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Internet of Things (IOT) Based Mini - Weather Station using Arduino

Sayan Bhattacharjee[1], Sayan Majumder[2], Ushasi Datta[3], Antara Ghosal[4], Anurima Majumdar[5], Palasri Dhar[6], Sunipa Roy[7], Suparna Biswas[8]

[1, 2, 3, 4, 5, 6, 7, 8]*Department of Electronics and Communication Engineering, Guru Nanak Institute of Technology, 157/F, Nilgunj Road, Panihati, Sodepur, Kolkata-700114, West Bengal, India*

Abstract: ***IOT or Internet of Things is one the most developing and flourishing fields upcoming in the future. It now plays an important role in daily weather detection too. IOT is defined as the collection of devices that interacts with the user as well as the cloud or the server it is connected to. We are building a mini weather station where we can measure parameters such as temperature, humidity, atmospheric pressure, light intensity, UV index as well as dust concentration using different sets of sensors such as DHT22 Temperature Sensor, Light Sensor, UV sensor etc. Collecting this data and uploading the same to the nearest network can be helpful to a huge amount of people. Predicting a cyclone, heavy rainfall and thunderstorms can save and impact the life of many individuals. Using the Blynk mobile application we can also spread our weather data around the globe.***
Keywords: Mini Weather Station, Arduino UNO, IOT.

I. INTRODUCTION

IOT or Internet Of Things in our day to day life plays an important role and life without it can't be imagined even. Wireless networking adds more flexibility to the system as it is now worldwide available through network technology. Weather conditions impact our lives through various factors so it is very important for us to gather information related to it accurately and effectively. Relying on the weather reports available on the internet nowadays is not a good idea, because it shows the weather of a vast area and fails to provide warnings and alarms ahead of time. With the help of IOT we can solve this problem which can be life saving for a huge number of people around the globe. Instant weather analysis and sharing the parameters collected by the device around the network will be useful to every individual living in the area. IOT ensures the device to be cost efficient, trustworthy, and affordable for the use of everyone.

II. BLOCK DIAGRAM

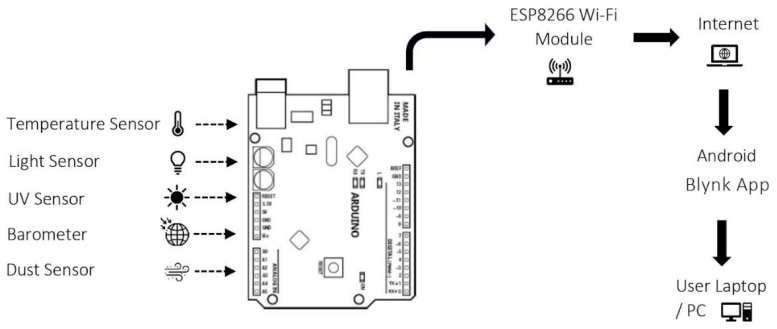
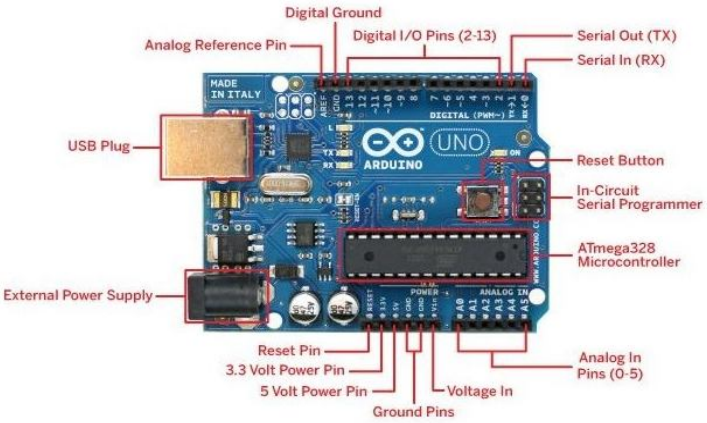


Figure 1. Block Diagram for Mini - Weather Station

The block diagram shows the system that is designed for the IOT based weather monitoring system. Sensors used in this system help to collect the related data to monitor the weather on a daily basis. Using the Wifi module and the Microcontroller to predict the weather and sending the corresponding output on the internet. And storing them on a server using the Blynk mobile application to get the weather related information and updates in understandable format which can be viewed on any browser over the internet.

