Web Application for Aqualab Sensor Monitoring and Analysis

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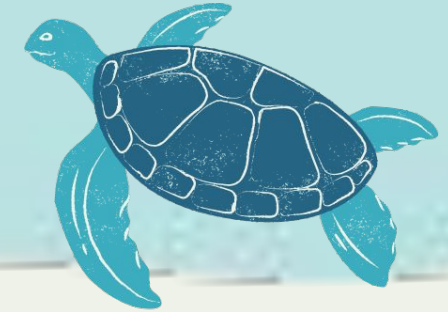
Introduction



- Dr. Turingan, the Director of the Aquaculture Laboratories at Florida Tech, is analysing how much carbon dioxide is absorbed in seawater as it used in food-production by marine algae (seaweeds).
- There are 2 tanks, one below which contains an environment of water and marine algae, and one above which contains a controlled environment of carbon dioxide.
- Multiple sensors/apparatuses are utilized to measure data including a water quality sensor, an air quality sensor, and a pressure gauge.

Overall goal and motivation:

Goal: Develop a customized web application to improve research efficiency and minimize time wasted from errors. The application will have the capability to:

- Connect with and receive data from the sensors.
- Display all current sensor measurements
- Alert the team when measurements are out of the desired range
- Record all sensor data, automatically plot the data, and allow the user to filter through the data
- Simplify disk storage and availability to move or delete data

Motivation: Current lab sensors are not connected to any system — Data and measurements from sensors only available in the lab and cannot be monitored remotely or automatically recorded.

Different User Types:

Lab Team Leader

In charge of the lab team and is the main researcher, has overall authority in all researching decisions.

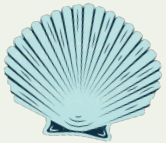
Lab Team Assistants

Works for/under the lab team leader, supports the research effort and reports back to the lab team leader.

Lab Mech Eng

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

Approaches (key system features):

