

**Project:** Web Application for Aqualab Sensor Monitoring and Analysis

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**Faculty advisor from CSE:** name and email address

**Client:** Dr. Turingan - Ocean Engineering and Marine Sciences

**Date(s) of Meeting(s) with the Client for developing Plan:** Wednesday, September 3rd

**Overall goal and motivation (help make the intended users "happier", limitations/pains of current systems):**

Goal: Our goal is to develop an intuitive, easy to use web application customized for the lab team to improve their research efficiency and minimize time wasted from errors. The application will have the capability to connect with and receive data from the sensors. The application will display current sensor measurements to be accessed remotely and give alerts when measurements are out of the desired range to ensure the lab team can respond to errors quickly. The application will record all sensor data, automatically plot the data, and allow the user to filter through the data to simplify data analysis. The application will simplify disk storage management by informing users of the currently used local disk storage and allowing them to move or delete data.

Motivation: The current lab systems include several sensors that are not connected to any network or system. Data and measurements from the sensors are only available in the lab and cannot be monitored remotely or automatically recorded.

**Approach (key features of the system):**

Types of Users:

-Lab Team Leader: In charge of the lab team and is the main researcher, has overall authority in all researching decisions.

-Lab Team Assistants: Works for/under the lab team leader, supports the research effort and reports back to the lab team leader.

-Lab Mechanical Engineer: Works for/under the lab team leader, supports the lab equipment and sensors, ensures the research environment is properly set up.

1. Allows all users to connect sensors to the web application.
  - a. Sensors include water quality sensor measuring amount of CO<sub>2</sub> in seawater, air quality sensor measuring amount of CO<sub>2</sub> in air, and pressure sensor measuring the pressure of the environment.
2. Allows users to monitor current/recent data measurements from the sensors
  - a. All users can view the current data measurements given by the sensors
  - b. All users can receive an alert if measurements aren't in specified values/range
  - c. The Lab Team Leader can set expected values/ranges for sensor measurements
3. Allows users (the Lab Team Leader and Assistants) to view and analyze all recorded data
  - a. Users can view recorded data in plotted graphs
  - b. Users can apply filters to data to view desired data
  - c. Users can view calculated relationships between sensor data

- d. Users can export desired data into a CSV file and retrieve archived data files from the cloud
- 4. Allows users (the Lab Team Leader and Assistants) to easily manage disk storage
  - a. Users can view current used local disk storage from the web application
  - b. Users can receive alerts when local disk storage is getting full
  - c. Users can move recorded data to chosen secondary storage and/or delete chosen data.

**Novel features/functionality: Discuss which features/functionality, if any, are novel and why.**

Working with and receiving input from specific sensors to display and be recorded by centralized software.

**Algorithms and Tools: Potentially useful algorithms and software tools**

- Coding Languages: Python and HTML/CSS/JavaScript
- Sensor Connectivity: Sensor APIs/libraries (Ex: RS232 and pyserial library)
- Code Collaboration: Github
- IDE: Visual Studio Code/IntelliJ
- Alerting System: JavaScript for on screen alerts/OneSignal for push notifications
- Data Plotting: JavaScript Plotting Library (Plotly.js/Chart.js/D3.js)
- Hosting Service: AWS or Google Cloud Platform

**Technical Challenges: Discuss three main CSE-related challenges**

- Connecting to different sensors via different APIs/connections and libraries
- Collecting data and displaying it accurately in real time
- Hosting a server for 24/7 access that is accessible anywhere
- Displaying/plotting data over time in an easy to read graph
- Archiving recorded data and uploading it to a cloud
- Allowing users the ability to move/delete recorded data

**Milestone 1 (Sep 30): itemized tasks:**

Compare and select technical tools for:

*-communicating with sensors, displaying the data, data analysis tools, user interface, recording data and uploading to cloud, accessing recorded data*

Provide small ("hello world") demo(s) to evaluate the tools for:

*-communicating with sensors, displaying the data, data analysis tools, user interface, recording data and uploading to cloud, accessing recorded data*

Resolve technical challenges:

*-Connecting to different sensors via different APIs/connections and libraries, Collecting data and displaying it accurately in real time, Hosting a server for 24/7 access that is accessible anywhere, Displaying/plotting data over time in an easy to read graph*

Compare and select collaboration tools for software development, documents/presentations, communication, task calendar

Create Requirement Document

Create Design Document  
 Create Test Plan

**Milestone 2 (Oct 28): itemized tasks:**

- Implement, test, and demo *Communicating with Sensors*
- Implement, test, and demo *User Interface*
- Implement, test, and demo *Recording Data*
- Implement, test, and dem *Uploading to Cloud*

**Milestone 3 (Nov 25): itemized tasks:**

- Implement, test, and demo *Displaying the data*
- Implement, test, and demo *Data Analysis Tools*
- Implement, test, and demo *Accessing Recorded Data*

**Task matrix for Milestone 1 (teams with more than one person)**

<b>Task</b>	<b>Greg</b>	<b>Haley</b>	<b>Ruth</b>
<u>Compare and select Technical Tools</u>	data analysis tools, accessing recorded data	communicating with sensors, recording data	user interface, displaying the data
<u>"hello world" demos</u>	data analysis, accessing recorded data	communicating with sensors, recording data	user interface, displaying the data
<u>Resolve Technical Challenges</u>	Archiving recorded data + uploading to cloud, user ability to move/delete recorded data	APIs/tools/libraries for connecting to different sensors, collecting data and displaying it in real time	Hosting services for remote access, tools/libraries for plotting recorded data
<u>Compare and select Collaboration Tools</u>	programs	documents/presentations	communication, task calendar
<u>Requirement Document</u>	write 20%	write 60%	write 20%
<u>Design Document</u>	write 60%	write 20%	write 20%
<u>Test Plan</u>	write 30%	write 30%	write 40%

**Approval from Faculty Advisor**

- "I have discussed with the team and approve this project plan. I will evaluate the progress and assign a grade for each of the three milestones."
- Signature: \_\_\_\_\_ Date: \_\_\_\_\_