Smart Irrigation System

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Objective/Motivation

- The main objectives of this project is to develop an IOT system:
  - To determine the amount of water required to maintain the irrigation conditions of the field such as moisture of the soil, temperature and humidity to maintain the soil moisture.
  - To notify the farmers if any one of the conditions such as temperature, humidity and soil moisture doesn't meet the required conditions of an irrigation system.

- Motivation:

  The proper management of conditions needed for a good irrigation field has been a topic of much debate as well as caution for everyone. Being a generation to carry forward the farmers' legacy to give people a good yield of crops, we are motivated to do an IoT based smart irrigation system through which we can deal with the problems faced by the farmers in the field. The conventional irrigation system is manually operated and it is based on real-time weather and soil conditions observed manually. The farmers sometimes have to water the field in odd hours due to variation in supply. There are also chances of overwatering and underwatering in few circumstances due to human error. This constantly arising problem faced by the farmers initiated us to develop this system based approach.

Work Process

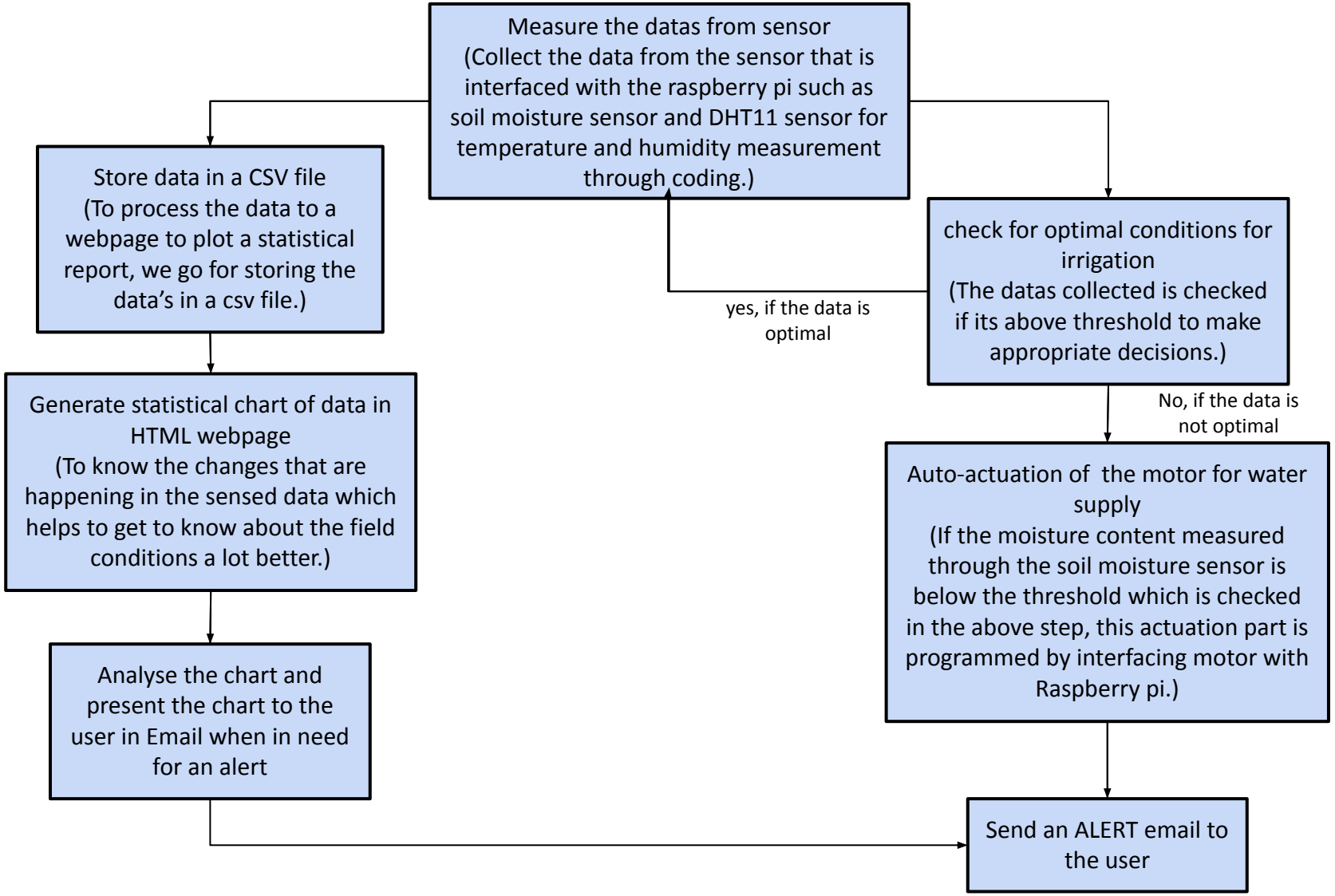

Figure 1. Working process depicted as Flowchart along with detailed explanation of each step included.

