Deliverable H: Prototype III and Customer Feedback

By Group 3.1

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Introduction

In the previous deliverable, prototype II was created, developed, and tested. The objective of this deliverable is to discuss the third prototype and redesign the previous design as well as update it according to the feedback obtained. This deliverable will be split into a few parts including prototype III, customer feedback, and next steps for the final design.

Prototype III

For this prototype we wanted to have the whole system finished, however due to a few time issues we had to stop just before the end. Our concrete box is poured and we have assembled our electronics. We just need to do the final assembly.

Testing Goals:

The goal of this prototype was to ensure all of the physical electronic components of our prototype will all be compatible with each other and that they will all be able to function properly.

Stopping criteria:

Testing for this prototype will be stopped once we have determined that all electronic components are functioning properly. Criteria for this includes:

- Sensors return the correct temperature/condensation value to the arduino.
- The fan blower activates when instructed by the arduino.

Analysis:

The test was successful as both the temperature and water sensor were able to successfully output the correct readings to the arduino controller, which in turn activated the fan blower at the appropriate times. No components were found to be defective

during the tests. While it is regrettable we were unable to test the solar panels or the sump pump due to not yet possessing those components, their integration into the already assembled components should be rather simple.

Prototyping test plan:

Green = Completed, **Yellow** = In progress, **Red** = Not started.

Test ID	Test Objective	Description of Prototype used and of Basic Test Method	Description of Results to be Recorded and how these results will be used	Estimated Test duration and planned start date
1	● Determine optimal layout of the system	● Small scale paper/cardboard model. ● Visual analysis	● The shape and layout of the model will be recorded.	● From March 5th to March 6th. ● **Completed**
1.5	● Test computer code used for the prototype.	● Tinkercade simulated arduino circuit. ● Computer simulation.	● Whether or not the code functions properly.	● From March 12th to March 13th. ● **Completed**
2	● Test the electronic components used within our design.	● Assembled electronic components in the design. ● Physical testing of electronics & code.	● Battery life in hours ● Temperature control software. ● Compatibility of components ● Calibration of sensors	● From March 20th to March 27th ● **Completed**
3	● Testing the fully assembled small scale prototype.	● A functional heat exchange chamber for our prototype. ● Testing how well HEC can retain heat.	● How well the HEC retains heat.	● From March 6th to March 30th.

Target Specifications:

Functional requirements:

	Design specification	Relation	Value	Units	Verification method
1	Temperature control	=	22-23	^{o}C	Test
2	Emission	=	0	N/A	Test
3	Control system	=	Yes	N/A	Test
4	Vent operation	=	Yes	N/A	Test

Non-functional requirements:

	Design specification	Relation	Value	Units	Verification method
1	Looks	=	Yes	N/A	Test
2	Life span	>	40	Years	Test
3	Reliability	=	Yes	N/A	Test
4	Material	=	Yes	N/A	Test
5	Location	=	N/A	N/A	Test

Constraints:

	Design specification	Relation	Value	Units	Verification method
1	Cost	<	20,000 - 30,000	CAD	Estimate/ Final check

2	**Available different seasons**	**=**	**yes**	**N/A**	**Test**
3	**Maximum Area**	**<**	**140**	**M^2**	**Estimate/Final Check**
4	**Operation conditions:**	**=**	**-60.8 to 49.6**	**^oC**	**Test**
5	**Weight**	**<**	**N/A**	**KG**	**Test**

