EEE 416 – Microprocessor and Embedded Systems Laboratory

Jan 2022 Level-4 Term-I Section C

Final Project Demonstration

SUBMITTED BY – GROUP C2.05

IoT Based Environment Monitor System

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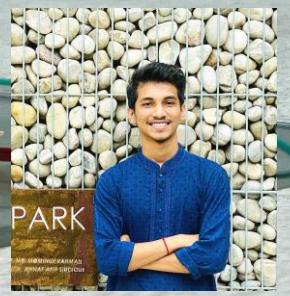

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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Outline

1. Summary
2. Introduction
3. Design
4. Implementation
5. Analysis and Evaluation
6. References

1. Summary / Abstract

- In this EEE416 sessional course we have built an IoT based environment monitoring system with integrated GSM technology. Two sensors work to find the temperature, humidity and the air quality. The values are uploaded online to a cloud system where it is shown and recorded. Warning message is sent straight to the users phone when the parameters exceed a given threshold. The entire system is powered with solar energy with battery backup.

2. Introduction

The air we breath in has a direct effect on our health. As such ensuring a healthy environment with good quality air should be imperative. The first step to do so is to monitor our surrounding environment. The monitor system we have built can help us get real time reading of the air quality remotely. With this we can identify the activities directly affecting the surrounding air and help maintain a healthy environment.

3.1 Design: Components

The components used in this project are:

A. Main Circuit Components:

- NodeMCU ESP8266 microcontroller
- DHT11: Temperature and Humidity sensor
- MQ135: Gas sensor
- SIM800L
- I2C adapter
- LCD display

3.1 Design: Components

The components used in this project are:

A. Solar circuit components:

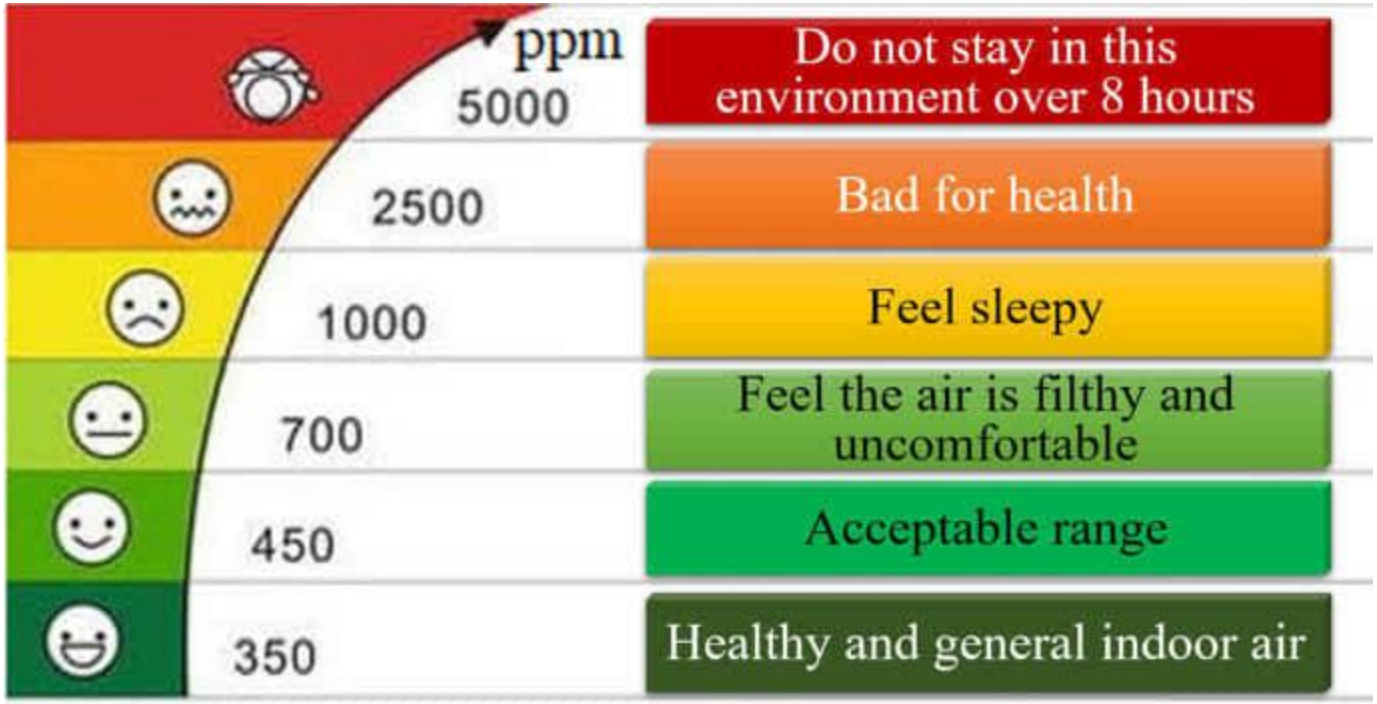
- 6V solar panel
- TP4056 battery charger
- MT3608 boost converter
- Switch (DPST and SPST)

3.1 Design: Sensors

- Main Circuit:
- The two sensors used are DHT11 and MQ135.
- DHT11 detects air temperature and humidity.
- MQ135 detects gases in air like ammonia, sulfide, smoke, carbon di-oxide etc. It measures the gas particles in air in ppm and can give a rough estimate about the change in air quality.