Schematic Diagram

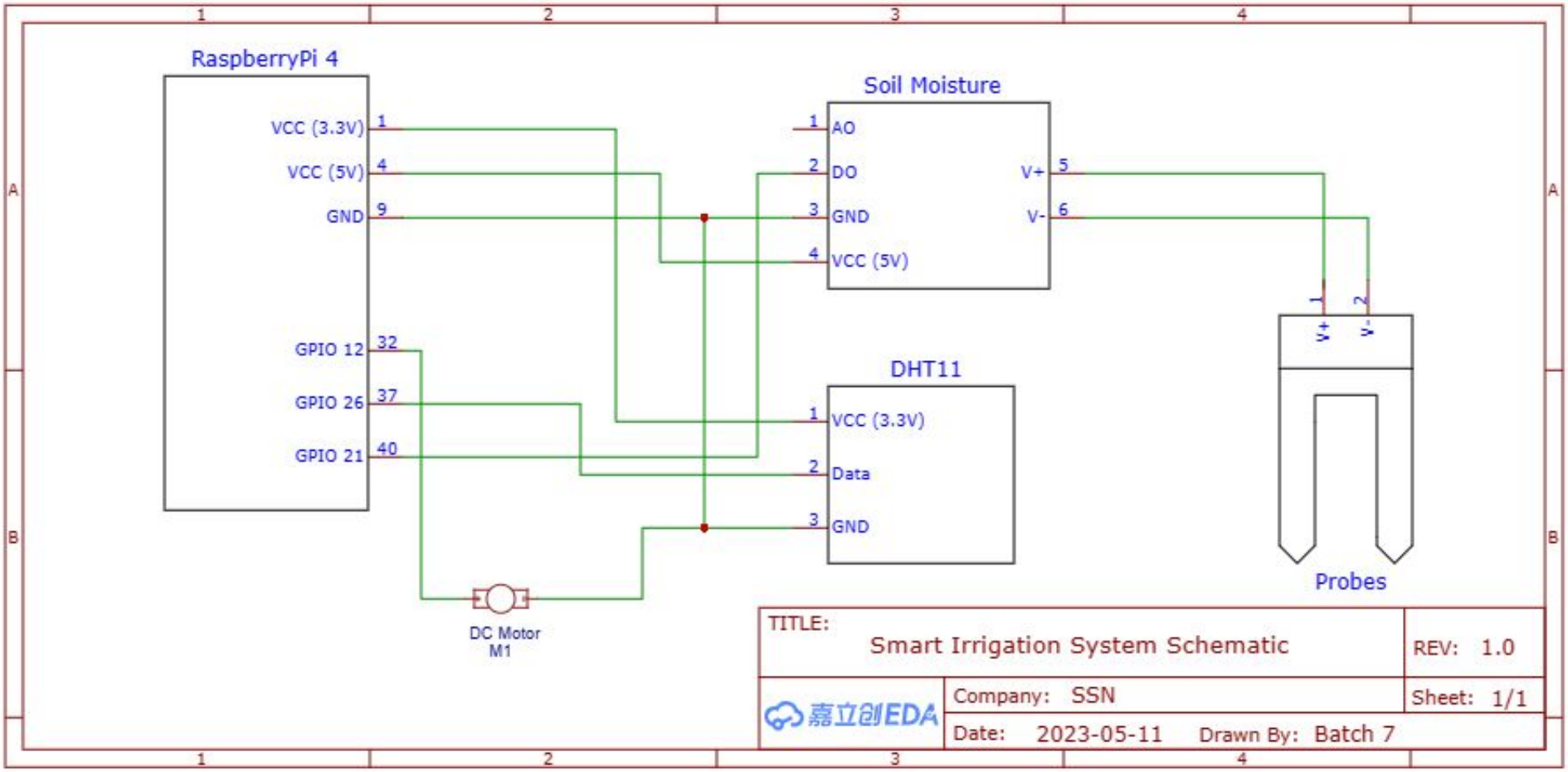

Figure 2. Schematic diagram of the Raspberry Pi 4 interfaced with DHT11, Soil moisture sensor, and DC motor.

