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Weather Monitoring System for Farmers using IoT

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Abstract: Weather plays a very important role in farming. It has an extreme influence on crop growth, yield, the impact of pests/diseases, development, water needs, and fertilizer requirements. For mass production, a farming system requires timely monitoring of environmental conditions such as temperature, pressure, rainfall detection, soil moisture, etc. The Weather Monitoring System can be designed based on IOT by using the ESP8266 microcontroller.

Index Terms **- IoT Technology; Weather Monitoring System; ESP-8266 Microcontroller; Arduino Projects**

I. INTRODUCTION

Weather plays an important role in agricultural productivity. Weather monitoring is required for better maintenance & production. This project is developed for monitoring parameters like temperature, humidity, air quality, atmospheric pressure, altitude, soil moisture, and rainfall.

In this project, temperature & humidity is monitored using the DHT-11 sensor. A gas-sensor detects the presence and concentration of gases in the area. Atmospheric pressure & altitude are detected by the BMP-280 sensor. The soil-moisture sensor will help the farmer determine whether the crop needs watering or not. Rainfall is detected using the rain-sensor. This project is cheap and affordable to the common farmer.

II. LITERATURE REVIEW

Several pollution monitoring systems are designed by completely different environmental parameters in the current 21st century. The present system model is presented as an IOT based Weather monitoring system. In this system, you'll collect, process, analyze, and present your measured information on a web server.
But several of those systems are expensive and farmers can't afford them. There are cheaper systems but they have fewer sensors. Our device can support up to five additional sensors which can provide a real-time Environment Monitoring System using ESP8266 and Thinger.io on the Internet of Things Platform. This system is cheap and affordable to the common farmer.

III. PROPOSED SYSTEM

The system proposed here consists of signal processing & transmission technologies. Functions of system components are as follows:
Nodes: The nodes are mainly for buses and bus stations to obtain weather information through the node MCU with sensors. The bus consists of nodes that transmit information to a neighboring bus station, and then the nodes on the bus station send the data back to the gateway.
Gateway: A gateway is any type of hardware device that acts as a gate between 2 networks. It may be a router, server, firewall, or some other type of device that enables traffic to flow through the network.
Server: A server is a type of computer hardware or software that is useful in providing functionality for other programs or devices also known as clients, over a network.
Client: Users can browse the Thinger.io website using computers & mobile devices to know about the current weather conditions.

IV. METHODOLOGY

The research method in this project is an experiment. The reason for this is the unsurety of how well the hardware & software will work separately & most importantly with one another. A series of tests were conducted to prove the precision of the sensors.
Devices connected to the microcontroller & the sensors connected are shown in the block diagram. That microcontroller transmits information across the internet to be received by the client.

V. HARDWARE REQUIREMENTS

1)ESP-8266: The NodeMCU(ESP-8266) is a cheap microcontroller, with full microcontroller capability.

2) DHT-11: DHT11 is a cheap digital sensor for measuring humidity & temperature.

3) MQ-135 Gas Sensor: The MQ-135 gas sensor senses the air quality for gases.

4) Soil Moisture Sensor: Soil moisture sensors measure the h2o levels in the soil.

5) Rain Sensor: A rain sensor is a sensor used to detect rainfall & then it notifies us.

6) BMP-280: BMP-280 is a low-cost pressure/altitude detecting sensor.

