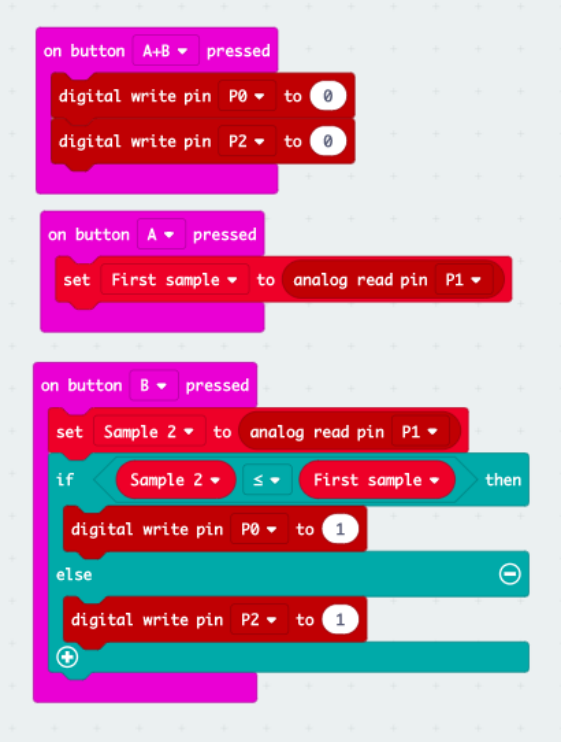
How clean is my pond?

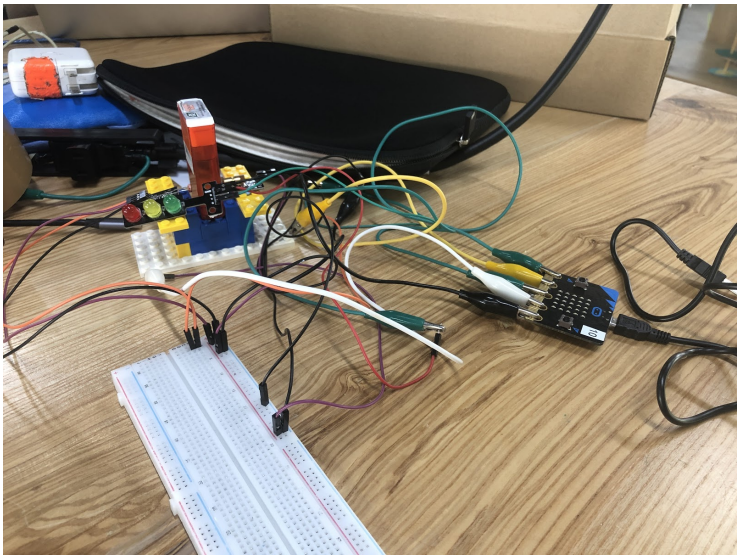
Pseudocode:

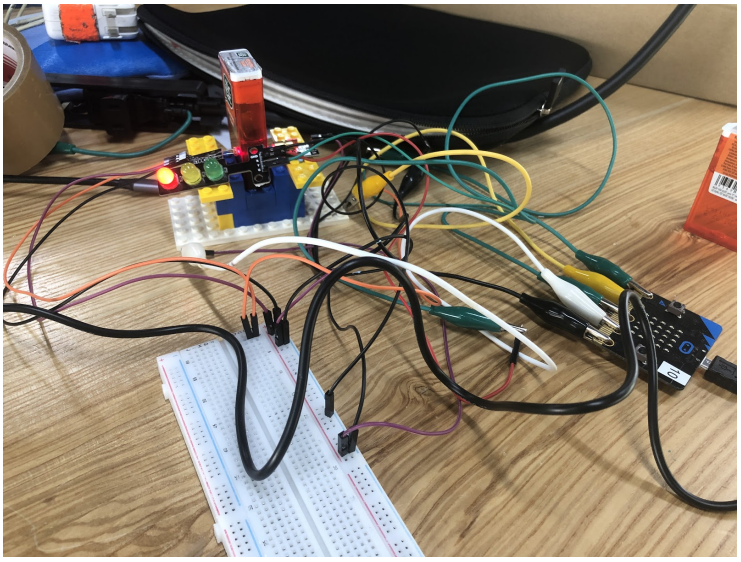
1. The user puts clean water then press button (A) to get an analogue read which is then set to a variable. (Controlled)
2. Then the user puts in a different sample of water then press button (B) to get an analogue read and is set to a second variable.
3. When the button (B) is pressed, the second variable analogue read is compared with the first variable analogue read (clean water).
4. If the second variable analogue read is greater than the clean water, then the red light would turn on, which represent that the 2nd sample is dirty.
5. If the second variable analogue read is equal or less than the first variable analogue read then the green light would turn on, which represent that the 2nd sample is clean.
6. When the user is done, the user presses both button (A) and (B)

Code (Microbit code in the folder):



Picture:





Questions:

Q1. How will this give an indication of the amount of algae in the water sample?