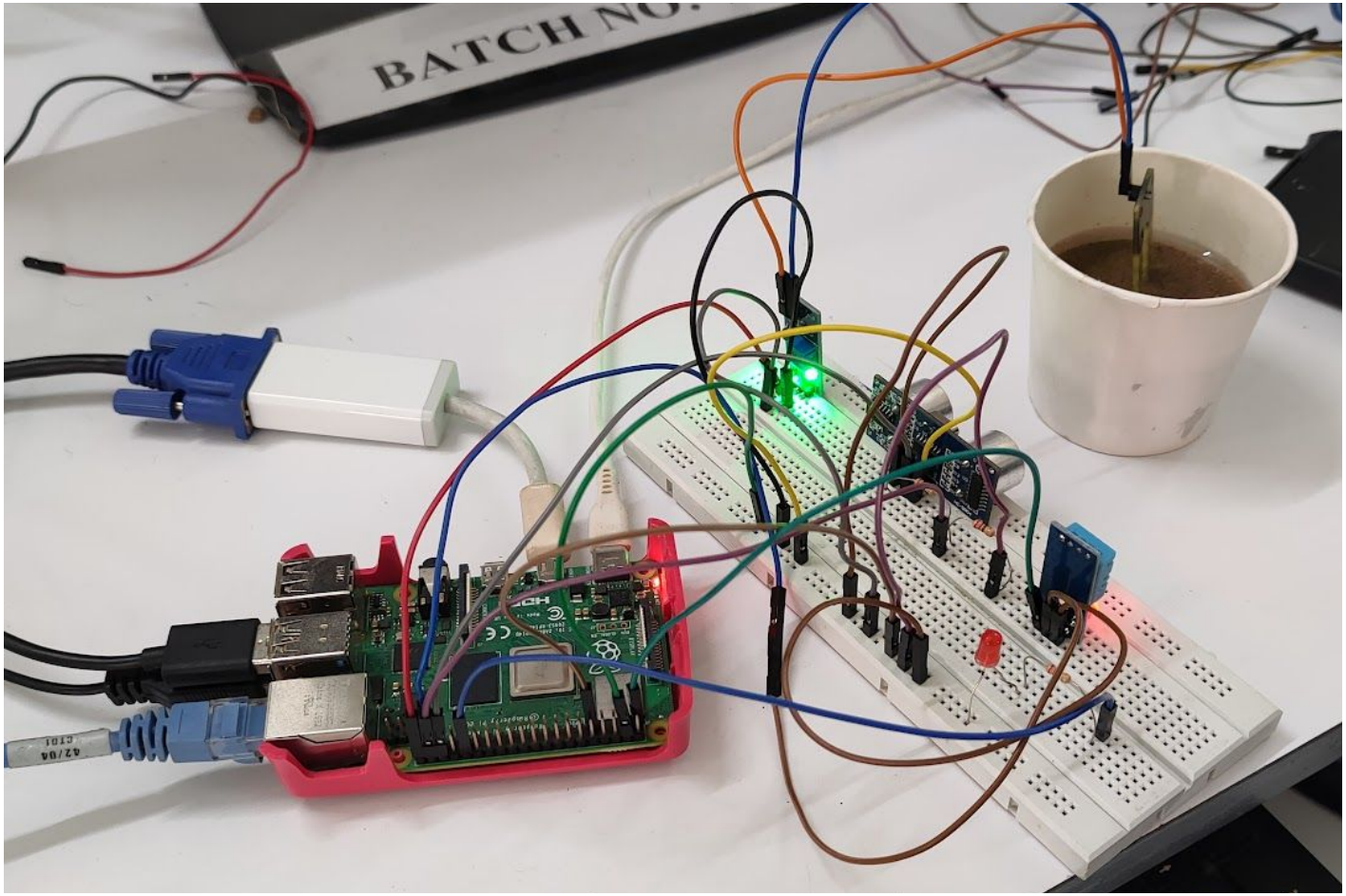

Figure 3. Circuit connection setup depicting the components used and its interface with Raspberry pi 4.

Parameter Evaluation

Parameters to be estimated	Sensor Used	Data Collected	How data used
Moisture Content	Soil Moisture Sensor	"Moisture" (Water content of the soil in the irrigation field.)	If Moisture is measured to be '1' then the moisture content in the soil is high (above threshold). Thus, the water required is already satisfied and thus the water won't be poured into the field by the use of motor to increase the water level. if Moisture is measured to be '0' then vice versa happens.
Environmental Temperature	DHT11	"Temperature" (Temperature of the environment in which the irrigation field is located.)	If the temperature is high (above the threshold) then, the moisture is decreased. Thus, we end up pouring some amount of water through running of the motor into the field to overcome the temperature variations.
Humidity	DHT11	"Humidity" (Environmental Humidity content in which the irrigation field is located.)	As like the Temperature, when Humidity is High (above the threshold), the variations is compensated by adding water through a motor into the irrigation field.

