land unsuıtable for agrıculture and preventing crops from being planted or harvested, which can lead to food shortages for both humans and livestock. A country's entire harvest can be lost in extreme floods. Some tree species may not be able to withstand flooding of their roots for a long tıme. Secondary and long-term effects include the temporary decline in tourism, health problems caused by mold formation in interior spaces, and accordıng to the US Federal Emergency Managment Agency, the economic problems resulting from the ınabılıty of small busınesses to reopen after the flood.

There are multıple causes for floods, the most common ones beıng dam floods, infrastructure problems, glacial melting and river overflows. Floods that cause the most damage in the world are those caused by overflows.

We discussed about the floods caused by overflow in our project. We focused on the infrastructure problems which damaged by floods. In addition, we aimed to save lives with awareness. For all of these, we aimed to combine satellite data, current meteorological data and historical flood data to calculate the damage that the next flood will cause both on infrastructure and people.

We used two satellite data for this; a system that shows the quality of water and a system that shows us the level of the water. Meteorology data are processed at the moment, our purpose is to designed an application to estimate future data by averaging the past flood data of twenty years by statistical calculation method. Satellite data showing the level of the water, but also, allows us to calculate how much area and person it harms. Meteorology data helps us to calculate the amount of rain per square meter and the size of the flood that will occur according to the intensity of rainfall.

In application, historical data are shown on the map and also forecast data are written . The views from satellites are combined and a new forecast is obtained. Information that given us from the satellites, we can predict the infrastructure damage by looking at this calculation . In addition to the infrastructure, help and notice lines have been put in the app to help people. They can reach the emergency phone number of the place where the flood may be exposed

and help can arrive in a short time. We aimed to minimize loss of life and property by raising awareness.
We made a demo fort his and a small trial analysis to show how the algorithm works. We selected the Brahmaputra River as an example because it is one of the most critic areas for overflow . We took a few years data of the river to show how the algorithm works . With this project, we wanted to minimize the economic loses and loss of lives which caused by flood. We want to take a step towards raising awareness of infrastructure problems in cities. With this application we want to save people who exposed to flood and provide occurring the damage of underground lines and systems such as electricity, sewerage, and telephone. Our goal is to help people and to increase the resistance of nations.

Describe how your project addresses this challenge

In this project, we aimed to minimize the infrastructural damages that may occur in the future due to the flood disaster in the world and to raise. We identified the rivers that cause floods in the world. Then, we investigated the agricultural lands affected by these floods, their habitats and their effects on living beings. We want to achieve our purpose by using the data which we obtained in this research. We analyzed the floods that occurred in Brahmaputura River in 2012 and 2020. We used annual meteorological data and statistics for this review. From these data, we obtained the amount of precipitation that caused the flood, the surface area of the land affected by the flood, and the number of people affected. We found that the number of settlements affected by the flood increases in direct proportion with the increasing amount of rainfall every year. Our aim is to calculate the amount of precipitation in 2020 and the years after, by finding the rate of increase in the amount of precipitation in water each year, and calculate the area of the affected land and the number of people and animals to be affected by the mathematical relationship we find. According to this result, it is possible to predict the infrastructural damage of the future water flood to the country or countries and to raise the awareness of the people and ensure that the necessary measures are taken to cope with this situation.

Describe how you developed your Project

According to the data that announced by the World Health Organization (WHO), the flood constitutes 90% of natural disasters in the last 10 years and affected more than 2 billion people in just 19 years and caused millions of dollars of financial damage every year. Even though we have to stay at home during this pandemic process we wanted to take action and find a solution to this disaster, which caused short and long-term material and moral damages despite the fact that it occurred in a short time, and which we frequently encounter in the news. The difference of our project from previous similar studies is that we aim to save lives and raise awareness, while those studies are only used to be data. Different than past studies we calculate the statistics of historical data and combined them with satellite data to offer you an estimate. Our goal is to make this project accessible to the whole world. However, in this limited time, we chose the Brahmaputra river for the demo, which has the highest loss of life and property.

We aim to minimize the loss of life and property by predıctıng possıble infrastructural problems by examining the severity of periodic rainfall, using meteorology and satellite data, foreseeıng possıble floods by usıng the data on the areas that have been submerged in the past and the water levels. In the mapping system we have created, we will raise the awareness by showing the floods that occurred, the possıble floods and the regıons they may affect for a selected region and tıme perıod. We believe we can ımprove our work by adding more data and algorithms in the following years.

How did you use space agency data in your project?

We aimed to create a system based on current data to minimize our margin of error. We will use current rıver rehabılıtatıon and restoratıon studıes and daily meteorology data. We use EOMAP's satellite-based water quality monitoring system, Essential climate variable (ECV), and altimeters sensor. We obtaıned our data from Copenicus sentiel -2 and sentiel -3 satellites. We used Nasa's NRC Global Flood Mappıng for the map data. We transferred data from the sources of the websites to the SQL database we created, and java was used as the language.

References: List the data and resources used in your project

- Nasa's NRC Global Flood Mapping
- Copenicus sentiel -2
- Copenicus sentiel -3
- SQL
- JS
- EOMAP's satellite-based water quality monitoring system
- Essential climate variable (ECV)
- Altimeters sensor