3.1 Design: Sensors

A chart showing the levels of CO2 in air

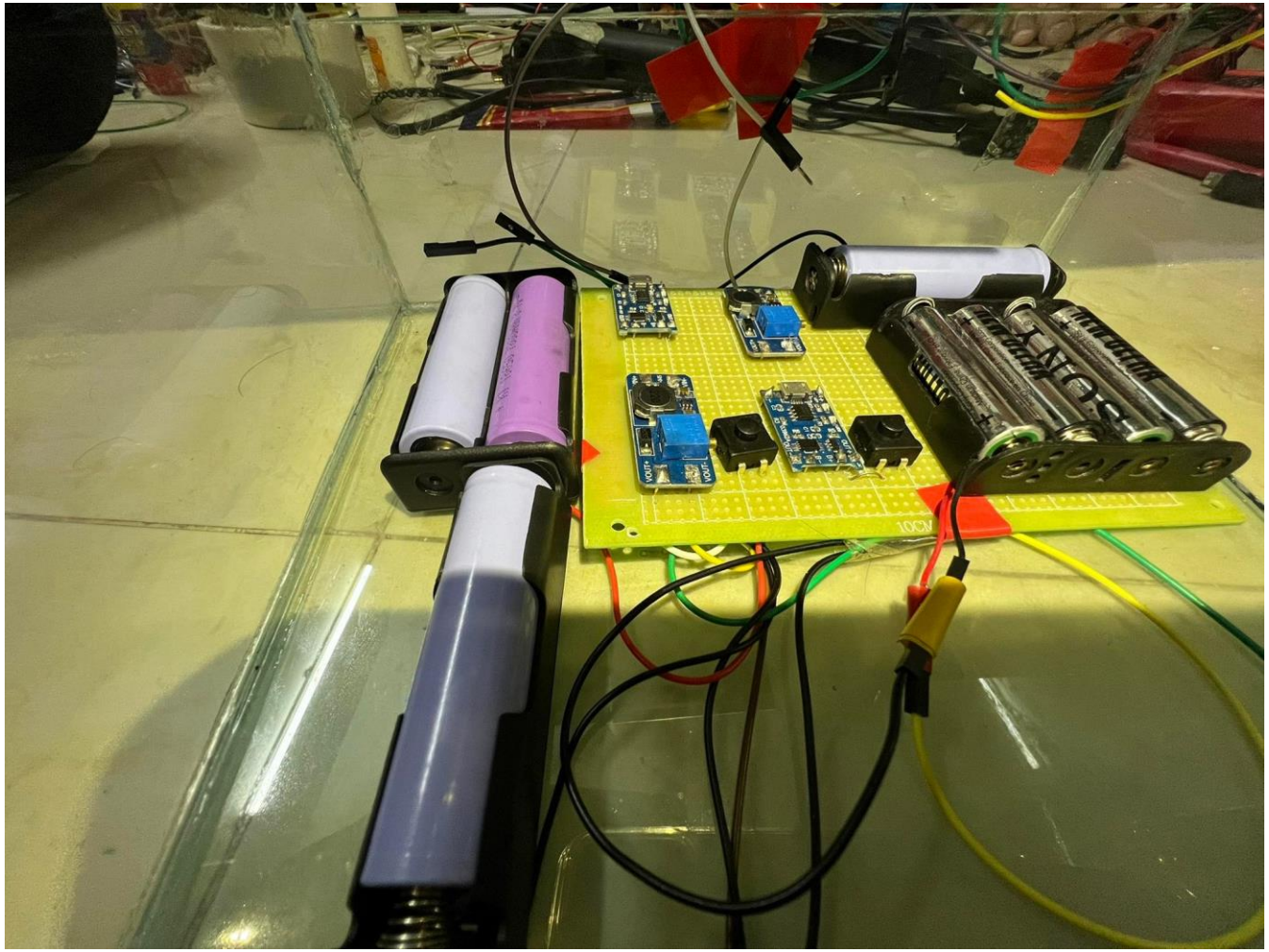


3.1 Design: Solar Power

- The main circuit is connected to two 6V solar panels through a rechargeable battery. The battery is connected with a boost converter to boost up the battery when indoors.

- The GSM module is connected in the same way with one 6V panel to provide it with the power needed to operate.

3.1 Design: Solar Power



3.1 Design: Data Access

The data from the sensors can be accessed in three ways two of which are remote.

1. From the mounted LCD on the circuit.
2. From ThingSpeak website integrated with the circuit
3. From SMS sent to the users personal phone number when parameters exceed a preset threshold.

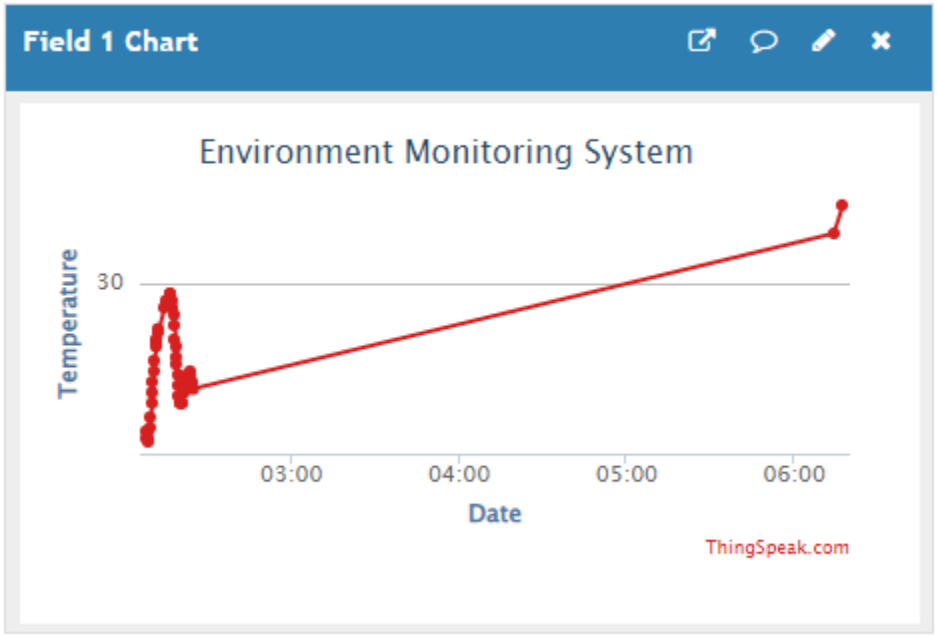
3.1 Design: ThingSpeak

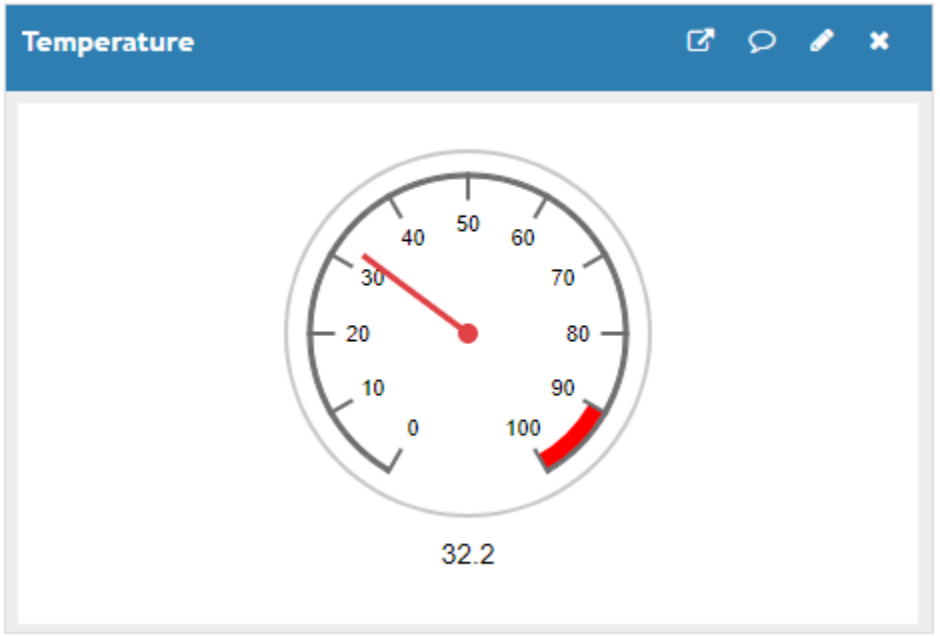
Data read from the sensors are directly uploaded to the ThingSpeak website in real time.

Users can see the temperature, humidity and air quality index at that moment and observe a chart of recent readings.