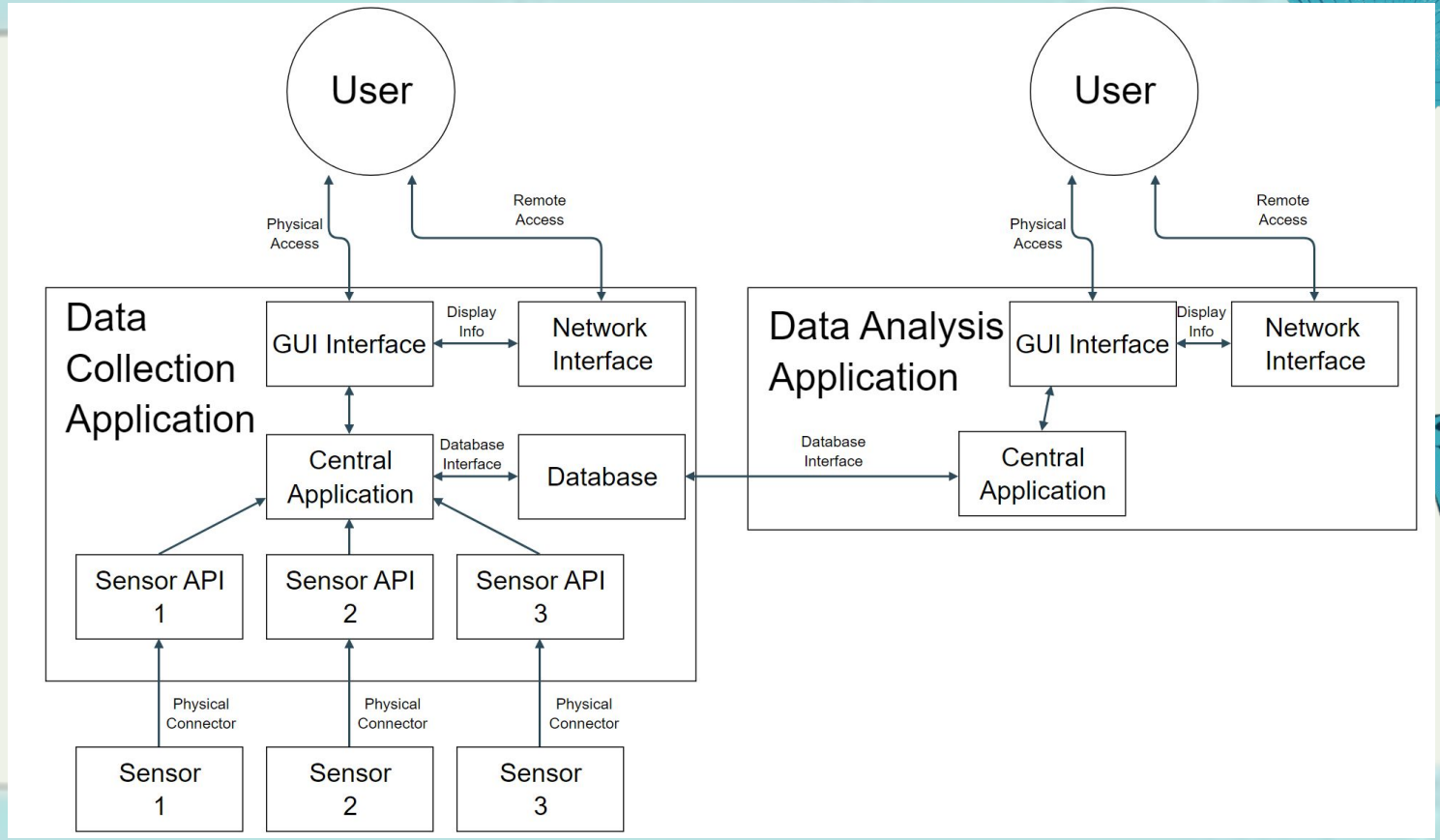


- **Allow all users to connect sensors to the web application.**
- **Allow users to monitor current/recent data measurements from the sensors**
- **Allow users (Lab Team Leader & Assistants) to view and analyze recorded data**
- **Allow users (the Lab Team Leader & Assistants) to easily manage disk storage**

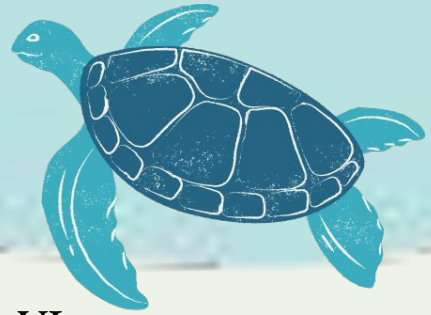
Technical Challenges:

- Collecting data and displaying it accurately in real time
- Ensuring database reliability and security for data collection and analysis
- Allowing users the ability to move/delete recorded data

Design - System Architecture Diagram



Evaluation (How to Measure Success):



- **Measurement Reliability:**
  - Verify sensor readings are accurate in the database and when displayed on the UI.
- **Measurement Accuracy and Timing:**
  - Verify users are able to view the application home page and tabs to see accurate and updated data from all sensors of all tanks.
- **Remote Access Speed:**
  - A user can remotely access the application in under a minute, including clicking through application pages and viewing updated data.
- **Notification functionality:**
  - Verify notifications are sent to the correct users using the correct method (email/text/both) and only when a sensor measurement is out of range. Verify notifications are sent in under a minute.
- **User interface intuitiveness:**
  - Includes giving users a survey to rate “look and feel” and ease of use as well as giving users different tasks to accomplish and measuring the time to quantify intuitiveness.

Progress Summary

Module/feature	Completion	To Do
Back End	**70%**	**Functions independently but still needs interfaces with sensors and frontend**
Front End	**80%**	**Web server and GUI are functional. Missing the ability for the front end to communicate settings changes to the back end.**
Sensors	**20%**	**Most physical sensors have yet to be delivered. Stubs are currently playing the role of sensors for testing.**
Database	**60%**	**MongoDB Database is implemented and functional. Efficient retrieval and analysis needs to be implemented.**

Milestone 4 (Feb 24):

- Implement, test, and demo Interface Between Frontend, Backend, and Database
- Implement, test, and demo Water Sensor Implementation
- Implement, test, and demo UI Tweaks/Improvements
- Implement, test, and demo Additions to Analysis Tool (filtering, calculated data relationships, csv exporting)
- Implements, test, and demo User Notifications

Milestone 5 (Mar 26):

- Implement, test, and demo All Sensor Implementations
- Implement, test, and demo Program Recovery After Shutdown
- Implement, test, and demo Backing up data/disk space management
- Conduct Evaluation and Analyse Results
- Create Poster for Senior Design Showcase

Milestone 6 (Apr 21):

- Implement, test, and demo Final UI
- Implement, test, and demo User Permissions
- Test/demo of the entire system
- Conduct evaluation and result analysis
- Create User/Developer Manual
- Create Demo Video

Task matrix for Milestone 1:

Task	Greg	Haley	Ruth
Implement, test, and demo interface between frontend, backend, and database	80%	10%	10%
Implement, test, and demo water sensor implementation	10%	80%	10%
Implement, test, and demo UI tweaks/improvements	10%	10%	80%
Implement, test, and demo additions to Analysis Tool (filtering, calculated data relationships, csv exporting)	20%	60%	20%
Implement, test, and demo user notifications	40%	20%	40%