III.HARDWARE REQUIREMENTS

1) *Arduino Uno:* The Arduino Uno, it's an ATmega328P microcontroller board. It contains everything that is necessary for a microcontroller to function correctly such as input/output pins, power connection, sensors etc. An Arduino Uno consists of 14 digital I/O pins, 6 analog inputs, and a 16MHz ceramic resonator, a power connection, USB port, an ICSP header and a reset button. This Microcontroller supports minimum input voltage of 6V and maximum input voltage of 20V. It contains 32KB of Flash memory, 2KB of SRAM and 1KB of EEPROM. The operating voltage of the Arduino is 5V and the clock speed of 16MHz.



2) *NodeMCU (ESP8266):* The NodeMCU (Node Microcontroller Unit) built around an low cost System-on-a-chip (SoC) called ESP8266. It is an open-source software and hardware development environment that comes with the ESP-12E module. The microprocessor operates at 80MHz to 160MHz which is adjustable. NodeMCU consists of 128KB Ram and 4MB Flash memory and has high processing power with a built-in Wifi module which makes it ideal for IOT projects.

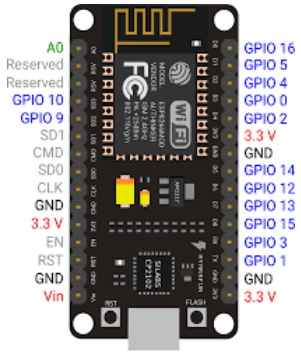


Figure 3. NodeMCU (Wifi Module)

3) *Temperature Sensor (DHT22):* DHT22 is a low cost temperature sensor which is made of two parts: a capacitive humidity sensor and a thermistor. This consists of a basic chip that performs analog to digital conversion and predicts the temperature and productivity. It operates between 3 to 5V and produces better results between -40°C to 80°C temperature.

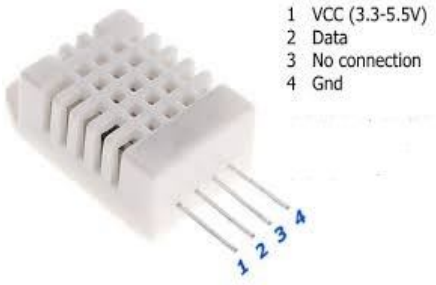


Figure 4. Temperature Sensor

4) *Light Sensor (SparkFun ISL29125):* Light sensor is a photoelectric device which takes light energy as input and converts it into electrical energy as output. It integrates a photoresistor to detect the intensity of light. The response time is between 20-30 ms and operates between 3-5V.

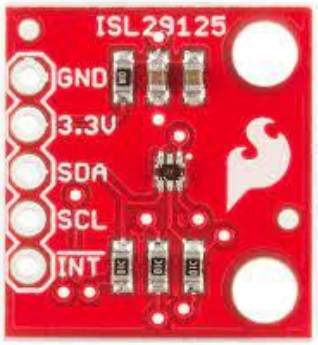


Figure 5. Light Sensor

5) *UV Sensor (ML8511):* It is used to detect the intensity of incident UltraViolet Radiation from the Sun. The operating voltage of this sensor is between 3-5V. And the response wavelength ranges between 240 to 370 nm. And the working temperature is -30°C to 85°C.
6) *Barometer (Adafruit MPL3115A2):* Barometer sensor features a high-accuracy chip to detect the atmospheric pressure and temperature. It measures the pressure widely from 300hPa to 1100hPa. It is connected to a microcontroller using a 12C bus.

Figure 7. Barometer

7) *Dust Sensor:* It indicates the air quality around the environment by measuring the dust concentration.