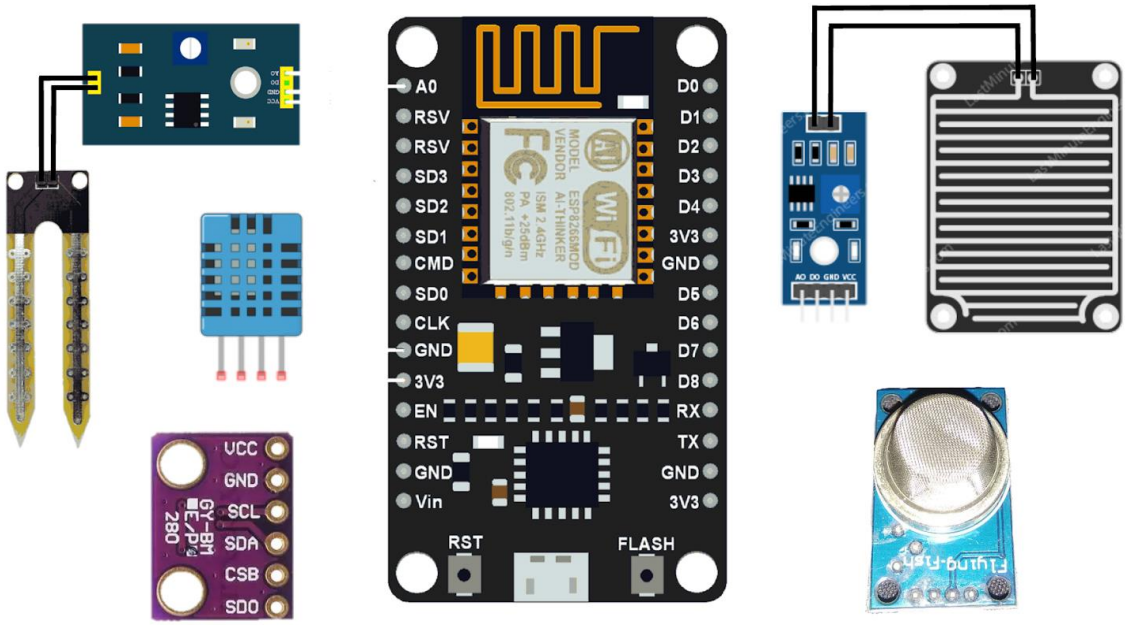

Figure 4: Hardware required

VI. SOFTWARE REQUIREMENTS

1) Arduino IDE: The Arduino Integrated Development Environment is a cross-platform app that is written in C & C++ language.

2) Thinger.io: Thinger.io is an online Application Program Interface(API) & IOT platform, which is used to store & retrieve data from sensors connected to ESP-8266 over the Internet or via LAN.

3) ESP-8266 Drivers: Node-MCU is a cheap microcontroller, it includes the firmware required to run the ESP8266.

VII. IMPLEMENTATION

As per our circuit diagram, we will assemble all the systems. Then using the Arduino IDE we will program the NodeMCU.
The NodeMCU is an open-source firmware that has a Wi-Fi module inbuilt in it. To this microcontroller we connect five sensors 1)BMP280(Pressure Sensor)2) DHT11(Temperature Sensor) 3) Rain Sensor 4) Soil moisture sensor and 5) MQ-135 (Gas Sensor). Data readings of these sensors are displayed on Thinger.io, which is a platform that allows the user to build interfaces for controlling hardware projects from their computer. After authentication, we've created a project dashboard, arranged graphs, sliders, buttons, and other widgets onto the screen. Thinger.io displays the fetched data after the connection has been established between the hardware & the app.