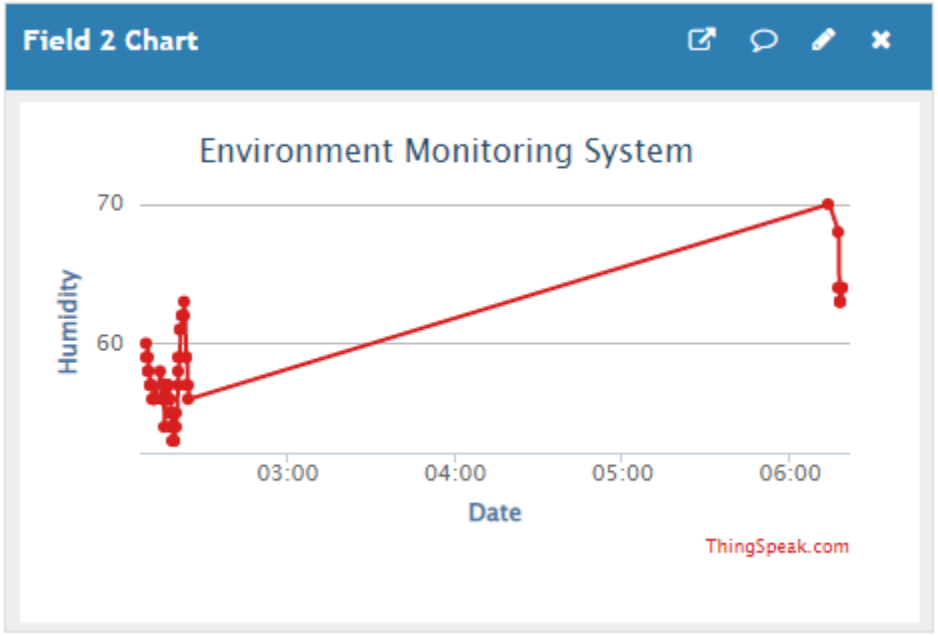
All the data uploaded are recorded and can be accessed at any time.

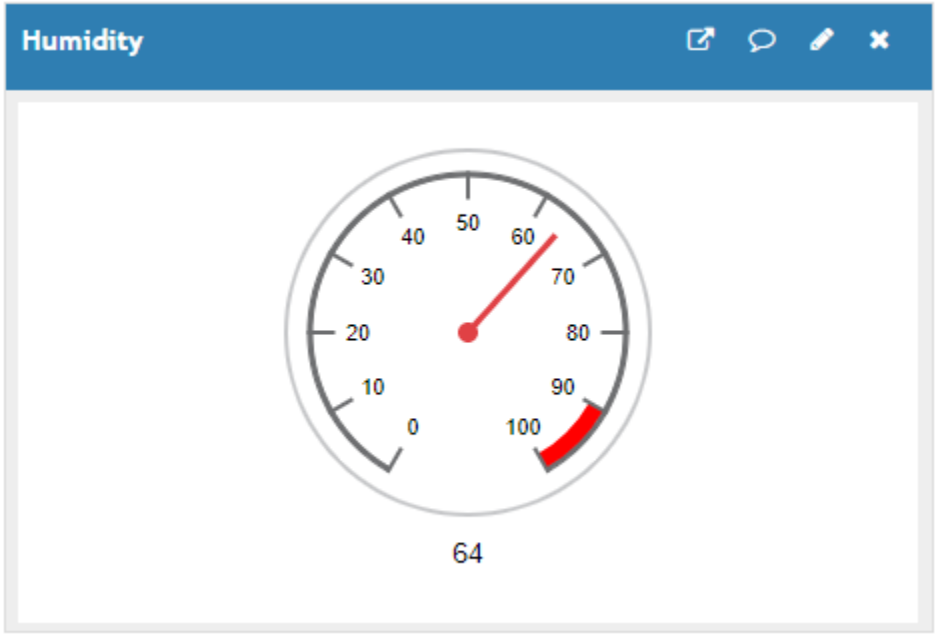
3.1 Design: ThingSpeak





3.1 Design: ThingSpeak





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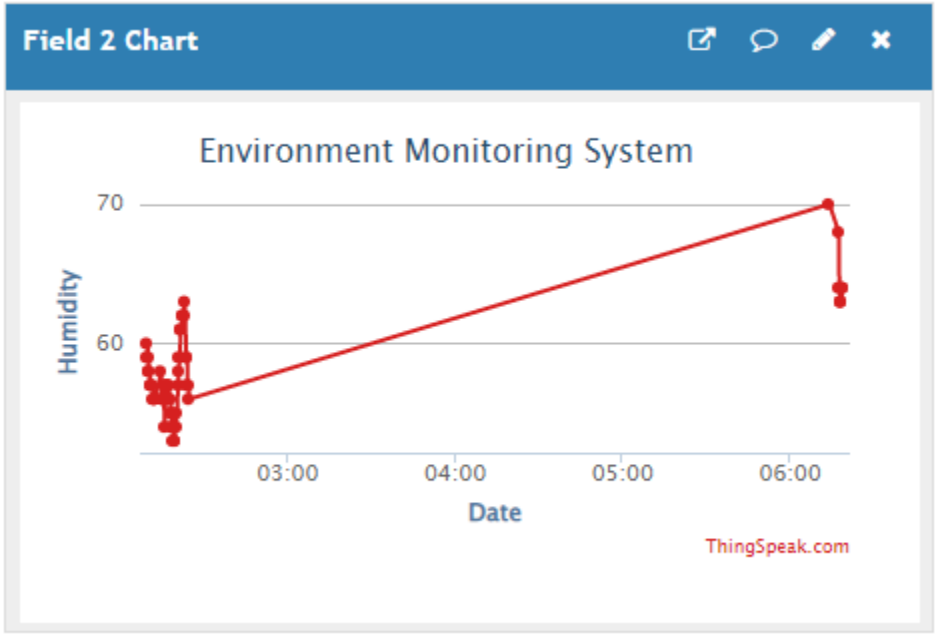
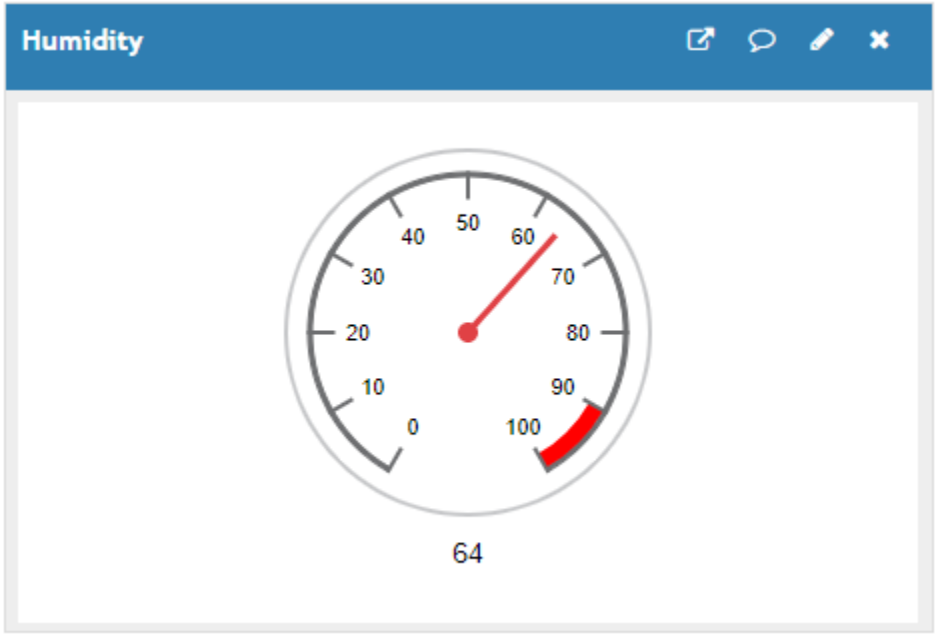
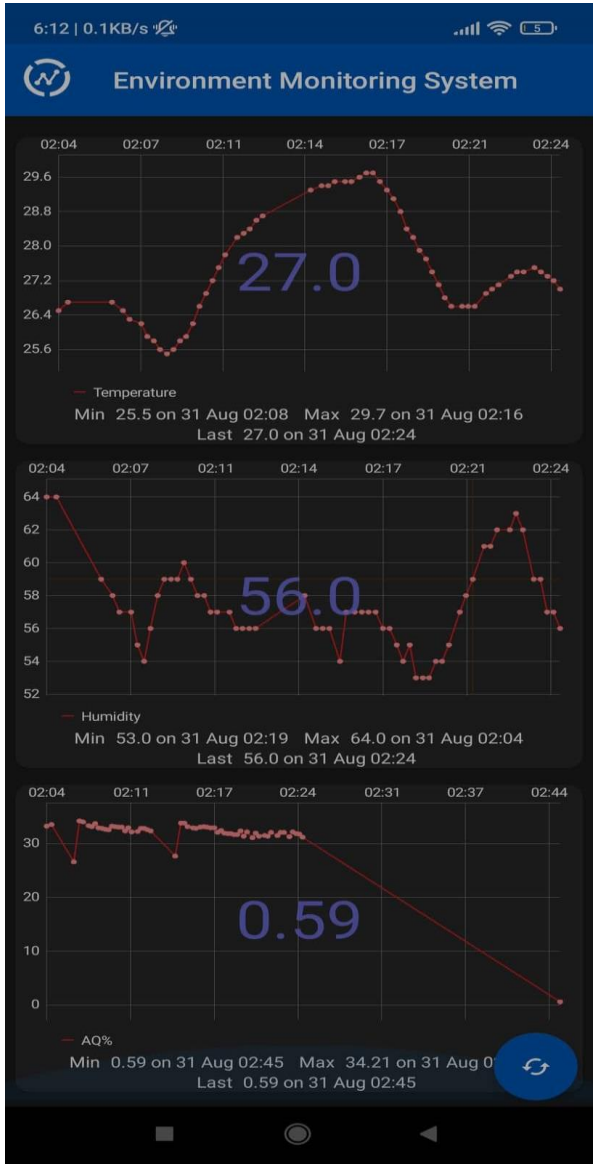




