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Software Engineering for Geoinformatics

Requirements Analysis and Specification Document

Web-Based Geospatial Data Analysis Application on North Rupununi Wetland Guyana, South America

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Section 1

General overview:

An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscapes, work together to form a bubble of life.

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other landforms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. . .., Wetlands must have one or more of the following three attributes:

(at least periodically, the land supports predominantly hydrophytes; the substrate is predominantly undrained hydric soil; and the substrate is saturated with water or covered by shallow water at some time during the growing season of each year).

The different vegetation types in a wetland can be divided up into emergent, floating, and submerged plants.

The North Rupununi Wetlands support a lot of vegetation type that differs from Grass, Shrubs to trees.

The data we are using is located North of Rupununi river in Guyana and collected from 18th of September 2020 to 13th of April 2021.

Goal:

The aim of the project is to explain the characteristics of North Rupununi wetlands and its valuable "services" for society and the environment, by providing a useful visualization and analysis tools in a desktop web-based application interface, which is a result of the classification of North Rupununi into subareas regarding to vegetation type, vegetation index, grass density, moisture content, watershed, streams.

Scope:

this project is concerning about providing information to users (Specialist/researchers) about wetland areas and to let them have access to sample datasets of our interest (**North Rupununi Wetlands**), contribute on data collection and data validation, and to make custom visualization on these data and get used of some analysis tools offered by a **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. also, the web-application will allow user to access and find information about coordinate regarding to dataset analysis to be displayed as (Bar Chart, Pie Chart, Histogram/ Land use, land Cover maps/ Coordinates, Contour).

Section 2

Domain analysis:

Users
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.

The member is an expert user who uses the web-application concerning analyzing the geographical aspects, add new data that collected by him and add comment if it is needed.

Beside visualizing data, the system offers the member adding new data to the dataset and commenting.

Section 3

Relevant Phenomena:
In this section we discuss the phenomena's that the machine cannot observe "**World Phenomena**", phenomena located entirely in the machine "**Machine Phenomena**" and phenomena's that shared among the two.

World Phenomena:
1. Opening the web-application.
2. Collecting data that users can add to database.

Machine Phenomena:
1. Storing added data by the user to the database.
2. Storing the registration data into database.
3. Storing the comment to the database.

Shared Phenomena:

1. The application asks members for username and password.
2. The member enters the username and password.
3. The software retrieves the data from the data base and visualize it to the users/members.
4. The member adds his collected data to the software.
5. The member adds comment to the software.
6. Map's visualization (Base maps with coordinate, attribute tables)
7. Analysis (watershed map, streams maps, contours maps).

Section 4

Use Cases:

UC1: Registration to the website
Actor: User

Entry Condition: The User opens the website.

Flow**:**

1. The website opens the registration window.
2. The User chooses to register as a member.
3. The User enters his username, password and email.
4. The software checks if the username and email in the database.

Exit Condition:

The software saves the username and password to the database.

Exception:

The software return with "Username exists" if username exists.

UC 2: Open the web application as member or user
Actors: User, Member.

Entry Condition: The User/Member opens the web-application.

Flow:

1. The software offers to the User to log in as member or continue as a user.
2. The User chooses one of the options:
   1.1. User selects to continue as user.
   1.2. User selects to join as member.
      - The software ask member to enter his username and password.
      - The member submits his username and password.

- The software check if the username and password are within the database.

Exit Condition:

The software retrieves the home page.

Exception:

If the username or the password are not within the database, the software shows an error message to the member.

UC 3: Add data by members to the database
The software gives preference to members over user's, preferences is the possibility of adding data to the database and the possibility of its appearance on attributes and/or maps.

Actor: Member

Entry condition: The member opens the web application.

Flow:

1. The member enters his username and password to login.
2. The member selects attribute table.
3. The system will offer ability to add data into database by clicking "add data "icon.
4. The system asks member to fill the data table (coordinates, grass height, etc...).
5. The member enters his collected data.

Exit Condition:

The software stores the input data into database.

Exception:

The software does not store the added data if one column at least is missed, and the software replay an "error" massage.

The software will not add data if its not in the right format.

UC 4: Enter Comment

The website display data that has been collected from multiple technicians and members of the website.

The member can add comment to validate the data being visualized by the website.

Actor: Member.

Enter condition: The member enters the website using credentials username and password.

Flow:

1. The user enters the website.
2. The member chooses to login.
3. The member enters his username and password.
4. The member selects attribute table.
5. The member pushes the add comment button.
6. The member adds his comment regarding the data he sees on the website.

Exit Condition:

▪ The software saves the comment to the database.

Constrains:

▪ The person who can add comment must be a member of the website.

UC 5: Visualization

Actors: User's, members.

Entry Conditions:

The User/Member opens the web application:

a) The user enters the website directly.
b) The member enters his 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).

Exit Condition:

The member logout and the user close the website.

UC 6: Data Analysis
Actor: Member.

Entry Condition:

The member enters his username and password.

Flow:

1. The member inters the analysis Icon.
2. The software retrieves the data from database.
3. The software provide member with many analysis choices [Statistics, Thematic maps, Topographic maps].
4. The member chooses a method.
5. The software asks the member to choose an option (Bar Chart, Pie Chart, Histogram/ Land use, land Cover maps/ Coordinates, Contour).
6. The member makes a choice.
7. The software displays the analysis information of members selection.

Exist Condition:

The software returns the desired data.

Exceptions:

When the member selects a method with no data then the system returns with an empty page.

Section 5

Requirements:

Technical Requirements
1. The dataset is collected using technicians and provided by Epicollect5.
2. The software should be coded in python language.
3. The system should be available as web application that can be used throughout the web browser.

Non-Functional Requirements:
1. The system should be available for 24/7.
2. The system should return a feedback within a 5 second window.

Functional Requirements:
1. The system should allow users to register by entering their (username, email and password).
2. The system should allow members to login using their (username and password).
3. The system should display multiple base maps.
4. Information about points can be retrieved by the user/member by clicking on a point. The system will offer entering a comment to the data base for members.
5. The system will offer data addition for members.

Domain Assumptions:

- Area is disregarded if and only if it is not a wetland.
- the quality of the data will depend on the accuracy of data collected by Epicollect5 technicians.

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https://five.epicollect.net/project/detect-nr-groundtruth2020

- Wetland's initiative website

https://www.wetlands-initiative.org/what-is-a-wetland