Result & Graph

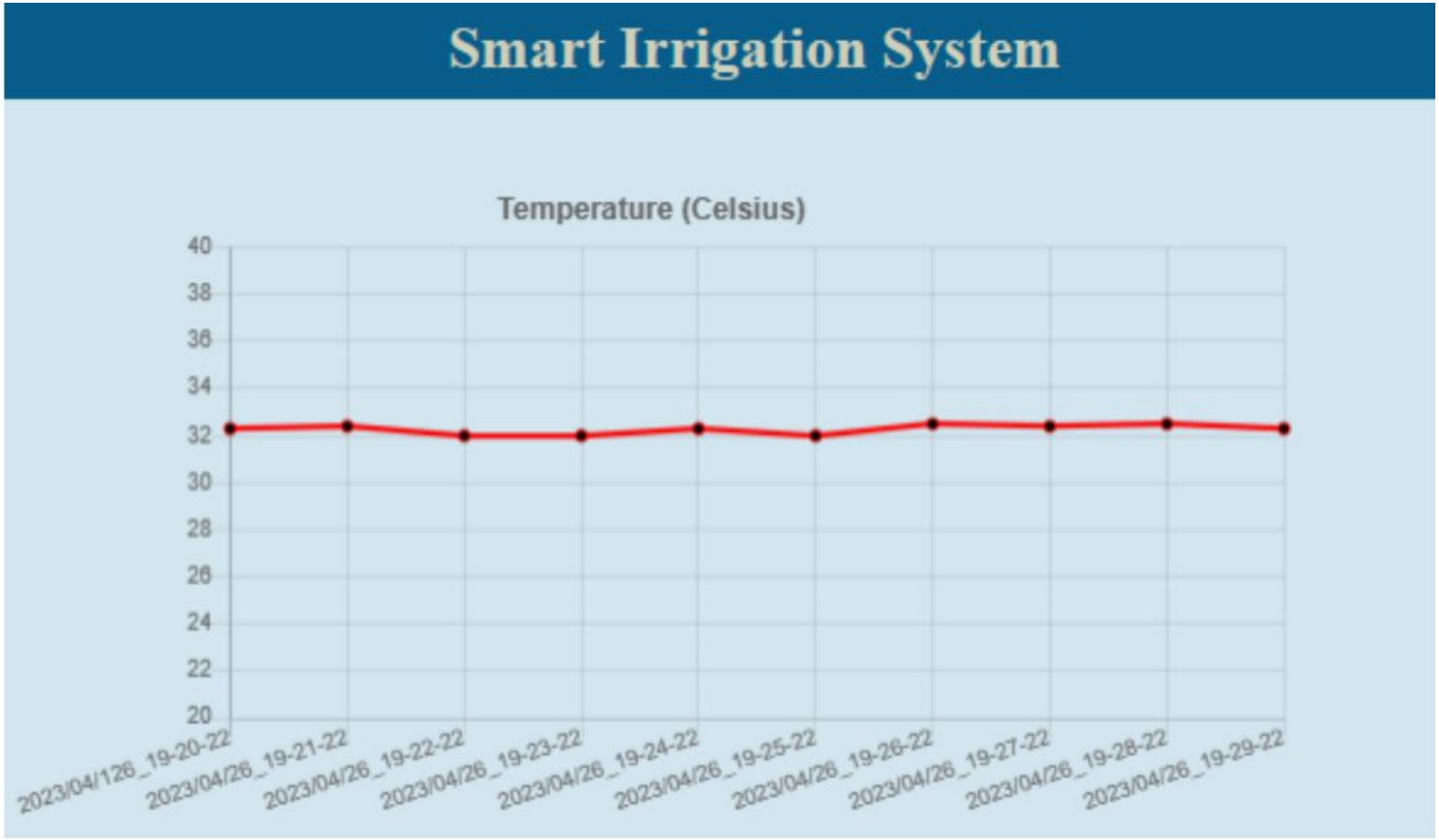

Figure 4. HTML including the Temperature chart in the client side.