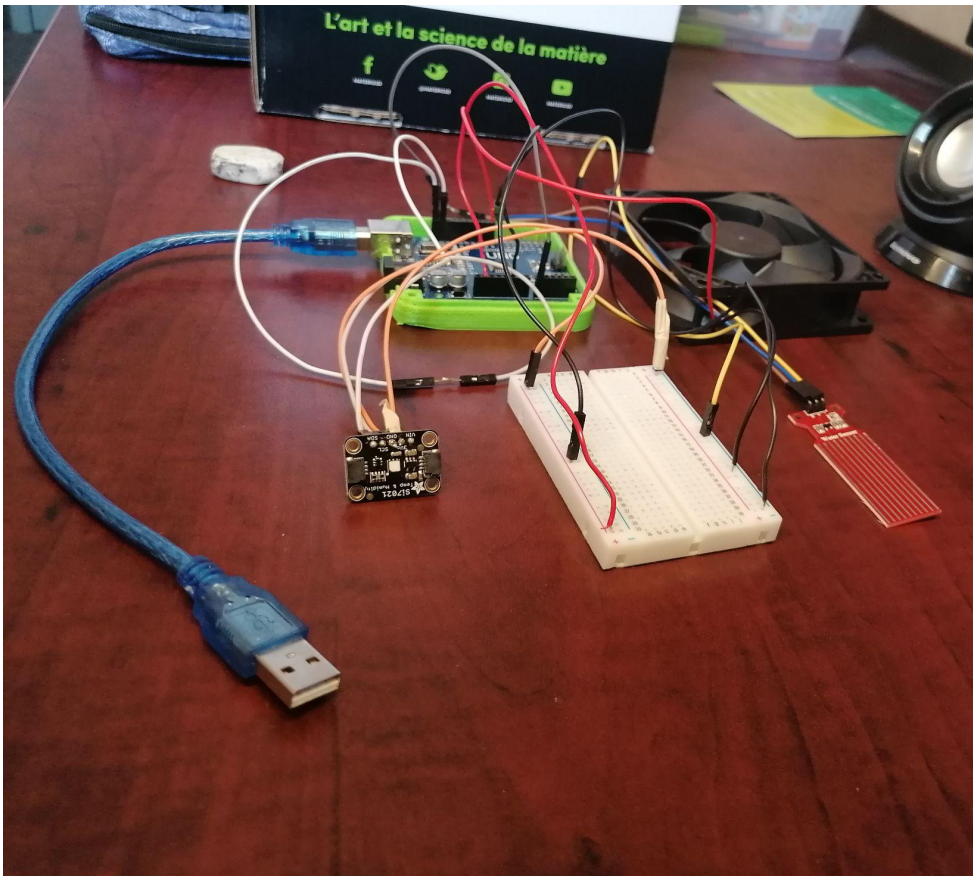
Customer Feedback

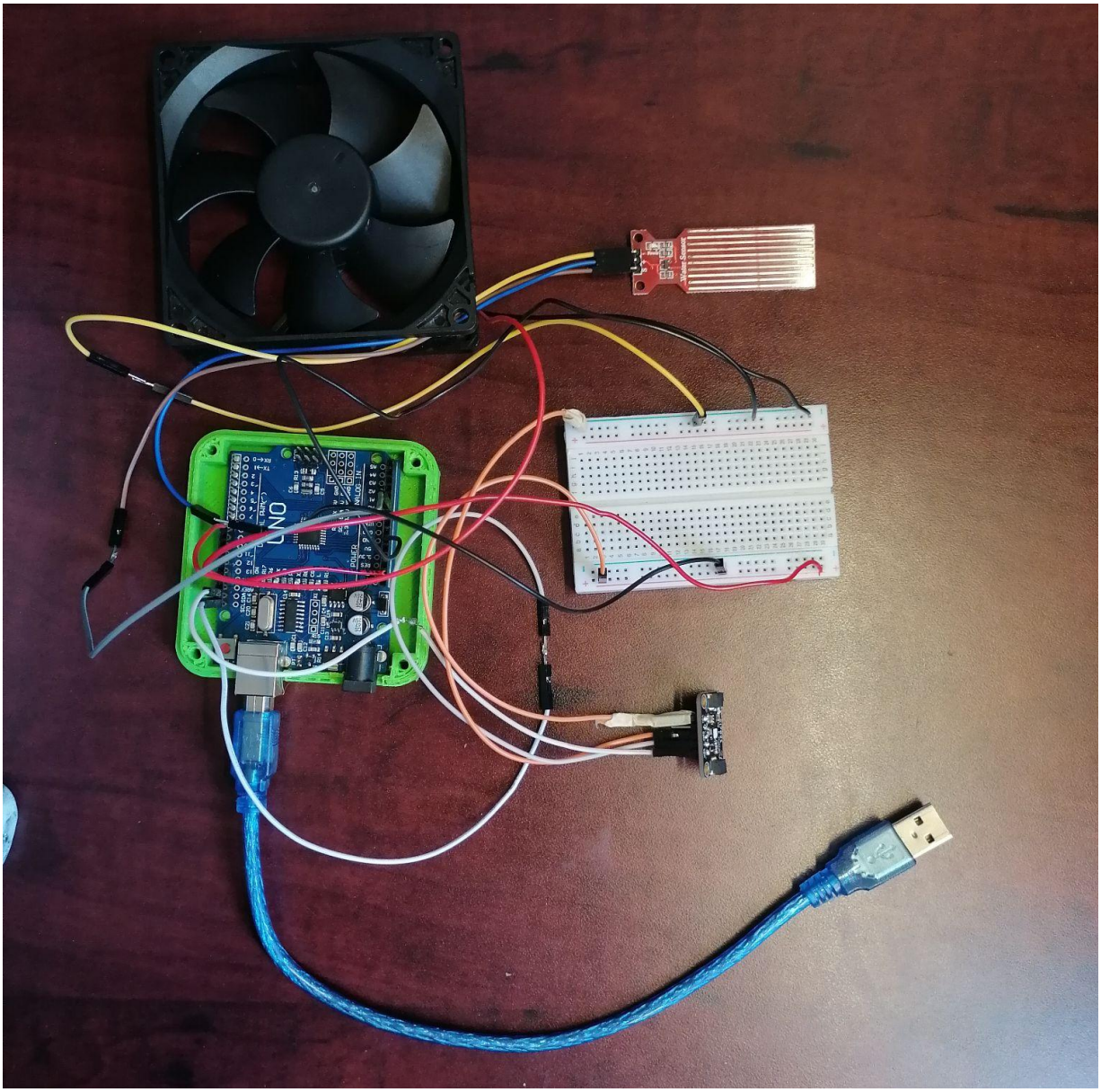
The client liked our idea. However, he proposed that vertical design would increase the cost and construction difficulty, not suitable for the average user. At the same time, our team has also collected feedback from some potential customers, most of whom hope that the system has low cost, high practicability and is easy to use. Optimisation of these will attract more customers and make them more inclined to use the GCHE system and more assured to use this system.