We first calibrate a sample, usually a clean one, and then scan another one. If the analog reading is less than the calibrated one, it means that it is clearer. If the reading is anything other than that, it means it is dirtier.

Q2: Why is calibration needed? How often is calibration needed?

Calibration is needed to set a standard to be tested on, for our case, the standard is the clean water sample. After setting the standard, we can compare different samples to that, and decide if it is dirty or not.

Q3. Document your apparatus setup (video and/or photo). Explain why you made specific connections

We had a light sensor and led light connected to the microbit and bread board, we also have the filter indicator connected to the microbit.

Q3. What event(s) will you use to trigger the calibration? The reading?

For us when we press the “A” button, it calibrates the first sample(the clear water) and sets it to “variable1”. When we press the “B” button, it scans a second sample and sets it to “variable2”. It then compares both of the value and outputs a certain light color(red or green). When button “A” and “B” is pressed at the same time, it resets everything.

Q4. Document your pseudocode/flowchart for what will happen when these events are triggered.

When the pseudocode is triggered, it stores two samples into two different variables and compares them to each other. If the sample two is less than the first sample(the calibrated sample), then it would turn on the red light(as it is dirtier). If anything else(greater than), then it will turn on the green light(Cleaner). To reset it, the user then presses buttons “A” + ”B”.

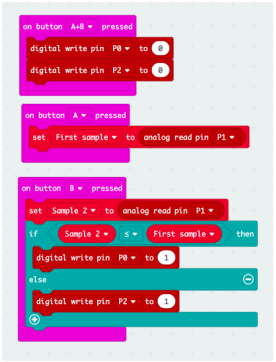
Q5. How would you edit the program script if you wanted the filter to keep the pond water even cleaner in the future?

If the second sample is cleaner than the first one, we can then set that to the calibrated value, and then compare another sample to see if it is cleaner or not.

Q6. What is the difference between an analog sensor and a digital sensor? What type of sensor are you using and how will it impact your code?

An analog sensor continuously detects proportional values between 0% and 100%, while digital sensors looks at the status, deciding whether it’s working at 100% or 0%. We used both sensors, when we analyzed and stored the data, we used the analog sensor to scan the values, then we used the digital sensor to show whether or not the values are clean or not(red or green).

Q7. Provide a screenshot of your working code and explain the programming techniques you utilized in the code.



In this code we used if statement to compare the two analogue readings, so we can compare the two water solution to compare.

Q8. Explain what a control system is and why this pond filtration system is a control system.

A control system commands and direct devices and systems. In this pond filtration system, we use the microbit as the main system that controls or commands the laser, light, and receiver.

Q9. Define “sensor”. What sensor(s) did you use in this control system? Explain how additional sensor(s) could be used in this control system.

A sensor is a device used to measure a certain thing like light, temperature, acceleration, etc. In this project, we used a light sensor to measure the level of light that is changed when the water sample is changed. For this system, we could add more light sensors since the dirt in the water sinks.

Q10. Define “actuator”. Explain how actuator(s) could be used in this control system.

An actuator is part of the computer system that carries out an action. We could add an actuator to shake the solution. Also on the microbit we used a button to do different functions when pressed.

Q11. Explain the relationship between the sensors, microprocessor, and actuators/indicators in this control system.

In this control system, we use sensors, microprocessor, and actuator to compare two different solutions (sample) of water. When the button is pressed, the sensors will measure the amount of light that is able to cross the water, then this analogue data is sent back to the microprocessor to determine if the readings are the same or different to the controlled sample.

Q12. Would this control system be considered an “open loop” control system, or a “closed loop” control system? Explain the difference between these types of control systems in your answer.

This is an open-loop system because the system doesn’t change anything by itself, there are buttons that the user have to manually click to receive an output. To make it a closed-loop we have to make it automatic. For example, if we make a larger scale version for a pond and it automatically checks the water randomly or at a set time, and then alerts the owner, then it would be a closed-loop.

Q13. Discuss the social impacts and ethical considerations associated with the use of this control system.

One ethical consideration we could discuss is any side effects that might occur when these control systems are deployed in ponds or larger bodies of water.

Team members & Contributions:

Kolton: In this project, I was mainly building the system and fixing the code. Since I only worked with the micro bit once before it was hard starting off.

Albert: Writing code