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# A REAL TIME IOT ENABLED SOLAR POWERED ENVIRONMENTAL MONITORING SYSTEM

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## ABSTRACT
*The described system provides a data collection and management system that relies on both studies to create large data sets based on the features used to create the given data. The innovation behind this is called the Internet of Things (IoT), which is the best way to connect everything in the world to everything on the Internet. We will pay close attention to the current weather conditions of the Pune region while dispatching the work. System; It tracks climate and environmental changes, including changes in temperature, precipitation, air pressure, and carbon monoxide levels in the air. Required equipment includes NodeMCUESP8266 with Wi-Fi module, solar panel, MQ-135 rain sensor, BMP 180 rain sensor. The data collected by these sensors is sent to the web and displayed through statistical reports. The information placed in the Blynk cloud application can be easily accessed by anyone in the world. The information stored on this page may also be used for future reference. The design also includes a buzzer that acts as an alarm to alert people when the indicator reaches a high level or there is a sudden change in weather conditions. Weather plays a very important role in our daily life. It is necessary to collect data on different climates in order to plan at home and in the environment. Recent advances in the Internet of Things have enabled data collection in the field. The report shows a system that monitors weather outside the location and displays the information according to the user's needs. Users can access this information over the internet whenever and wherever they want. The proposed system uses an Arduino embedded with sensors that record weather parameters. This information can be viewed from anywhere in the world using the blynk cloud app. The collected data is uploaded to the cloud for further access.*

*Keywords: BMP180, ESP8266NodeMCU, Blynk Cloud, Rain Sensor, MQ135 Gas Sensor, Solar Panel, Inverter Battery, LCD with I2C, Internet of Things, Wi-Fi.*

## 1. INTRODUCTION
A An important part of weather management and weather monitoring is predicting and forecasting the weather, so it is possible to collect data to gain a deeper understanding of the country's climate and pattern. The purpose of weather forecasting is to predict future weather. Weather forecasting is important for many reasons, including the fact that it can save lives in the online world and help during natural disasters such as floods, storms, and hurricanes [1, 2]. These natural disasters can be predicted from weather forecasts. The more knowledgeable people are, the better prepared they can be for an impending disaster. Our daily lives are affected by weather conditions; If we do not know what the weather is like at that moment, we may face big problems. Recreation, outdoor activities, agriculture, hiking and transportation will be affected. The impact of the environment has caused challenges in many industries, including agriculture, manufacturing, construction and others. Compared to other industries, agricultural production is often affected by weather conditions[3]. It can affect all agricultural activities carried out during the growing season, including the growth of crops, total yield, pest occurrence, water and fertilizers, and the introduction of pests[4]. In other words, outdoor farming is weather-dependent and vulnerable to adverse events, especially today when climate change is causing extreme weather conditions that are unpredictable and beyond human control. Internet of Things (IoT) is the core technology of this system. After the Internet, the Internet of Things is considered the innovation and financial wave of the global information economy. The expansion and development of Internet-based systems has increased communication between people, as well as between people and objects, or between objects and objects. The term "Internet of Things" (IoT) refers to a network of real-world objects with sensors, programming, and other technologies that allow them to communicate and exchange with other online systems and information[5,6]. Therefore, the concept of IoT aims to make the internet increasingly accessible. For farmers, IoT weather forecasting provides application data that

can improve agricultural efficiency and reduce air pollution. Weather stations powered by the Internet of Things (IoT) are useful for monitoring weather in places like forests and volcanoes. The best way to protect your crops and ensure good yields and health is to understand current conditions such as weather, dew, precipitation and soil[7,8]. Severe weather events such as floods, floods, hail or cold can immediately affect crops, causing yields to decrease and prices to rise.

## 2. LITERATURE REVIEW

Today, it is becoming increasingly difficult to obtain accurate weather data at the right time and place, making weather analysis one of the most challenging tasks. Farmers and our agricultural areas are affected by weather conditions and have difficulty adapting to this difficult climate. Kalyani G. Gajbhiye and colleagues conducted a study in India to monitor climate variability across climate hazards using simulation tools. Weather forecasting is a scientific and technological application that collects a lot of information about the weather using Arduino and predicts the future situation by analyzing current and past conditions[15,16]. This study discusses this claim after reviewing various articles by KarthikKrshnamurthietal. This is quite a difficult task, but in recent years many sensors have begun to be used to measure temperature, humidity, rain and wind direction. This research based on MEMS and WSN technology was proposed by Rong-Hua Ma et al.

