Water Quality and Flood Detection Software

Group 20 - Dhaval Patel, Kruneet Patel, Charvi Virani, Michael Gallagher

PROJECT DESCRIPTION

The software system aims to detect and maintain water quality for supply management from natural water sources as well as overhead detection of floods. It's function is '*water purification and detection'* and '*monitoring the flood and forecasting'*. For this it will take data readings of certain key factors like dissolved oxygen level, temperature, pH, radiochemical and stable isotope analysis, conductivity, etc. from the water flow continuously across the state. These readings will be collected from multiple sensors and collected in a single <<Interface>> sensor. After validation, this data will stored in a database to ensure the users see accurate values. The system also tries to analyse the past weather data along with some critical factors like the temperature change in the surrounding terrain of the water body to predict the future water level and send out accurate flood warnings in advance.

The feature implemented in this scenario is the interaction between the system and public user and lab user. We are using 3 different API's for the second release: (1) Weather API for mock sensor input (2) API for GPS location and (3) Flood forecast details API to generate a report for the laboratory user. These APIs will be used to simulate a sensor network and display the data.

REQUIREMENTS

There are various hardware and sensor-software requirements to be kept in mind while designing the system.

- System must collect the data from local weather station.
- System must provide water quality report according to the data collection.
- System must detect the flow speed/state of current water stream(rivers, creeks)
- System shall poll the sensors every 10 seconds.
- The water quality sensors must be polled frequently enough to prevent the contaminated water from entering the client factory.
- System must maintain the accuracy of the temperature within ±*0.2*°C.
- The product database shall cater for 20,000 simultaneous public users with read access to the flood warning and water quality summary.
- The system is expected to have over 1000 sensors of different types. Only a small portion of them can fail at the same time.
- The system should be available at all times.
- The sensors and its connected circuit outdoors should be completely waterproof and weatherproof.

TEST PLANS

We created a prototype sub-system keeping these requirements in mind. Various tests have been documented for this software application. Items to be tested with regards to the application are:

1. Home Page (ID 1)
2. User Interface (ID 2)
3. Public User Interface Page (ID 3)
4. Laboratory User Interface (ID 4)
5. Sensor Interface (ID 5)
6. Database (ID 6)
7. Map API Functionality (ID 7)
8. OpenWeatherMap Functionality (ID 8)
9. Graphical Report Generation (ID 9)
10. Admin Pages (ID 10)

Each of these items have at least one unit test, with specified input/output and pass/fail conditions. The results of testing done on these items have also been noted in the report.
In case of software update, API changes, database changes or version control changes, various regression tests have also been specified for the following items:

1. Public User Interface Page (ID 3)
2. Laboratory User Interface (ID 4)
3. Sensor Interface (ID 5)
4. Database (ID 6)
5. Map API Functionality (ID 7)
6. OpenWeatherMap Functionality (ID 8)
7. Graphical Report Generation (ID 9)
8. Admin Pages (ID 10)

Each of these items have at least one regression test, with description and new test procedures.

INSPECTION PLANS

The following are the items to be inspected for the Water Quality & Flood Forecast Software Simulator

1) MVC .Net Frameworks setup.
2) Creating a Front-end User Input GUI for the Sensor Interface
3) Creating a Front-end User Input GUI for the Laboratory User Interface.
4) Leaflet Map API with front-end user input for latitude and longitude.
5) Manage Sensor and Laboratory Database from lab user input. on MySQL Workbench
6) Data Validation is done for Sensor and Laboratory Database and Laboratory User to give correct result for the Public User Interface and generate graphical Report.
7) Graphical Report from Laboratory Interface.

Each item has been inspected by 2 other people than the one who created it. The date of inspection and result of inspection has been noted.