3.1 Design: ThingView

- The affiliated app to ThingSpeak can be used to access the recent data as well.

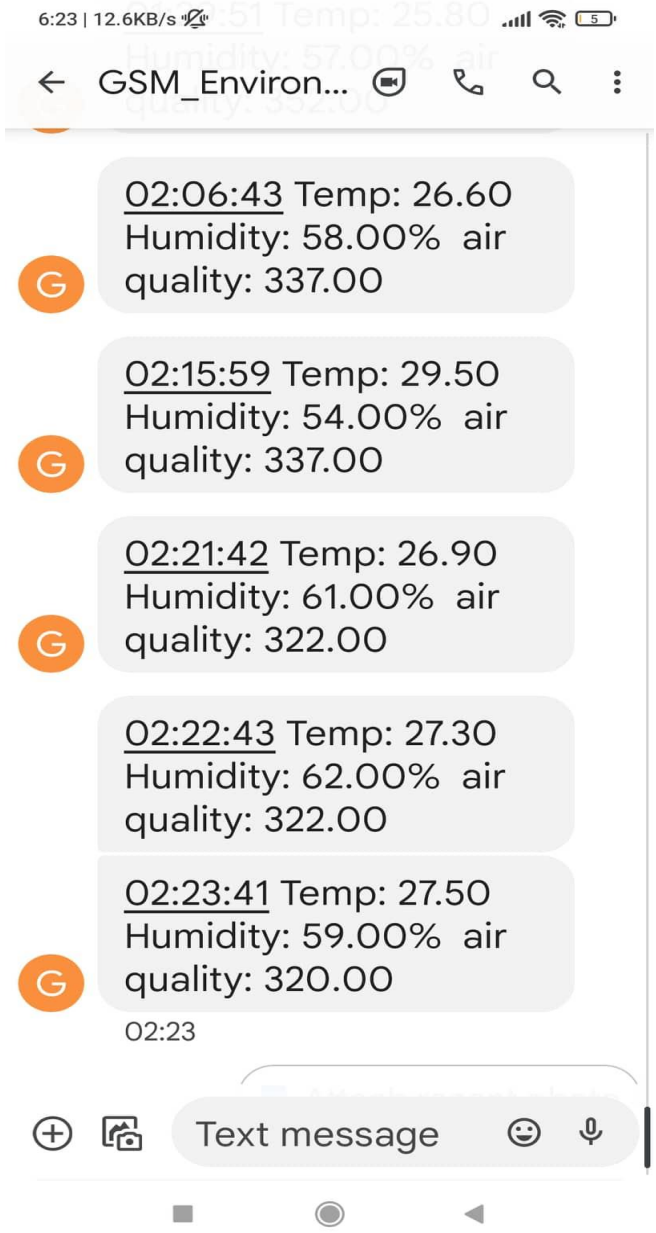
- All the data taken are at indoor conditions.



3.1 Design: GSM

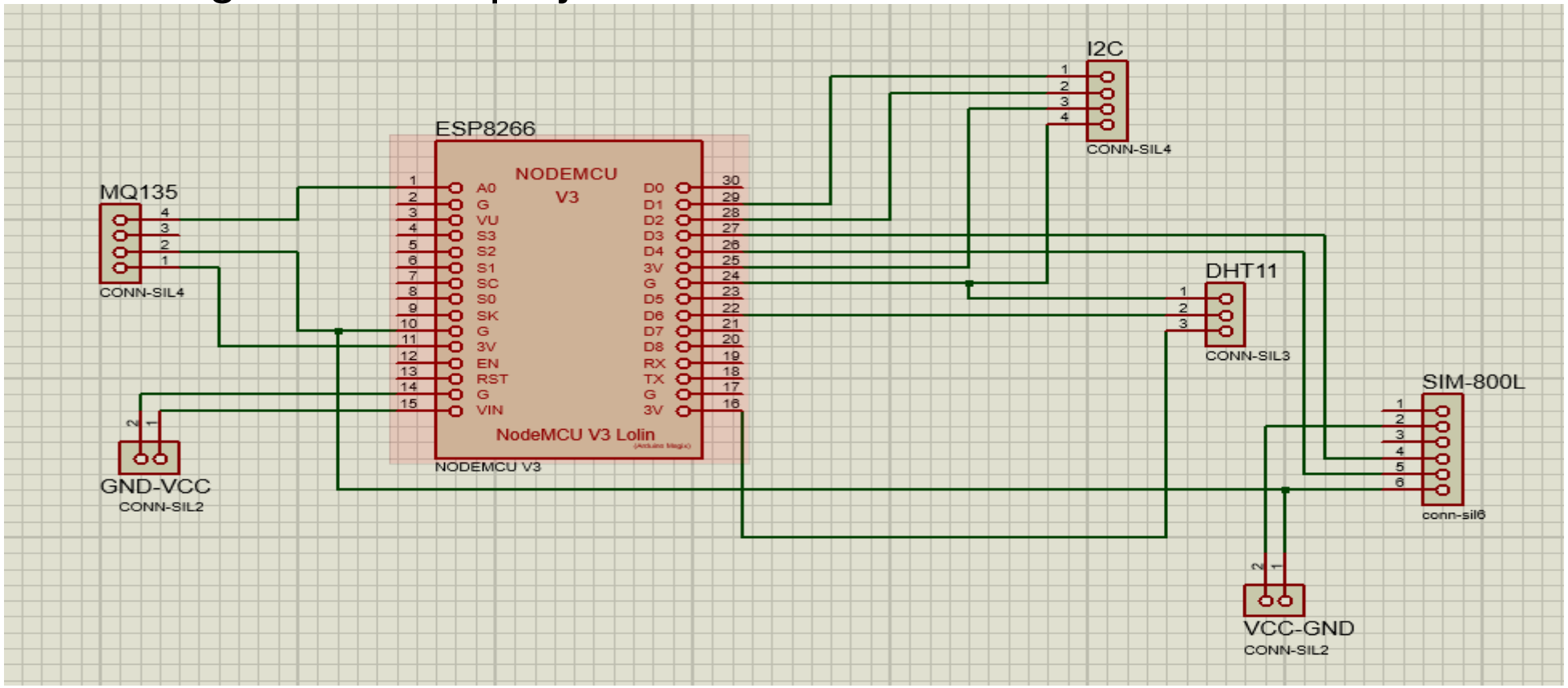
The user can also receive an SMS briefly stating the data under specified conditions.

