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Requirement Analysis and Specification Document

Water quality monitoring for the Pomperaug river

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1 Intoduction

1.1 Abstract

Summer months bring outdoor recreation including water-based activities like fishing, boating, and swimming to the Pompraug River in state of Connecticut, United States.

High bacteria levels in water can make it unsafe for such recreation [1]. We are focusing here on Escherichia coli (E. coli). It is the type of bacteria under study, and is found abundantly in the gut of mammals including humans. Its presence is used as the primary sanitary indicator for fresh water. High bacteria levels can indicate water quality degradation from pollutant sources such as agricultural runoff, septic contamination, and pet waste.
E. coli usually poses little concern to humans with the exception of one strain that is capable of causing illness. Prolonged exposure to or swallowing water containing high levels of E. coli can cause mild to severe symptoms that may present in a way similar to a stomach virus, an ear infection or a rash. Typical recovery is expected within a few days to over a week.
Bacteria ranges represent risk thresholds, which are based on the statistical chances of getting sick if individuals come in contact with water in these bacteria ranges. Tests are for E. coli, a bacterium that is found in the guts of all warm-blooded animals, including humans. Most E. coli will not cause illness. E. coli is tested because it is often an indicator for the presence of other, more difficult to test for pathogens that may cause waterborne illnesses to those swimming, wading, or boating.

What mentioned above encouraged us to intend a system to to represent water quality by using citizen science data collection to provide a web-based platform that visualizes and monitors bacteria in the watershed.

1.2 Purpose

The aim of the project is to indicate the water quality and its validity for the several uses or activities such as swimming, fishing, and wading. . . etc. by providing a useful visualization and analysis tools in a desktop web-based application interface, which is a result of the classification of the water of the river in monitoring sites. the system divided water of the river into several classes, these classes are determining the safety of the water in the watershed area to the different activities and uses.

1.3 Document Structure

This RASD document will be composed in 3 parts. We will start exposing the different interactions and action the software and the user can do and have. We will then present the different use cases, that develop more the details of all these interactions. Finally, the requirements will be presented. They precise the features we need the software to accomplish.

2 General overview

2.1 Domain analysis

Software : By software, we mean our application. In the following, we will not discuss the singularities of the hardware nor of the system hosting our software. The term software will only be used as a synonym of our application to be designed

User : This term should define the person using the application. Someone is a user at the moment they start using the software. Before and after, they are not user anymore.
The user is a visitor who uses the web-application without specific experience on analyzing geographical aspects. The system allows users to visualize data in map and tables form.

Member : Members are registered users. A user becomes a member of the application when they register their credentials and the software keep them in memory.
The member can an expert or local civilian user who uses the web-application to visualize data, concerning analyzing the geographical aspects and add comment if it is needed.

Actor : Actors are both users and members.

2.2 Dataset

Our dataset contains a total of 179 entries (last visited 30-oct-2020). It has been gathered and stored on Epicollect5 [2] via the same questionnaire, resulting in data entries containing 24 attributes each. Some of these attributes requests to upload photos or to mention the used method of sampling, etc., and can thus be overlooked. A clean up of the data before storing it on the local server database will be implemented to keep only the relevant attributes.

2.3 Assumptions

- The quality of the data will depend on the accuracy of data collected by Pomperaug Watersheld Coalition [1] technicians.
- Epicollect5 will continue to grant access to the database through REST API.

3 Requirements

Requirements should precise all the feature that will contain our software. They are divided in different subsections.

3.1 Technical requirements

- The dataset [2] is collected by experts of the Pomperaug River Watershed Coalition [1] and provided by Epicollect5.
- The software should be coded in python language.
- The system should be available as a web application that can be used throughout the web browser.
- Actors can search by tags, words and images Consider providing an image search engine (Image detection).
- Actors should be provided with information of the evolution and repartition of the water pollution in time and space.

3.2 Non functional requirements

- the system should be available 24/7
- The system should return feedback within a 5 second windows

3.3 Functional requirements

- The system should allow users to register by entering their credential (username, email and password).
- The system should allow members to log in using their credentials (username or email, and password).
- The system should offer the user display multiple different base maps
- Information about water quality in an area can be retrieved by the actors by clicking on the area
- Only registered user can add a comment to the database and read comments added by other members
- Actors can select different species by menu.
- Actors can visualize the data.

4 Scope

This project is concerning about providing information to users (Specialist, researchers or local citizens) about water quality of the Pomperaug river, and let them to have access to the datasets [2] of it, also to contribute in data commenting their observations about data, and to make custom visualization on these data that provided by the desktop web-based application.
The web-application will offer maps of dataset with the ability of the manipulation of the data and to add comment to database for registered users. also, the web application will allow users to access and find information about coordinates regarding to dataset analysis to be displayed as (Bar Chart, Pie Chart, Histogram/ Land use, land Cover maps/ Coordinates, Contour).
In general, enabled action and interaction of the user and the software are described in the following.

