Problem Solving & Software Design
Final Project Proposal

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I.   The Big Idea

Our idea is generated from the fact that China does not have an interconnected system between citizens and government officials (e.g., the police department). We believe this app can help build a bridge between citizens and the government in order to build safer neighborhoods. There will be two types of users: citizens and government officials.

   a. For citizen users, the goal is to create a web app that enables them to both gain access to and report the information of nearby crimes/emergencies based on their current location. By using this app, citizens can stay alert to emergencies and take corresponding actions.
   b. For government officials (e.g., the police department), the goal is to create a web app that enables them to share crime and emergency information with citizens on a daily basis, while gaining an extra source of data from the citizen users' self-reporting.

The function of this app is not only built upon the daily usage of crime reports, but it can also be altered to the special need under extreme conditions.

   a. For daily uses, the app enables citizen users to gain access and report any crimes nearby based on their location input.
   b. For extreme conditions, this app can be applied as an information and alert system for emergencies including disease outbreak, natural disaster, all of which are based on reports from the government. For example, coronavirus is an ongoing disease. In this case, the app could provide the latest statistics to citizens and let them make corresponding reactions.

Minimum viable product:

A system that has a web interface for citizen users:
   a. Citizen users can input their locations and display any crime/emergency situations in their surroundings.
   b. Citizen users can also input any crime/emergency situations into the system and the system database will update immediately.

Stretch goal:

Our first stretch goal is to build a system that has two different web interfaces for two different types of user (in addition to the citizen user interface, also includes a government official users interface):
   a. Government official users can input database into the system
   b. Government official users can view any self-reporting from citizen users, and they can choose to verify or delete them

Our second stretch goal is to add an additional feature for citizen users, providing potential solutions nearby to deal with crimes and emergencies. For example, nearby hospital locations, shelters, closest police stations, transportation, etc.

II. Learning Goals

1. Create a function app matching with our proposal
2. Explore how computation can be applied to a real-world problem
3. Have a hands-on experience with Python
4. Implement API from Google Maps
5. Learn data structure and algorithms in Python
6. Create an input function for users to upload data into our system
7. Import existing dataset into a program
8. Be able to apply UI/UX design principles using HTML
9. Enjoy the process

III. Implementation Plan

Stage 1: Research and Preparation

- Data - find potential datasets that can fit into our program
    a. Crime Data
    b. Coronavirus Data
    c. Weather Data
    d. ...
- App Development - to understand what libraries and skill sets we need for building the project
    e. Data visualization (map)
    f. Web building (for different types of users)
    g. Dataset storage and simultaneous update
    h. UX/UI design
    i. ...

Stage 2: App Development Process (for the Minimal Viable Product)
- Design Flow Charts to display detailed thought process on how we will theoretically approach the problem (the minimal viable product)
- Discuss internally to further improve programming logics until the reach of an agreement
- List specific steps and tasks with due dates
- Start to build the program using Python
- Debugging and testing after the first round of modeling.

Stage 3: Evaluate and Improve
- Feed different datasets into the program and observe its ability to adapt
- Test the user interface and improve UI/UX
- Evaluate if we have the ability to upgrade the minimal viable product to reach our stretch goals. If yes, repeat stage 2 and 3.

IV.   Project Schedule

Our group will hold a weekly meeting on Wednesday at 4:45 pm for 2 hours to discuss weekly tasks and set up deadlines for each team member. We will also record questions that we have so that we can ask the professor to get the issue solved as soon as possible. The following section includes our detailed plan for each week.

Week 1: Conduct research and identify reliable data sources on crime, weather, and coronavirus.

Week 2: Learn skills that we need to know to construct the app using Python.

Week 3-5: Coding and designing the algorithm while debugging and making improvements at the same time

Week 6: Retest our program and fix additional bugs.

Week 7: Polish and improve the user interface.

Week 8: Work on our stretch goals by adding additional features.

V.   Collaboration Plan

Our group will split tasks, and each member is in charge of working on certain parts. If there are any specific questions, our group will figure them out together. We have a WeChat group, so it is convenient for us to communicate with each other instantly. If problems are still unsolved after group discussion, we will contact the professor for further help. In addition, our group will ensure that each group member's opinion takes into account.

VI.   Risk

The major potential risks include:
- Insufficient or unreliable data sources.
- Unable to achieve the desired outcome due to the failure of debugging.
- Postponing our planned deadlines due to necessary modifications and redesign of programs.
- Difficult to estimate the time consumption of each task.
- Different opinions from team members might start internal conflicts.

VII.   Additional Course Content

It will be helpful to know how to implement API from Google Maps and design maps properly using Python. How can we store our dataset that can be modified and reflected in the system simultaneously? What thought process that we need to have to build our algorithm in a fast and convenient way? In addition, it is necessary for us to understand how to organize and implement data for our program. Moreover, learning to debug and making corresponding improvements are important steps as well to ensure the high quality of our project.