This design can be subject to further improvement



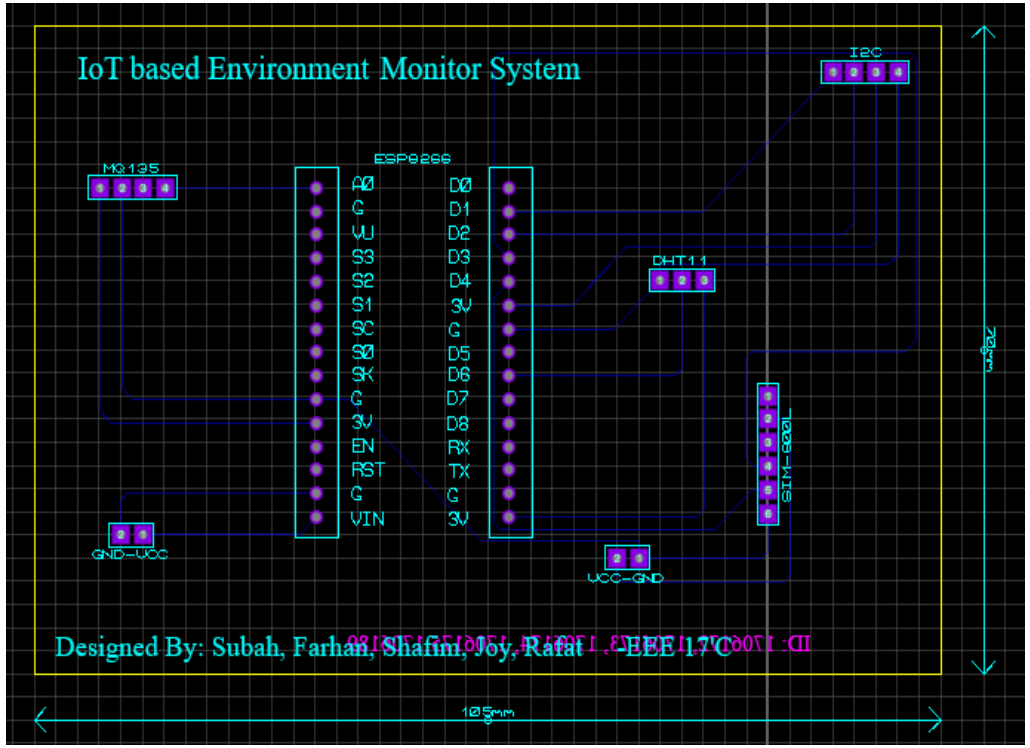
3.2 Design: Circuit Diagram

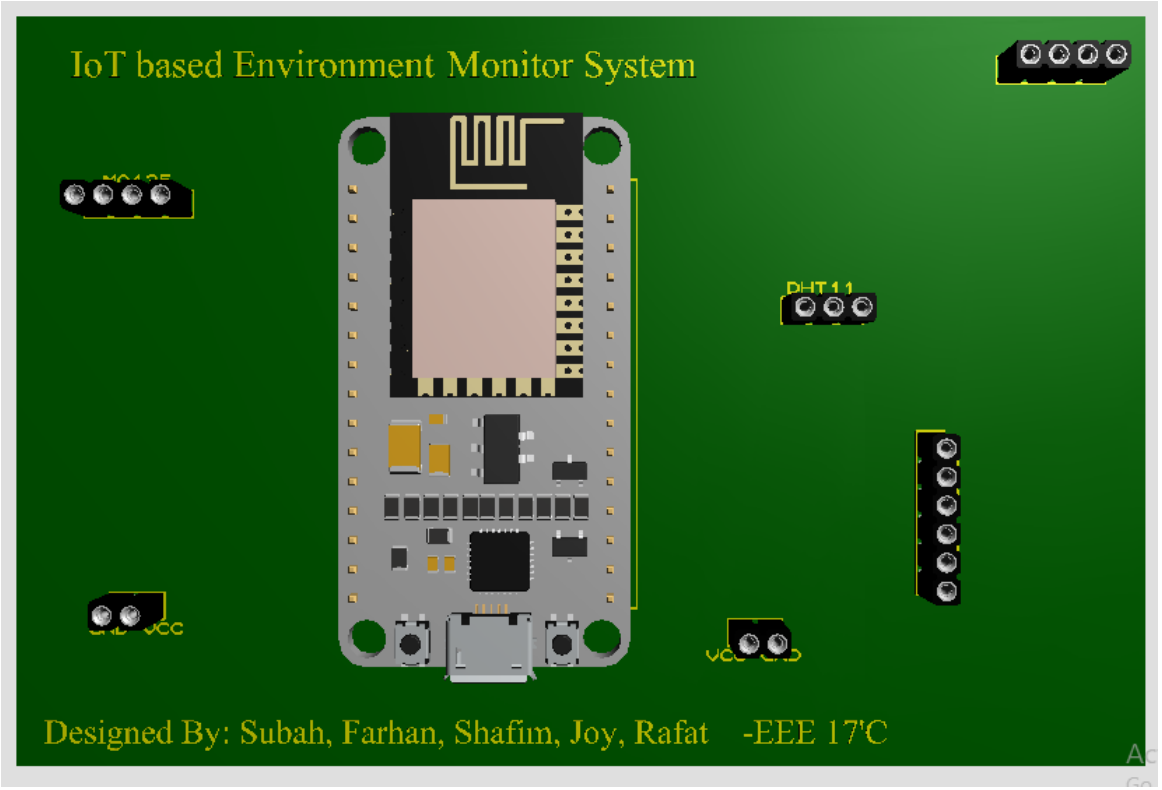
- Circuit diagram of our project



3.4 Design: PCB Layout and 3d rendering

- The following figure shows the PCB layout and the 3D rendering of the main circuit.