Conclusion

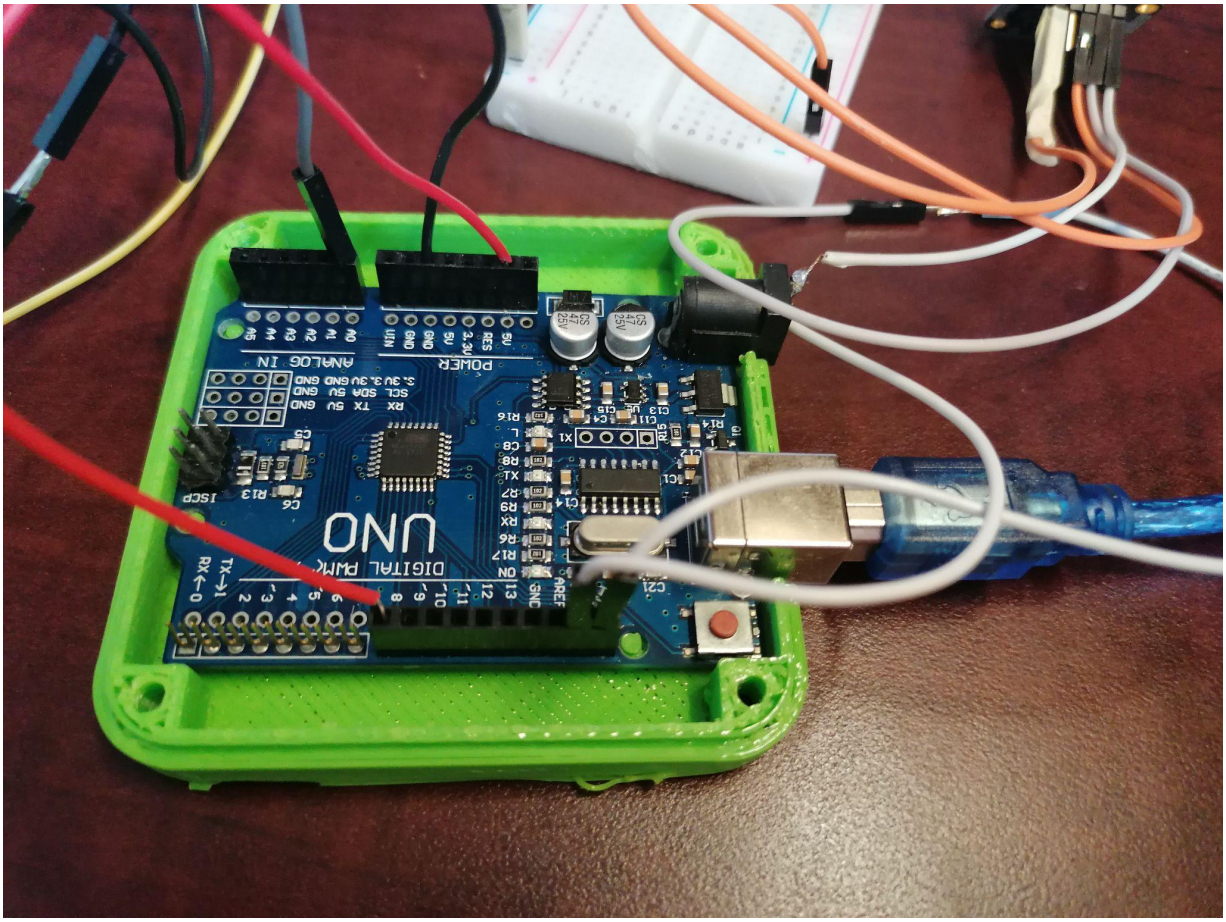
This deliverable we have been working on the final prototype, due to time constrictions we have only completed the electronics for the GHEC. We have also poured the concrete for the box, but we have not yet assembled the whole system. We hope to complete the finished prototype before the design day.