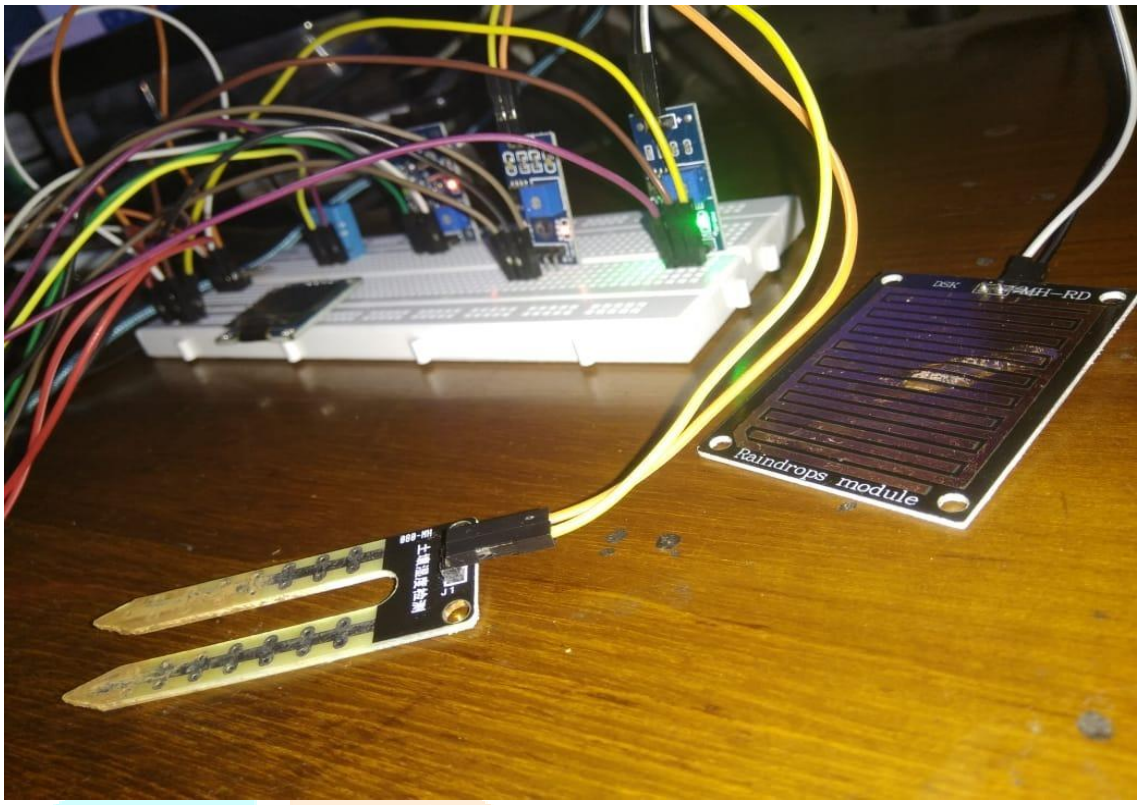

Figure 1: Actual Implementation

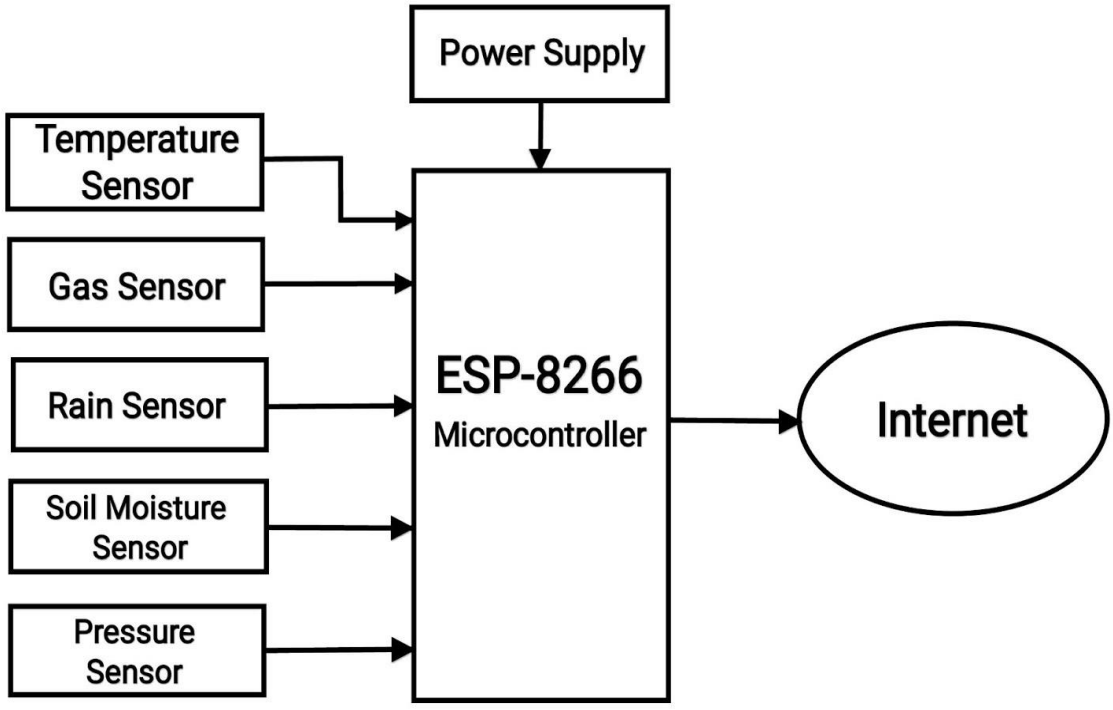

Figure 2: Block Diagram

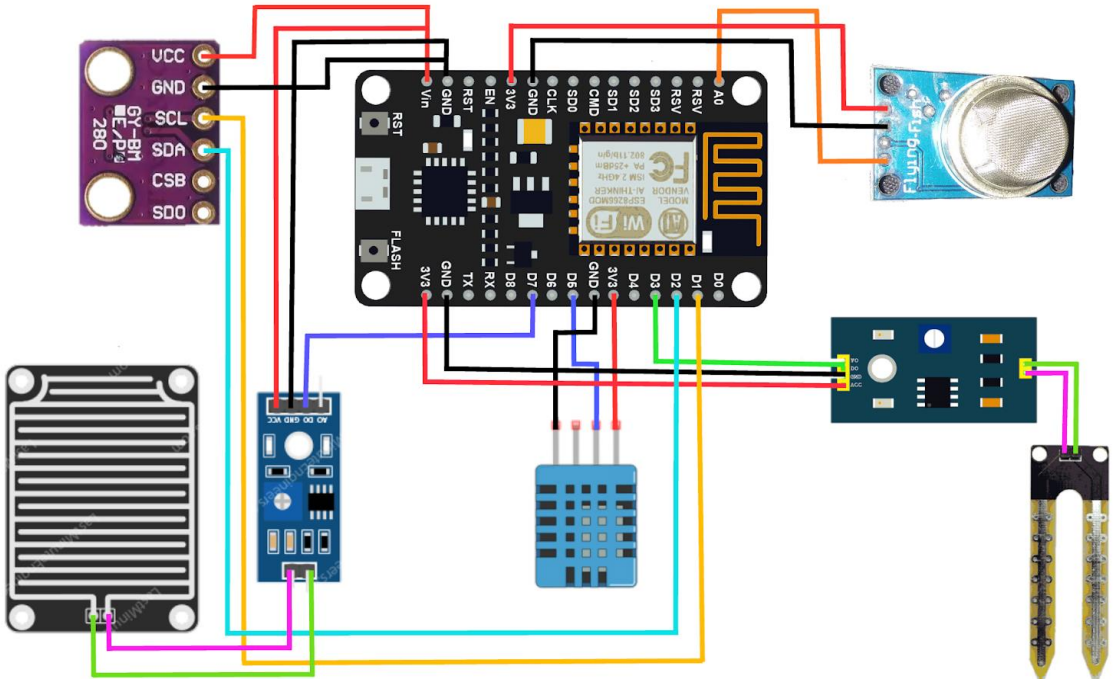

Figure 3: Circuit Diagram

VIII. RESULT ANALYSIS

The data collected from all the sensors is sent to the Thinger.io platform by connecting the NodeMCU to the internet.
The retrieved data will be stored and displayed on the cloud (Thinger.io). It can be used for continuous tracking and analyses. The environmental conditions (temperature, humidity, air, soil, rain, etc.) are regularly monitored. All the above data will be stored, to provide trending conditions in a particular area at any point in time.