Figure 8. Dust Sensor

IV. CIRCUIT DIAGRAM

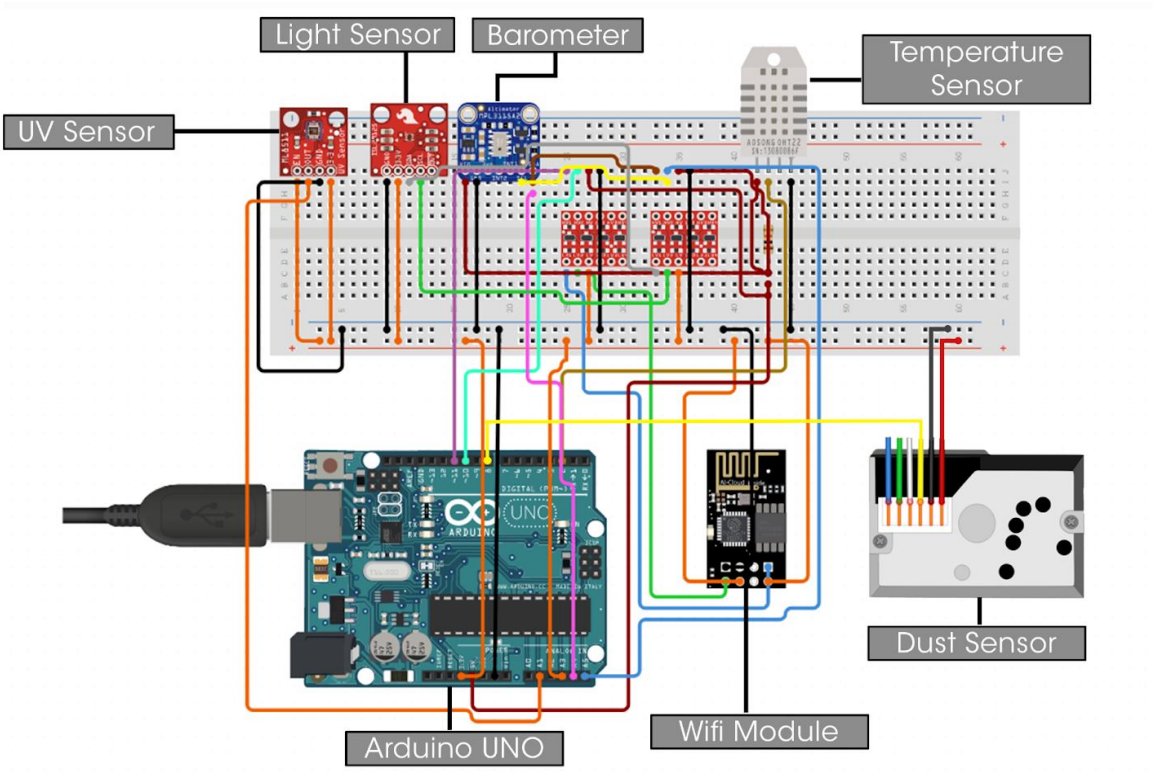


Figure 9. Circuit Diagram of the System

V. SOFTWARE REQUIREMENTS

1) *Blynk Mobile Application (Android):* With this application, you can easily interact with microcontrollers. This can digitally display the parameters captured by our device in our smartphones seamlessly. This application allows us to create amazing interfaces for a project using multiple widgets which are in-build in this application. Blynk Server acts as an interpreter between the hardware and the smartphone, building a smooth connection between them that's important for communication. And this is not only limited to one device, using the blynk cloud we can share this data with any number of devices.
2) *Arduino IDE:* IDE (Integrated Development Environment) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. This software is available for many operating systems like Windows, MAC, Linux and even runs on the java software. A range of Arduino modules consist of Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro etc. Every module contains a microcontroller on the board which is built in by default.

VI. CONCLUSION AND FUTURE WORK

In our paper, we have discovered the importance and benefits of IOT (Internet of Things) in mini weather monitoring systems. This device and information of ours will definitely help many citizens and will even save lives of many sailors who can easily access this date from their smartphones. Our system can effectively detect any upcoming thunderstorm, heavy rain, or cyclone which can be devastating to lifeform. Our improved version of this device will be integrating it to a smart device which can be installed in every household and the data collected by each device will be stored in a cloud server for further data processing and study.