4.1 Implementation: Photo Gallary

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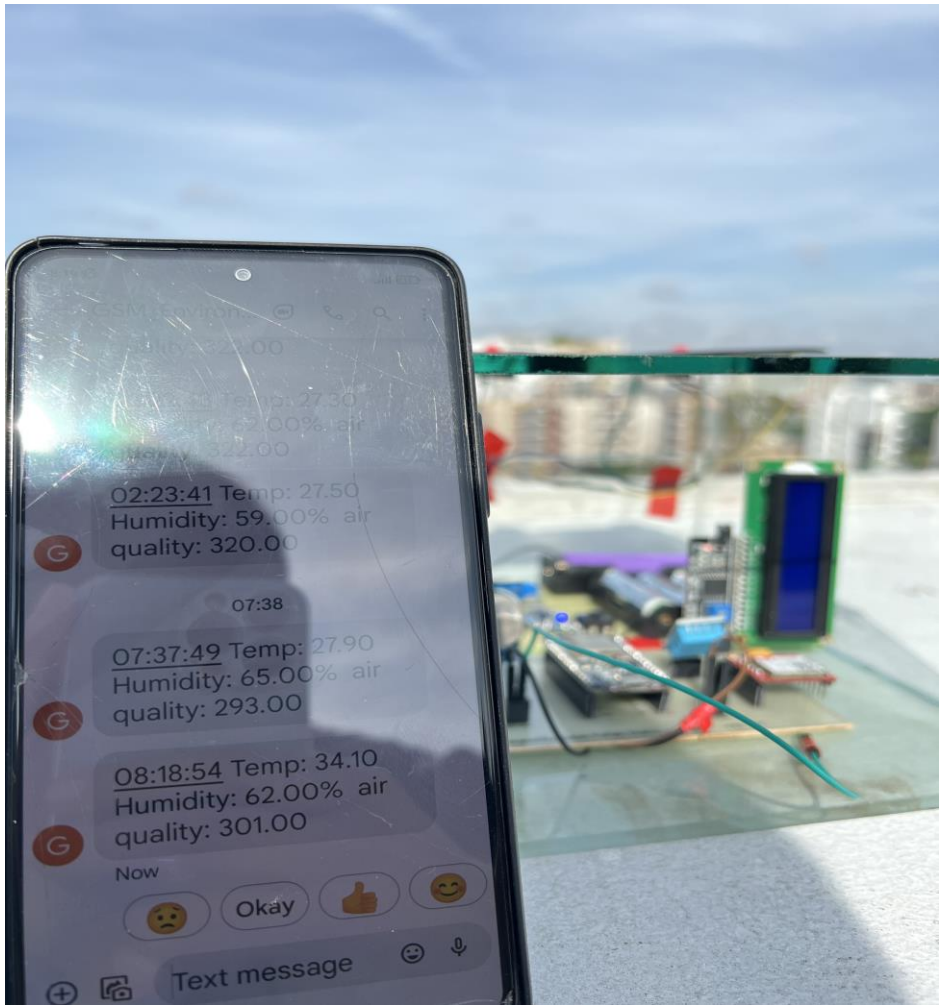

