

Report Details:

Timeframe: 11/12/25 - 11/18/25

Group number: 21 (*sdmay26-21*)

Project Title: A Smart Aquatic Ecosystem

Client &/Advisor: Md Maruf Ahamed

Team Members/Role:

Griffin Urban — Frontend Developer

Daniel Pender — Hardware

Aden Koziol — AI Population Tracking

Ryan Holden — Backend/Frontend Developer

Marina Mannan — Embedded Systems Engineer

Carson Irving — Backend/Frontend/AI

Max Purvis — Hardware

Weekly Summary

This week, we made significant progress towards being able to put the tank together. We ordered more parts that are necessary to create a habitable environment inside the tank. We split the lid design into multiple smaller pieces to fit in the 3d printers, and ordered the filament we need.

We added security measures to the software end, restricting API access and limiting the frontend to GET requests. The code for the Arduino was updated to manage everything using only one program. We continued to perform live tests with all of the sensors sending data to the database.

We made progress on the frontend, implementing live data readings from the backend displayed as graphs on the user interface. We experimented with a new layout for the user interface and possible testing libraries for software integration testing.

Past Week Accomplishments

- **Aden:** Researched background subtraction and fine tuning for the model. Tried it out on some pictures I found on the internet.
- **Marina:** Visited the makerspace and prepared the lid (i.e., cut the design into multiple pieces and add connectors to assemble the lid later) for 3D printing through BambuStudio. Did the Bambu 3d print training required for using the printers. Ordered the filament needed for printing.
- **Carson:** Recalculated our budget and ordered additional parts that we had been waiting on. The heater, sensor calibration solutions, power adapter for the Arduino, and extra breadboards were all ordered. Researching how to handle authentication between the Arduino and the frontend so that not all of the API is accessible to the public. I decided to restrict all unnecessary API routes for the user to use with a private API token and only

communicate with the Arduino and the API. Then the frontend will only be able to access GET requests. If we add more functionality in the future, the frontend will need to be authenticated with user credentials, and more consideration will be given to this aspect. Updated the Arduino code to include the camera and all sensors in the same program. The sensors and pictures can be sent at different intervals, and all data will be stored in the backend.

- **Max:** Researched parts and sensors, helped Carson finalize everything we needed to order. Helped Carson set up the sensors for testing with the updated Arduino code.
- **Danny:** I spent time tracking down noise in the turbidity sensor. I tested different LED drive currents and repositioned the emitter and receiver to see how the geometry affected consistency. After noticing that ambient room light was messing with the readings, I added a temporary light shield around the sensing chamber and confirmed that it reduced fluctuations.
- **Ryan:** Researched testing libraries for backend > frontend integration testing. Experimented with using Playwright to launch our React app in a browser and send HTTP requests to the backend.
- **Griffin:** I updated the team website with our new reports, design documents, and lightning talks. Additionally, I worked on implementing live data reading from the backend to display graphs on the frontend. Additionally, I experimented with a multi-graph layout in a new window to display the data.

Pending Issues

- N/A

Individual Contributions

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Aden	● Researched Fine-Tuning ● Researched Background Subtraction	6	50
Marina	● Modeled design in Bambu Software ● Cut the lid up into smaller pieces ● Added dowel connectors, ordered the filament, and did the hands-on 3d printer training	8	52
Carson	● Recalculated budget and purchases ● Researched authentication for the Arduino to be able to POST to the backend without public access ● Implemented all of the sensors and cameras into one Arduino program, with different post intervals allowed	8	61
Max	● Helped finalize parts order ● Helped test the updated Arduino code	6	52
Danny	● I worked on reducing noise in the turbidity sensor. I experimented with different LED settings and sensor positioning. ● I identified ambient light as a major source of interference ● I added a light shield to stabilize the readings.	5	52
Ryan	● Researched integration testing libraries ● Experimented using Playwright	6	49
Griffin	● Updated team website ● Worked on the data display through a graph ● Worked on the new graph page	7	56

Comments and Extended Discussion

- N/A

Plans for Upcoming Week

- **Aden:** Continue researching and practicing with background subtraction and fine-tuning. Create an API endpoint to store the pictures in the database.
- **Marina:** Once ETG delivers the filament, I will go to the makerspace and start printing the lid. Printing also depends on the availability of the H2D printers, so I may need to visit multiple times.
- **Carson:** Once all of the parts/solutions we ordered get here, we can set up the tank with just water and the sensors and run it over the break to gather some data and show a POC of everything working together. Continue to research security solutions and explore the implementation of security testing once they are in place.
- **Max:** I plan to monitor the sensor information over break to ensure that it is all making sense and to check for any code errors/ changes that need to be made to ensure the backend is receiving the correct and accurate data. I also plan to use the power adapter we are waiting on from ETG to have all of the sensors, the camera, and the feeder running at once, so we can test them all at the same time.
- **Danny:** Thanksgiving break
- **Ryan:** Decide on a tool for integration testing and create tests for communication between the frontend to each controller on the backend.
- **Griffin:** While it is Thanksgiving break, I would like to merge all of my branch content into the main branch and catch the project up to speed. Alongside that, I would like to spend some time optimizing and refactoring my code.

Summary of Weekly Advisor Meeting

We conversed and ultimately focused on the goal of getting a system test up and running with all the sensors in the tank, aiming to complete it over Christmas break. We discussed budgeting further and agreed to email ETG regarding the process for ordering fish, which we have now done.