Stage III - Requirements Modeling and Analysis

Team Members: Hunter Dubel, Jeremy Leon, Richard Levenson, Evan Melquist and Zach Nelson
Team Name: Pollution Prognosticators
Project Name: Pollution Prediction
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Security:
Since our project is involved with predicting the pollution at a given lot, we will need to access the database to obtain information for our prediction algorithm. One security feature that needs to be implemented is to ensure that the user cannot access the database directly and can only see pollution levels at a specific location. This is an important feature because we do not want the public to see how SOAP stores its data or be able to change the data that is currently stored in the database. The user should not be able to download all of the data to their local machine and must go through the SOAP system in order to access the data. Lastly, any code concerning the clustering algorithm for prediction pollution should not be visible to the public. We will provide these features by making sure that any modules we add for prediction do not expose any aspects of the database.

Backup and Recovery:
The database that holds the prognostication data will be relevant to backup and recovery. Handling errors of the database and the failure of the site itself will be important, displaying proper error messages and correctly updating the database if it is lost. There is also the possibility that the prediction algorithm fails if the required information is not present or if the output is incorrect. This will be handled by displaying proper error messages and recovering the page before the prediction algorithm was invoked.

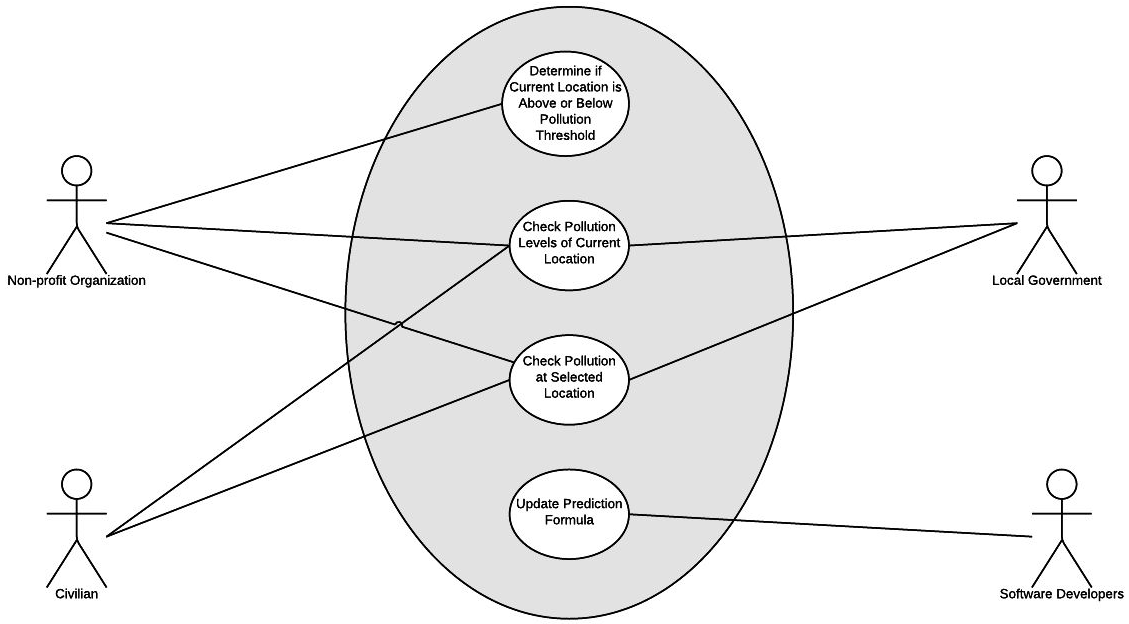
Backup and recovery of development files will be handled by Git and GitHub. Backups are handled by Git commits and can additionally be pushed to the GitHub repository. Recovery of previously backed up files can be done using the Git checkout command to change to the previous commit.

Legal Issues:
If one of our calculations that a lot is polluted turns out to be false there may be liability issues. The ideal way to avoid this would be to have the most accurate prediction algorithm as possible. We must make sure that our pollution prediction algorithm does not infringe on any copyright laws concerning pre-existing algorithms. We have to make sure that the SOAP website explicitly states when the pollution information is actual and when it is just a prediction so that there is no ambiguity.

Possible Applications:
The pollution prediction algorithm is designed towards the specific needs of the SOAP project. Since its goal is to successfully predict or prognosticate the pollution of a

designated area, this system could be slightly modified to work with various other environmental advocacies to predict the levels of pollution around the globe. Although the algorithm would not be used by the general populous, environmentalists and various other scientific professionals could utilize it to help predict future environmental concerns. Additionally, the clustering algorithm could be modified to be used for applications outside of the scope of environmental awareness. For example, it could predict the levels of available natural resources using local information.