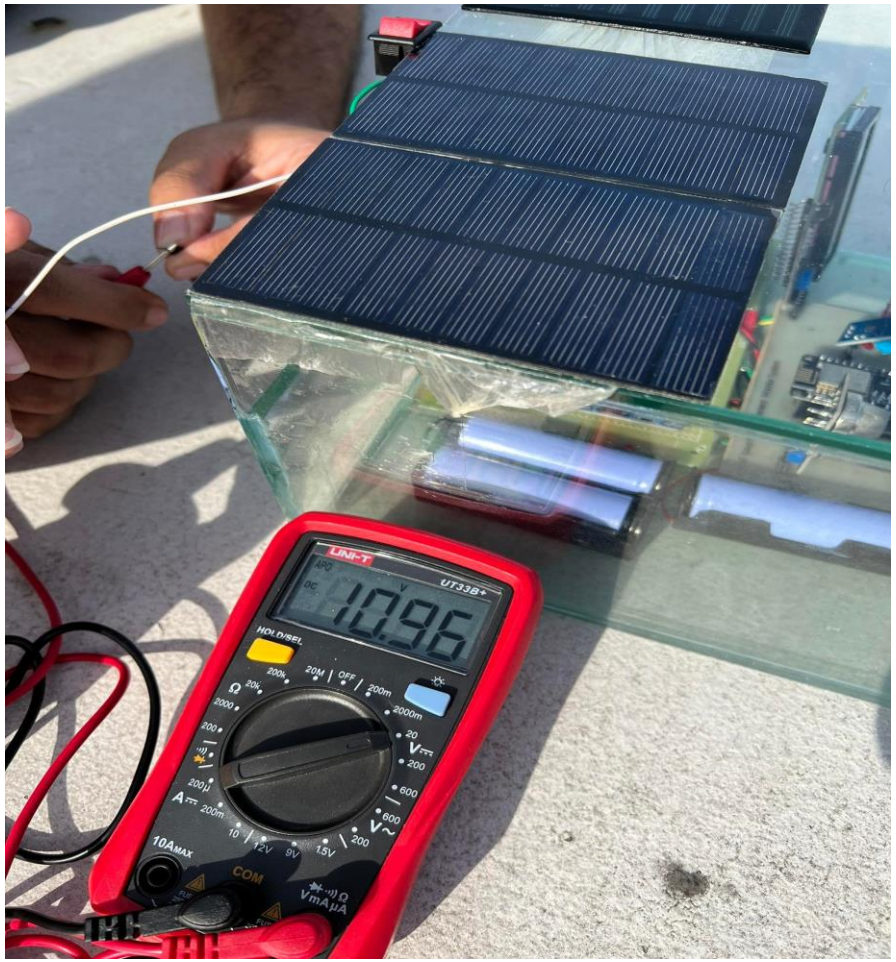

4.2 Implementation: External Links

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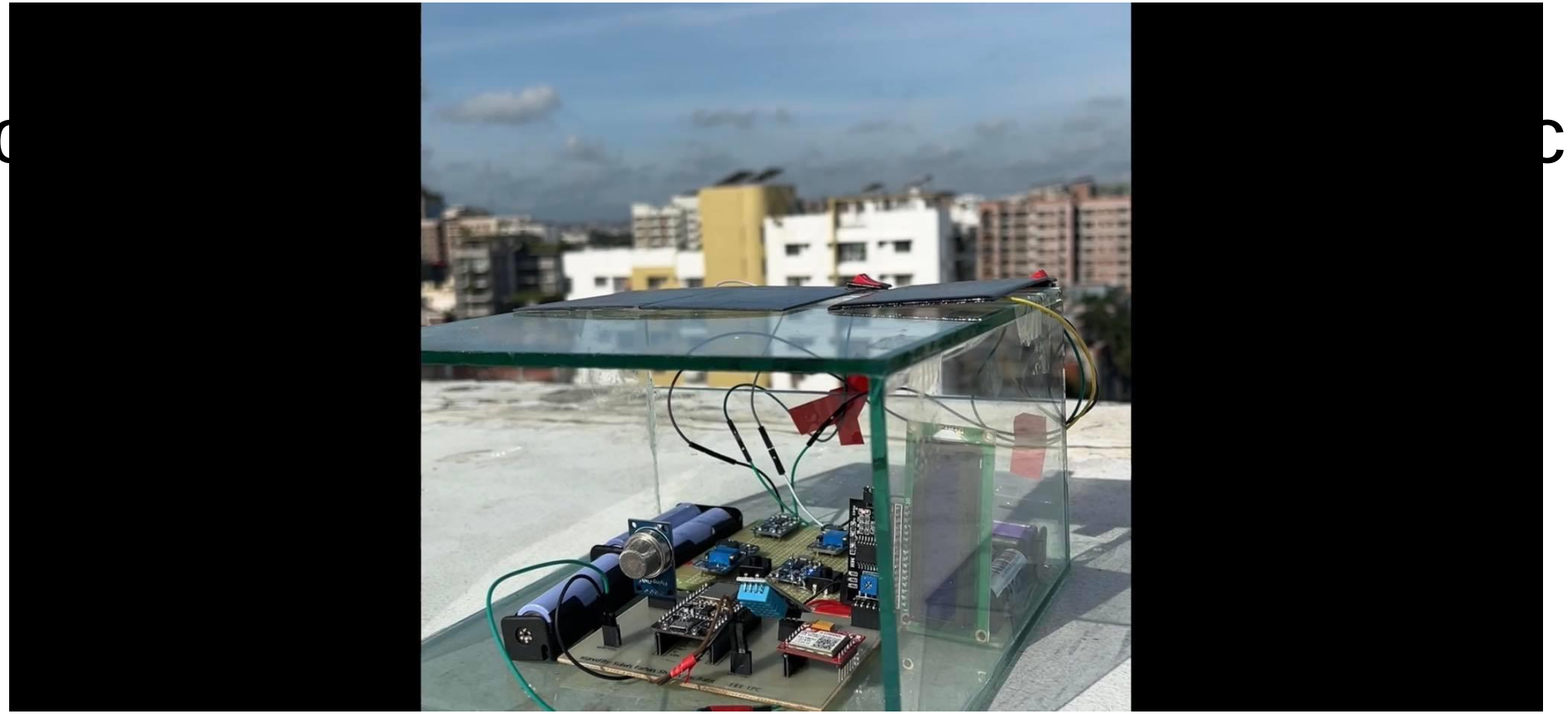

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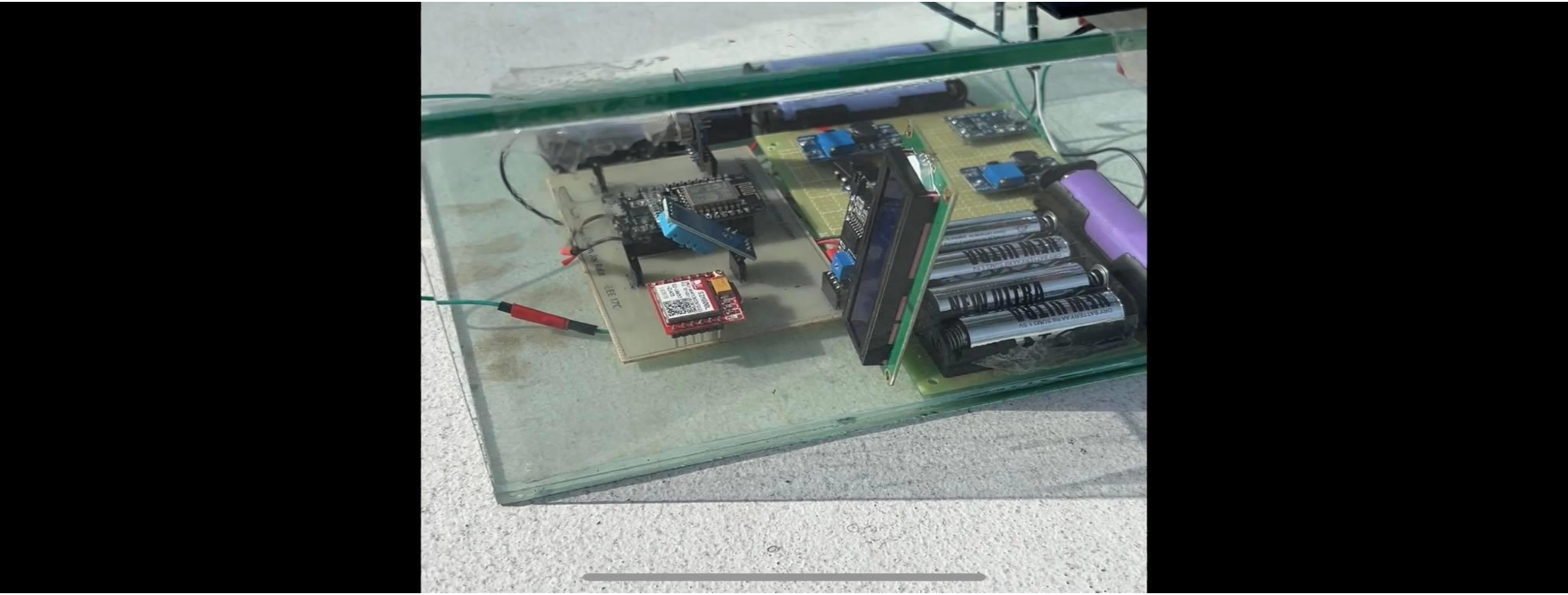

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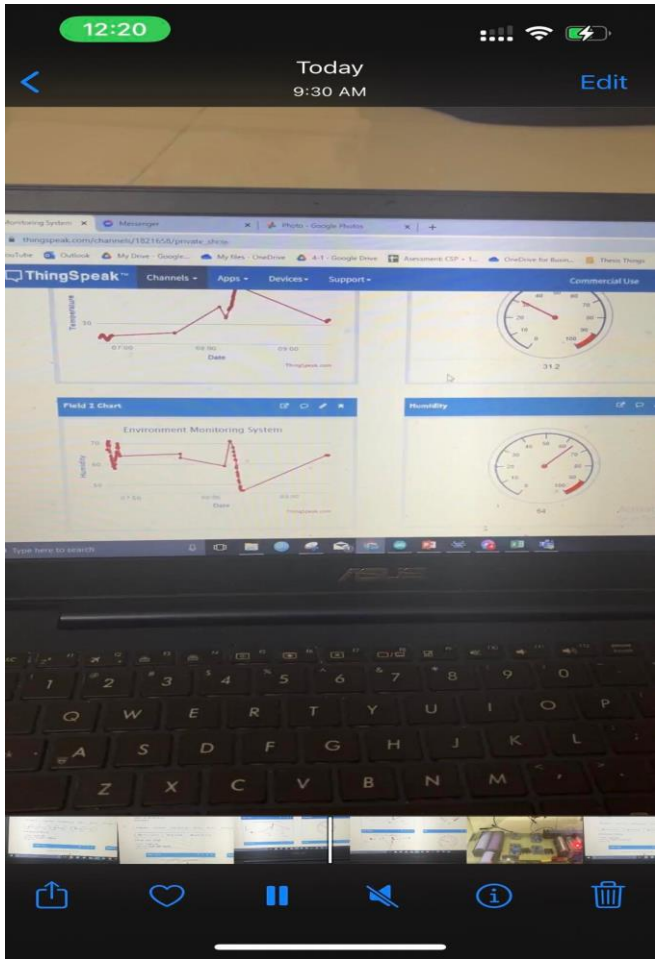