Result & Graph

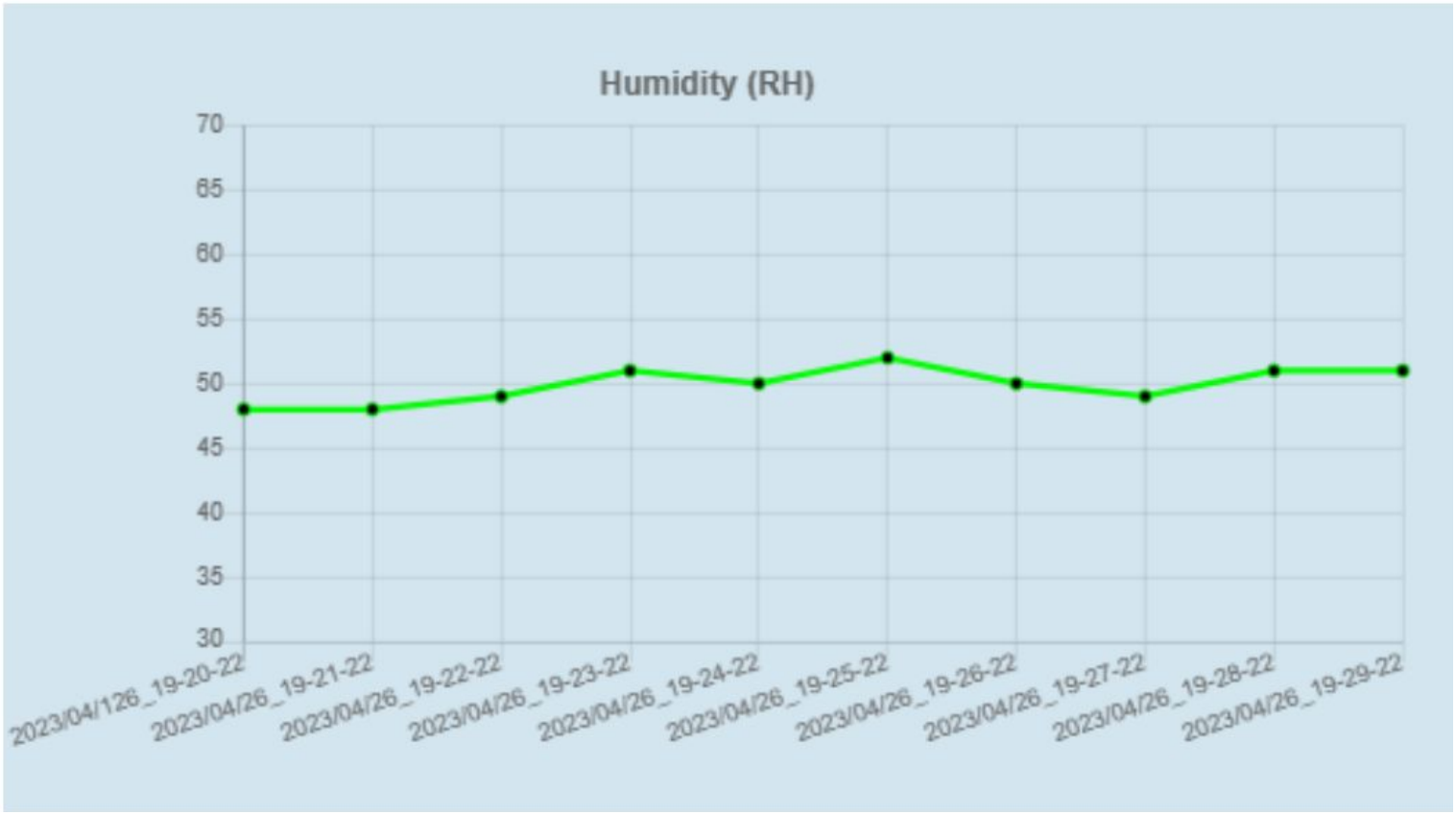

Figure 5. HTML including the Humidity chart in the client side.

Result & Graph

Motor is on Inbox ×

bommana2011042@ssn.edu.in

to me

	Timestamp	Temperature	Humidity	Moisture
0	2023/04/19_19-20-22	33.3	48.0	0.0
1	2023/04/19_19-21-22	32.4	48.0	0.0
2	2023/04/19_19-22-22	32.0	49.0	0.0
3	2023/04/19_19-23-22	32.0	51.0	1.0
4	2023/04/19_19-24-22	32.3	50.0	1.0
5	2023/04/19_19-25-22	32.0	52.0	0.0
6	2023/04/19_19-26-22	32.5	50.0	1.0
7	2023/04/19_19-27-22	32.4	49.0	0.0
8	2023/04/19_19-28-22	32.5	51.0	1.0
9	2023/04/19_19-29-22	33.3	51.0	0.0

Figure 6. Mail sent upon Alarm to the client.

Conclusion & Future Scope

- The overall design of this smart irrigation system is an automated solution to optimize water usage in agricultural or garden irrigation based on real-time data. By incorporating sensors offers several benefits:
  - Water Conservation - By monitoring soil moisture levels, weather conditions, and plant requirements, water is applied efficiently, minimizing waste and reducing water consumption.
  - Improved Plant Health - By providing water on-demand based on plant needs, smart irrigation systems promote healthier plant growth. Overwatering or underwatering is avoided, reducing the risk of diseases, root rot, and nutrient leaching.
  - Cost Savings Efficient water usage leads to cost savings in terms of water bills and energy costs for pumping water.
  - Customization and Optimization - Smart irrigation systems can be tailored to specific plant types, soil conditions, and microclimates, ensuring optimal irrigation for each area.
- Complex Analysis:
  - To predict the water supply when the conditions for a perfect irrigation field not met.
  - Using Heuristic methods for learning and to take decisive action.

Thank you !