VII. ACKNOWLEDGMENT

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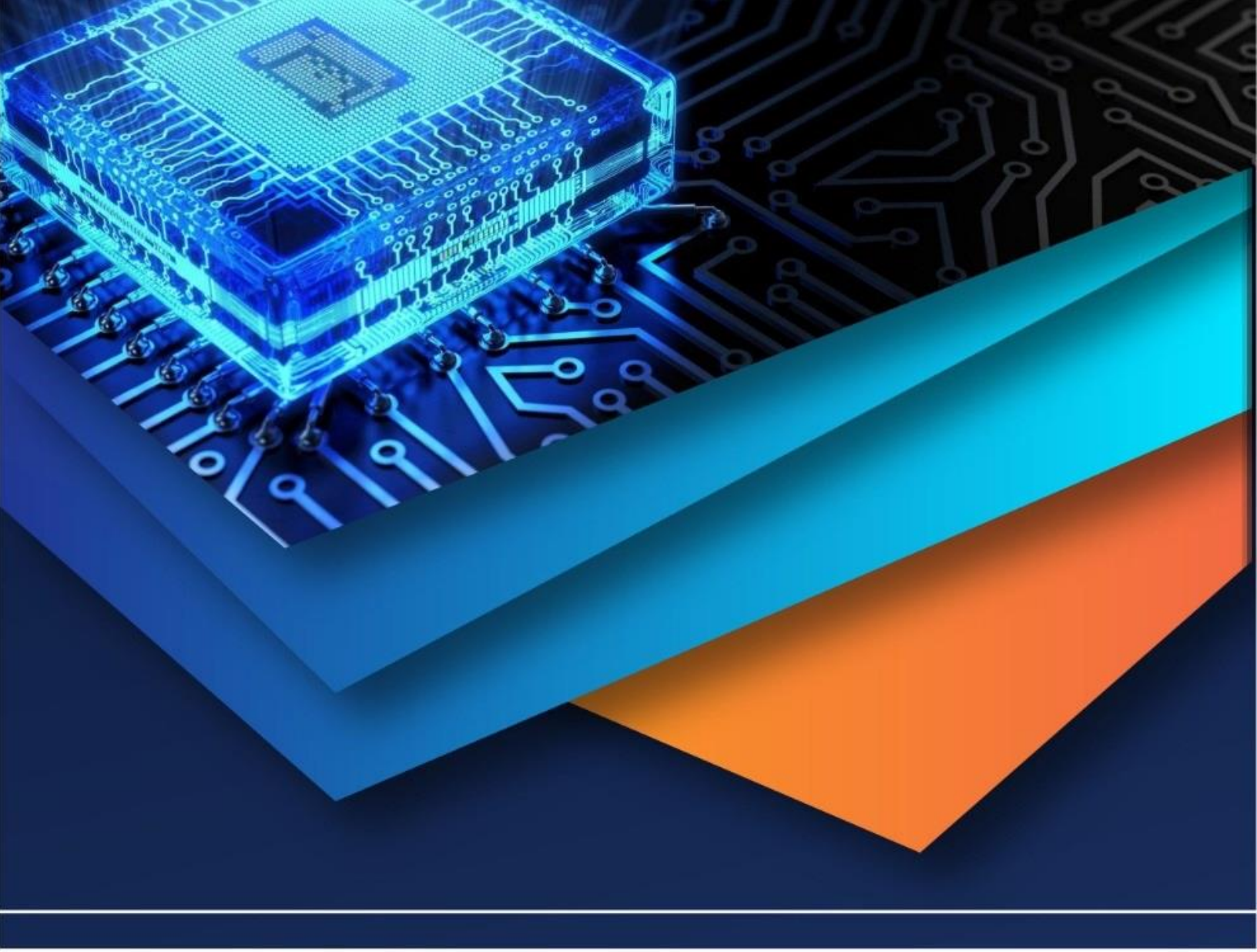

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