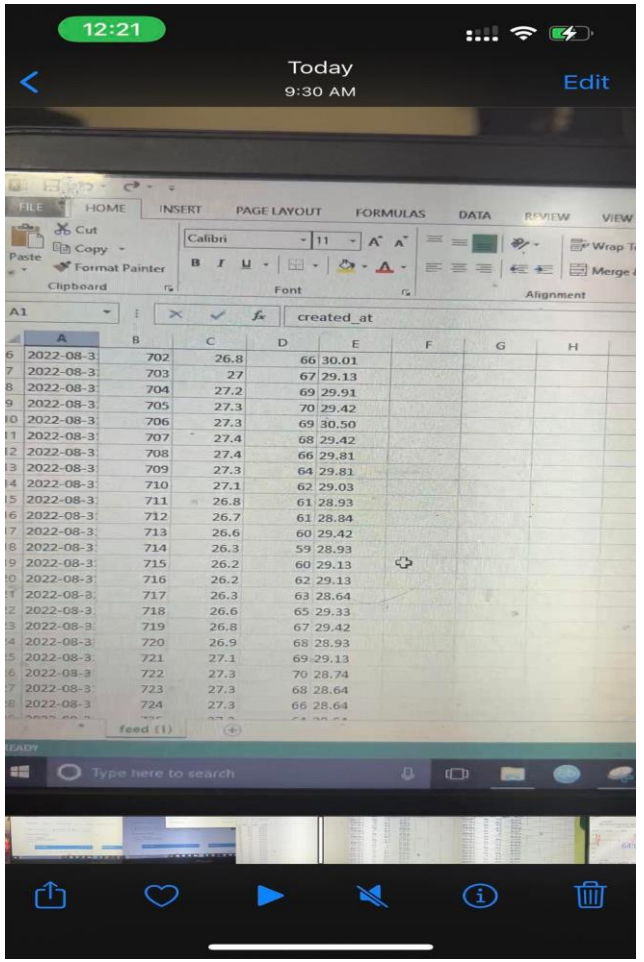

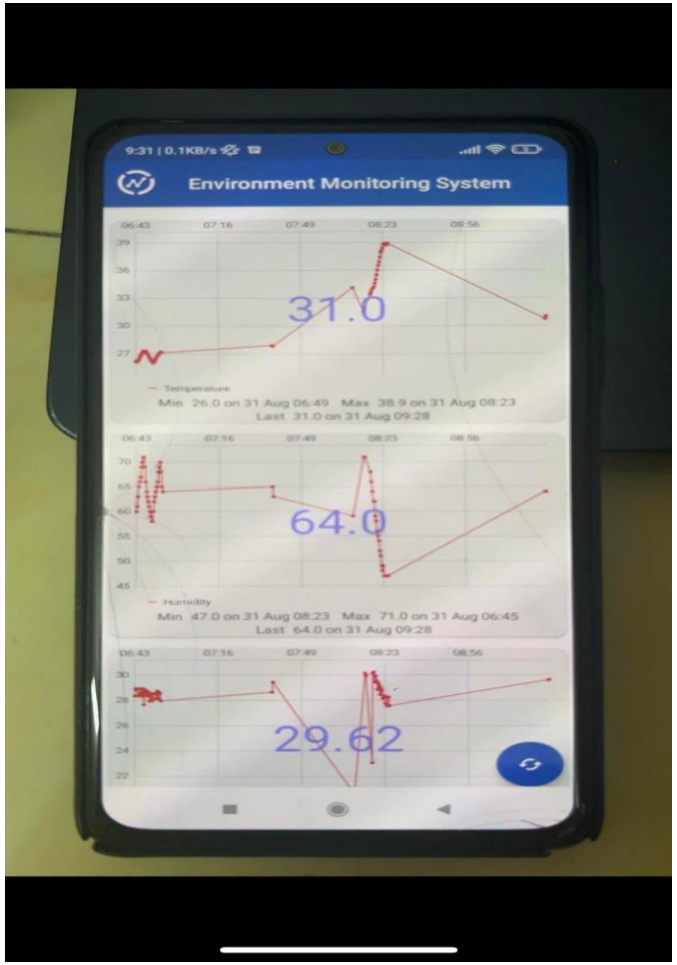

4.2 Implementation: External Links

5. Analysis and Evaluation

- 5.1 Novelty
- 5.2 Project Management and Cost Analysis
- 5.3 Practical Considerations of the Design
- 5.4 Assessment of the Impact of the Project
- 5.5 Evaluation of the Sustainability

5.1 Novelty

- We have created a portable device that is run with clean solar energy and whose data can be accessed remotely in more than one way from any place any time as long as one has internet connection.

5.2 Project Management and Cost Analysis

Component	Quantity	Price per Unit (Tk)	Total Price (Tk)
ESP8266	1	432	432
DHT11	1	136	136
MQ135	1	200	200
SIM800L	1	365	365
I2C module	1	70	70
LCD display	1	180	180
Solar Panel	3	320	960
TP4056 battery charger	2	25	50
MT3608 boost converter	2	70	140
Battery+holder	8	17.5	140

5.2 Project Management and Cost Analysis

Component	Quantity	Price per Unit (Tk)	Total Price (Tk)
PCB printing	1	263	263
Soldering Cost	-	-	1000
Miscellaneous	-	-	500
Casing	1	300	300
Transport	-	800	800
TOTAL			5536

NOTE: Only the components and quantities used in the finalized product are included in the cost analysis. Including all the faulty sensors, backup components and ruined ones; the actual cost of making this product is almost twice as much.

5.3 Practical Considerations of the Design

- The sensor can be used to monitor air quality and environment temperature and humidity of both indoor and outdoor conditions. The end product is small and noiseless. The data can be accessed remotely.
- The monitor system is solar powered with battery backup. Thus it does not pollute the surrounding environment in any way.
- This monitor system can be used to maintain a healthy environment inside homes, schools, hospitals, workspace and factories.

5.4 Assessment of the Impact of the Project

- For a city as dense and polluted as Dhaka, the air quality is a major concern for the health and livelihood of it's people. This monitor can be made more compact and cheap for the use of regular people.

- The alarming data seen from this sensor can be a wake up call for the common people regarding the pollution happening all the time around us.

5.5 Evaluation of the Sustainability

- The monitor system is run entirely on renewable solar power. The monitor can run directly under sunlight at daytime and use the battery backup during the absence of sufficient sunlight or at night.

6. Reflection on Individual and Team work

1. Individual Contribution of Each Team Members
2. Mode Of Team Work

3 Diversity Statement of Team

4 Log Book of Project Impelementation

6.1 Individual Contribution of Each Member

Shafim (1706172)-GSM, solar

Rafat (1706173)- PCB designing

Subah (1706174)-PCB design, GSM, sensors.

Farhan(1706175)- Solar, GSM, ThingSpeak cloud

Joy(1706189)- Solar, LCD display

While some members may have focused more on certain aspects of the project, all of us were present and helping each other out

6.2 Mode of TeamWork and Diversity

6.3 Logbook of Project

At the time of making this slide,763 entries have been uploaded to ThingSpeak from 3rd August 2022 to 31st August 2022.

THANK YOU!

ANY QUESTIONS?

7. References

- Add any and all references here, for websites, give URL. Include any research articles, datasheets, handbooks, reference manuals used in the project. In presentation, just show this slide, no need to explain.