4.1 World phenomena

World Phenomena are all the actions made by the user before and after interacting with the software. They also include the reasons that can motivate the use of the software by the user. Software cannot "observe" these phenomena, even though they will lead actor to use the software.

- opening the software
- observing color, smell and the level of the water
- closing the software.

4.2 Shared phenomena

These are a listing of all the possible interactions between the user and the machine (here the machine is our software).

- The user selects "skip" icon to continue as a user not a member.
- The user selects the registration icon.
- Software asks user to fill the registration form.
- The user fills the registration form in the software.
- The software returns with “Username already exists” if a username exists.
- The user makes a request to confirm the registration.
- The member selects the log in icon.
- Software asks member to enter the username and password.
- The member enters the username and password in the software.
- If the username or the password are not within the database, the software shows an error message to the member.
- The member selects the "add comment" icon.
- Software opens the comment field for the user.
- The member inserts comment in the comment field
- The web application displays base map for both the member and the user.
- The software offers to the User/Member information about points on map for which we have data.
- The member logs out from the web application.

4.3 Machine phenomena

Below are listed all the action done by the machine, that cannot be detected by the machine.

- The software stores the registration information in the database.
- The user's password is encrypted before being stored in the software's database.
- The software stores the comment in the database.

5 Use cases

Use cases describe the functional requirements of a system from the end user's perspective, creating a goal-focused sequence of events that is easy for users and developers to follow.

5.1 Use case 1 : Registration

Actor : User.

Flow :

1. Entry Condition: The User opens the website.
2. The user chooses to register as a member and selects the "register" option from the start page.
3. The website opens the registration window.
4. The user is asked to fill in the registration form, including username, age, email address, and a password.
5. The user fills the form and confirms the process.
6. The user's email and username is stored in the software's database.
7. The user's password is encrypted before being stored in the software's database.
8. Exit condition: the software stores the registration information in the database.
9. Exception: the software returns with "Username already exists" if a username exists.

5.2 Use case 2 : Logging in

Actors : User, member.

Flow :

1. Entry Condition: The User/Member opens the web-application.
2. The software offers to the User to log in as member or continue as a user.
3. The user chose to "continue as user" or "login"
4. The user/member enters a username and password.
5. The software responds by verifying the user and either granting or denying access to the system.
6. Exit Condition: the software retrieves the home page.
7. Exception: If the username or the password are not within the database, the software shows an error message to the member.
8. Upon entry, the software creates a new user session, including cookies (e.g., the user's geo-location and username).

5.3 Use case 3 : Add comments

Members can add comments to validate the data being visualized by the website.

Flow :

1. The member logs in to the website, and selects data they want to visualize.
2. The member selects the “add comment” option.
3. The software provides a field for member’s input
4. The user types in a comment
5. The software stores the comment in the database
6. The software displays the post on the message board of the data area.
7. Exit condition: the user’s comment is successfully stored and displayed
8. Constrains: the person who can add comment must be a member of the website.

5.4 Use case 4 : Data visualization

Actors: User, member.
Entry Conditions:
The user/member opens the web application:

- The user enters the website directly.
- The member enters their username and password.

Flow :

1. the web application displays base map for both the member and the user.
2. the software offers to the User/Member information about points on map that contain (coordinates, grass height, etc).
3. Constrains : Members can visualize comments added by other members. But simple users only see a preview of comments, with a pannel "sign in to see more"
4. Exit Condition: The member logs out and the user closes the website.

5.5 Use cade 5 : Data analysis

Actor: Member.

1. Entry Condition: The member enters his username and password.
2. The member inters the analysis Icon.
3. The software retrieves the data from database.
4. The software provide member with many analysis choices [Statistics, Thematic maps, Topographic maps].

5. The member chooses a method.
6. The software displays the analysis results of the members selection.
7. The software returns the desired data.

1.

5.6 Use case 6 : Log out

Actor : Member

Flow :

1. The user closes the website
2. The member selects the “logout” button on the main page
3. The software requires the member to confirm the logout operation
4. The member confirms the operation
5. The software closes the user’s session, causing the session cookies to expire
6. The software returns the user to the starting page

6 Effort Spent

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References

[1] Pomperaug river watershed coalition. Epicollect5, 2014. URL: https://www.pomperaug.org.

[2] Pomperaug river watershed coalition. Epicollect5 - PRWC Bacteria Sampling 2020, 2020. URL: https://five.epicollect.net/project/prwc-bacteria-sampling-2020.