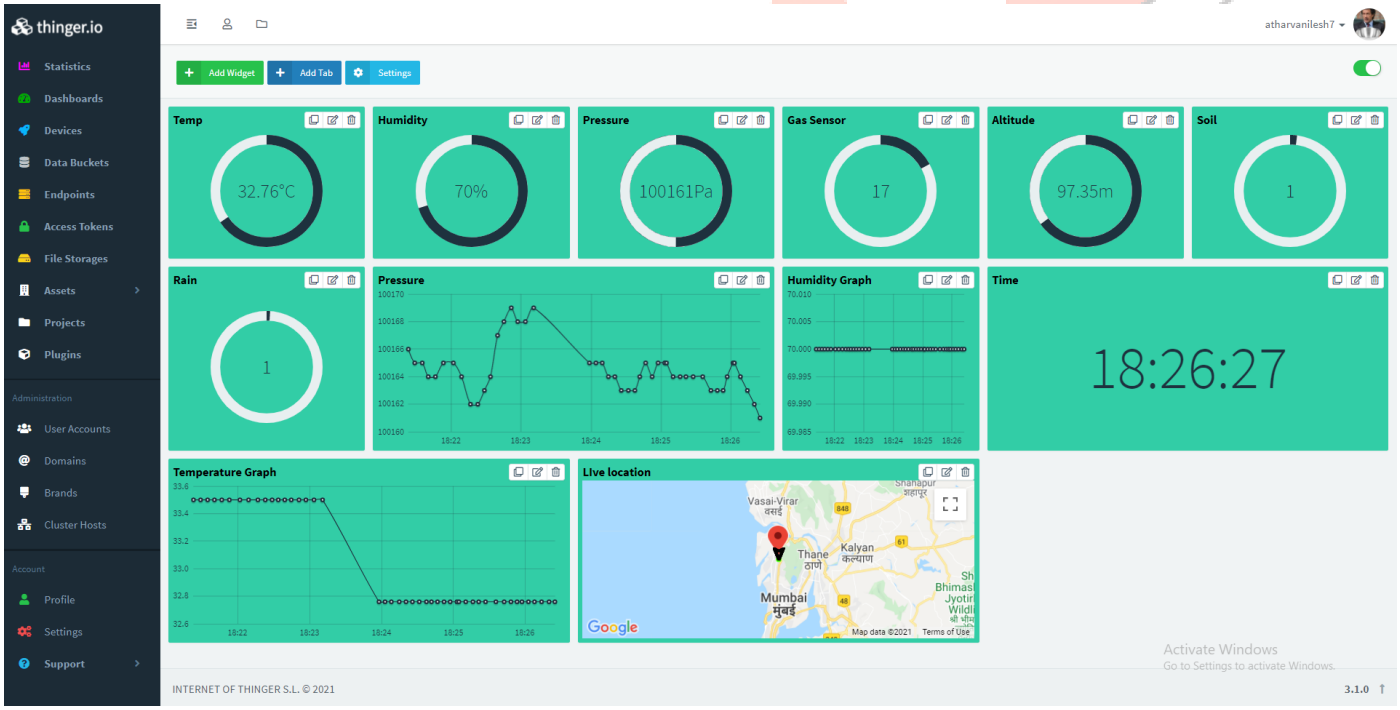

Figure 5 & 6: Output displayed on Thinger.io

IX. Conclusion

Here we've learned how the present system is better and also more efficient than the other systems. It is exceptionally compatible. It reduces human efforts. The project work will be a huge success and will provide a considerable way for saving weather parameters in real-time and will help farmers, industries, normal people as well as others whose daily life is related to weather and its parameters. The best conditions required for plants to grow are dependent upon the collected data. If we talk about agriculture, the farmer can modify the environmental conditions which are suitable for plant growth. This will have a large effect on agriculture and also on farmers everywhere.

X. Future Work

Adding a few more sensors to track other environmental parameters such as light, radiation, and oxygen levels.
There is a great scope of this type of system in in aircraft, navigation, and the military.
Projects like these can also be implemented & used in the medical field.

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