Use Case Diagram:



Use Case Descriptions:

Use Case: Determine if Current Location is Above or Below Pollution Threshold

- Iteration: Stage II, last modification: September 24 by Dr. Pulimood
- Primary Actor: Non-Profit Organization
- Goal in Context: To determine if a selected location is above the calculated pollution threshold.
- Preconditions: System must be configured, user must be using the map feature, valid area must be selected
- Trigger: User selects a location and decides to check if pollution is over threshold
- Scenario:
    1. User enters SOAP Map
    2. User selects location to check pollution
    3. If location is a brownfield, automatically above threshold
    4. Else, clustering algorithm determines if current location is polluted above threshold
    5. Map shows user result

- Exception:
    1. Map fails to load
    2. User chooses non-valid location
    3. Not enough information at location for algorithm
- Priority: High priority, must be implemented alongside other basic functions
- When Available: Stage V
- Frequency of Use: High Frequency
- Channel to Actor: Via SOAP's Map Feature
- Secondary Actors: System Administrators, Citizens
- Channels to Secondary Actors: Via SOAP's Map Feature
- Open Issues:
    1. What error message to give if user chooses non-valid location?
    2. What to do if algorithm fails due to lack of appropriate input?
    3. What information should be shown if pollution very close to threshold?

Use Case: Check Pollution Levels at Current Location

- Iteration: 2, last modification: September 24 by Dr. Pulimood
- Primary Actor: Civilian
- Goal in Context: To determine how polluted the current location is for personal safety concerns.
- Preconditions: System must be configured, user must have given location access permissions to the system from his or her device, user must be using the map feature, user must be in a valid location.
- Trigger: User wants to determine how polluted his surroundings are.
- Scenario:
    1. User enters SOAP Map
    2. User selects "current location" option
    3. If the location is a known brownfield, displays the currently known pollution information.
    4. Else, clustering algorithm determines what the likely pollution levels are.
    5. Pollution information is displayed in a pop-up window.
- Exception:
    1. Map fails to load
    2. User does not grant location access permissions
    3. User is in a non-valid location
    4. Not enough information at location for algorithm
- Priority: High priority, must be implemented alongside other basic functions
- When Available: Stage V
- Frequency of Use: High frequency
- Channel to Actor: Via SOAP's Map Feature
- Secondary Actors: Non-profit Organizations, Local Government
- Channels to Secondary Actors: Via SOAP's Map Feature
- Open Issues:
    1. What error message to give if user is in a non-valid location?

2. What error message to give if user has not granted location access permissions?

Use Case: Check Pollution Level at Selected Location

- Iteration: Stage II, last modification: September 24 by Dr. Pulimood
- Primary Actor: Civilian
- Goal in Context: To show detailed information on the pollution in a selected area, including list of chemicals, amount of each chemical, and determined pollution level
- Preconditions: System must be configured, user must be using the map feature, valid area must be selected
- Trigger: User decides to check pollution level at selected location
- Scenario:
    1. User enters SOAP Map
    2. User selects location to check pollution level
    3. Pollution information appears in pop-up window
- Exception:
    1. Map fails to load
    2. User is in a non-valid location
    3. Not enough information at location for algorithm
- Priority: High priority, must be implemented alongside other basic functions
- When Available: Stage V
- Frequency of Use: High Frequency
- Channel to Actor: Via SOAP's Map Feature
- Secondary Actors: Non-profit Organizations, Local Government
- Channels to Secondary Actors: Via SOAP's Map Feature
- Open Issues:
    1. What error message to give if user chooses non-valid location?
    2. What to do if algorithm fails due to lack of appropriate input?

Use Case: Update Prediction Formula

- Iteration: Stage II, last modification: September 24 by Dr. Pulimood
- Primary Actor: Software Developer
- Goal in Context: To update the prediction formula for more accurate predictions.
- Preconditions: User has access to clustering algorithm, user has admin privileges.
- Trigger: Developer makes significant progress on designing improvements to the formula.
- Scenario:
    1. User designs additions to the prediction formula.
    2. User enters SOAP with admin privileges
    3. User inputs formula changes to backend
    4. System accepts formula changes
- Exception: SOAP website is down
- Priority: Average
- When Available: Stage V
- Frequency of Use: Infrequent

- Channel to Actor: Via SOAP admin features
- Secondary Actors: N/A
- Channels to Secondary Actors: N/A
- Open Issues:
    1. How will we push updates?

Analysis Class Diagram: