Faculty of Engineering & Applied Science

OntarioTech
UNIVERSITY

SOFE-4820U: Modelling and Simulation

Project Milestone - Progress Report

Group Number: 3

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Approach
Currently we are trying to set up the prerequisites to model our proposed system to help estimate various impacts of sea level rise on critical coastal infrastructure. This mainly involves doing research on existing information, getting relevant datasets, and setting up mathematical equations and variables

What we are working on
Evaluating different types of simulating techniques. Right now Monte Carlo is being used in multiple research projects related to ours and is probably gonna be our choice of simulation. Monte Carlo Simulation is very fitting to our project due to the fact that it can predict possible outcomes of uncertain events. We can use Monte Carlo simulations to estimate various impacts like costs of sea level rise, future mean sea level and other related and important values.

We also are going into the process of choosing different variables and equations that are relevant in our project goal. We are trying to choose the most appropriate variables relevant in our model. Some variables that are proposed are cost evaluation, risk rate, and other relevant variables. We already found some different equations that were found already in different research projects that can help us in our goal of evaluating the impacts of sea level rise on infrastructure.

Problems Solved
Data Acquisition and manipulation issues occurred when trying to reformat the original Time column. The original format, Year.percentage of year (example 1998.872), was changed to a Year-Month format to easily use the dataset. Solved by creating a python script to scrape and reformat the dataset and store it as GMSL.csv.

Future Problem
Create a mathematical model to estimate damages in dollars based on the global mean sea level. We want to take into account erosion and storm surges without a greater increase in complexity. So we could estimate based on global damage to coastal infrastructure per mm of sea level rise, which already takes those parameters into account.

The Monte Carlo simulation is sensitive to the number of simulations and the initial conditions. At the moment, the model spits out an error at >10000 simulations.

The quality of the data used to fit the ARIMA model we are currently using can significantly affect the accuracy of the results. We want to take another look at our data quality.

Next Steps

1. Determine relevant variables and equations that will help with proposed solution
2. Finally Determine correct simulation techniques
3. Program visuals of our simulations through Python with various libraries

References

[1]   N. A. S. A. Earth Science Data Systems, "Sea level change data Pathfinder," NASA, 04-Nov-2021. [Online]. Available: https://www.earthdata.nasa.gov/learn/pathfinders/sea-level-change#:~:text=Global%20sea%20level%20has%20risen,to%208%20feet%20by%202100.&text=billion%20people%20could%20be%20impacted%20by%20changes%20in%20sea%20level. [Accessed: 19-Feb-2023].