Pictures:

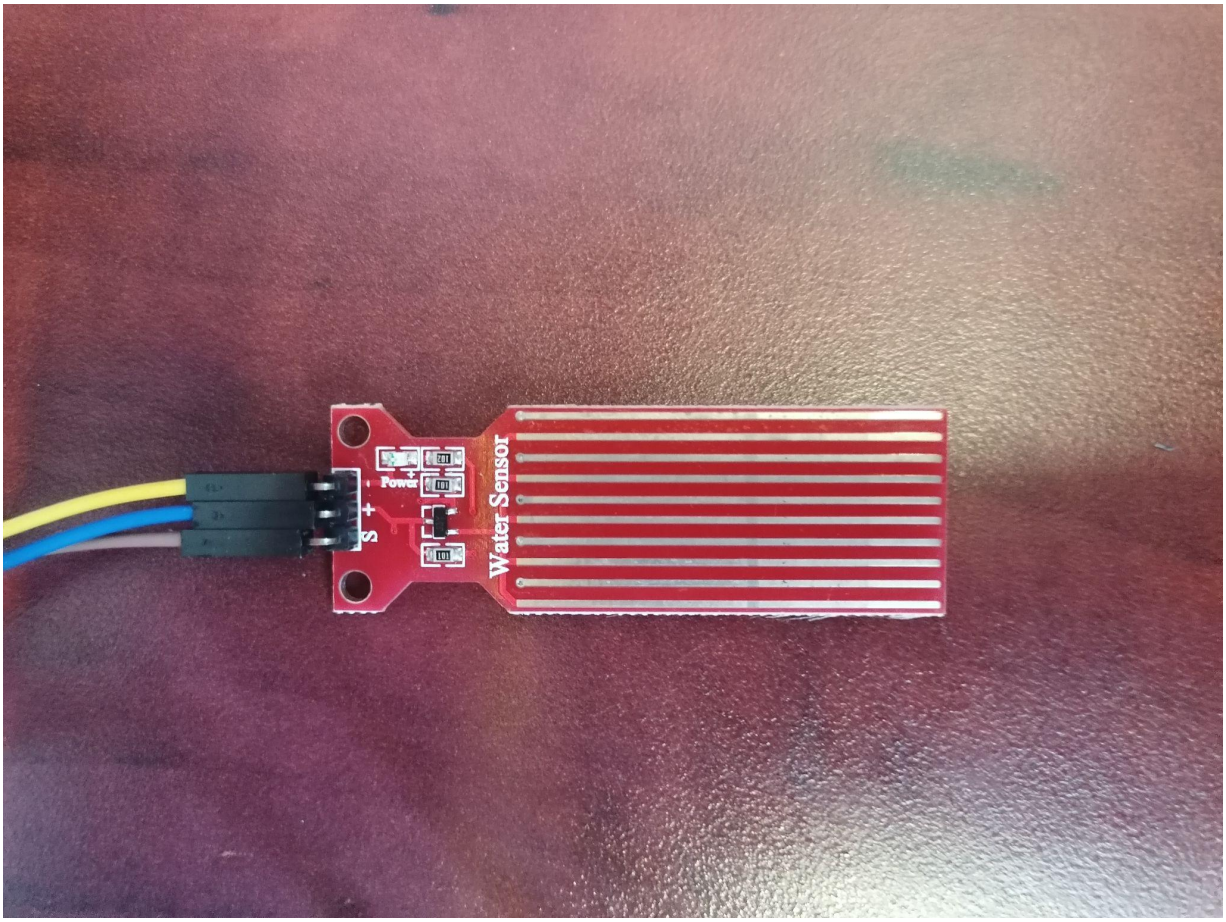




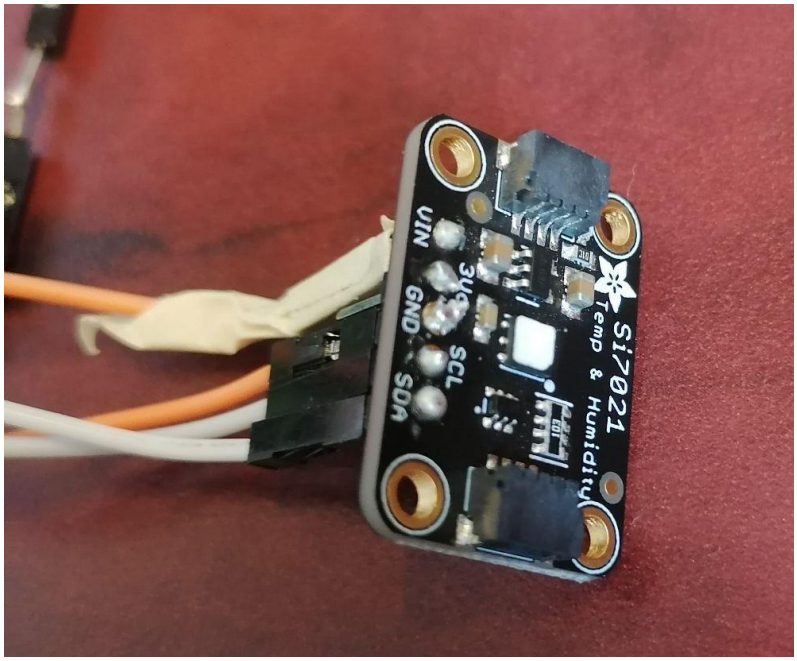
Electronic components of the prototype.
Note: *Sump pump, battery, and solar panel are not present.*



Arduino board, which controls the entire system.



Water level sensor, which detects how much condensation is forming in the pipes.



Temperature sensor which checks the temperature.

Fan blower which is responsible for bringing in fresh air.

Arduino Code:

Code used to control the system.

```
#include <Adafruit_Si7021.h>


//Group 3.1 Temperature Control System.
// C++ code
//

Adafruit_Si7021 sensor = Adafruit_Si7021();

int vtemp = 0;
float desiredTemp = 15;
float ctemp = 0;
int condensation = 0;
```

```
int fanPin = 8;
int pumpPin = 9;
int waterPin = A0;

void setup()
{
  pinMode(fanPin, OUTPUT);
  pinMode(pumpPin, OUTPUT);
  pinMode(waterPin, INPUT);
  Serial.begin(9600);
  sensor.begin();
}

void loop()
{
  delay(3000);

  //reads temperature
  condensation = analogRead(waterPin);
  ctemp = sensor.readTemperature();


  // reads desired temperature:
  if (Serial.available() > 0) {
    desiredTemp = Serial.parseInt();
  }

  //turn on fan
  if (desiredTemp != ctemp) {
    digitalWrite(fanPin, HIGH);
  } else {
    digitalWrite(fanPin, LOW);
  }
```

Wrike

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=KRR6Hz5AowiC0jPPEiSwNoEB2i5lyCD8%7CIE2DSNZVHA2DELSTGIYA