- The Internet of Things is a collective, local smart device that can send and receive information from the online world of M. Sowjanyaet.al. In this method, weather data is collected from outside using the LPC1768 microcontroller and GSM network and put into the network. To prevent accidental collisions, Vicente R. Tomas et al. Introduce a self-management system that can quickly provide weather forecasts and warn drivers of impending weather. The most difficult task by far is collecting accurate weather data from the web. Due to extreme climate variability, climate data specific to a region may not be sufficient.
- A special climate monitoring system was prepared by Varad Vishwarupe and others. It leverages crowdsourcing and telecommunications infrastructure to help easily recover from bad weather conditions[17,18]. This method gives you the option to get specific weather data for a particular area instead of getting the weather forecast for the entire city.
- The environment of each metropolitan area is different, so area-specific information is needed (Christopher et al.). This work describes a climate analysis coupled with online data recording and display. In this way, data transfer is reliable and stable thanks to the Ethernet connection. As the earth revolves around the sun, Sankar's weather varies with the seasons[19]. P. In this study, hydrogen balloons containing sensors were used as an embedded system to monitor temperature, pressure and humidity. Radiofrequency3 signals are required to send communication and measurement data to the ground station.

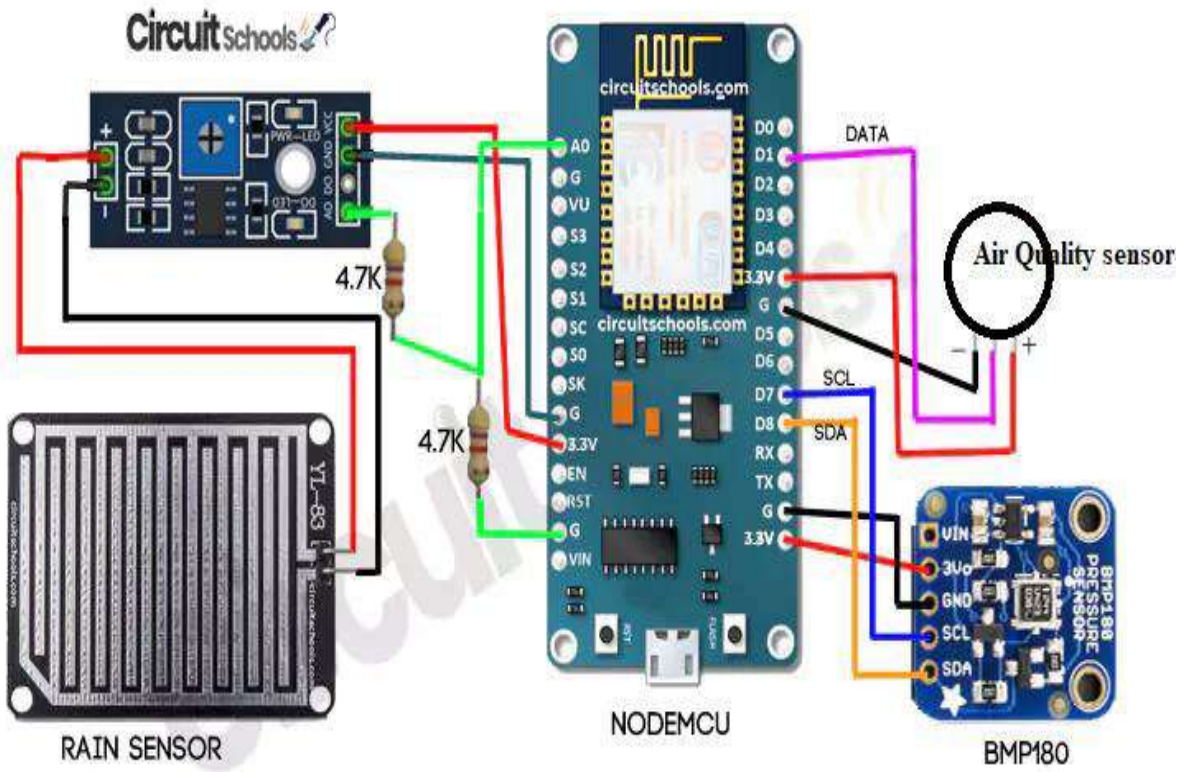
## EXISTING SYSTEM:

Current climate monitoring tools include thermometer, gauge, wind meter, anemometer, etc. It often uses weather stations to measure weather and climate change using various tools such as Most of these devices use simple analog input, which is then physically recorded and stored in a file[9]. This information is then sent to the media and various radio stations that provide weather forecasts.

## 3.1 PROPOSED METHODOLOGY

Our planning process uses 3 weather/environmental indicators such as temperature, air pressure, fuel quality, precipitation. The value read by the sensor is processed by the Arduino microcontroller and stored in a text file that can be processed for analysis. Readings are also displayed on the built-in LCD screen for quick viewing. All of these readings can be analyzed to obtain weather characteristics and record the weather in a particular region[10,11]. These records are important and vary from region to region. These rules are entered into the Blynk cloud storage and the results are entered in a timely manner by requesting them. Using these results as input, we can plan the weather over time for a particular area. The output of the Arduino microcontroller (i.e. the value read by the sensor) can also be stored in the Blynk cloud library[12]. If we want to see the value from the website or standalone application we can use the data to process the data.

### 3.2 CIRCUIT DIAGRAM




LIVE WEATHER STATION DIAGRAM

### 3.3 BLOCK DIAGRAM

**Block diagram:**

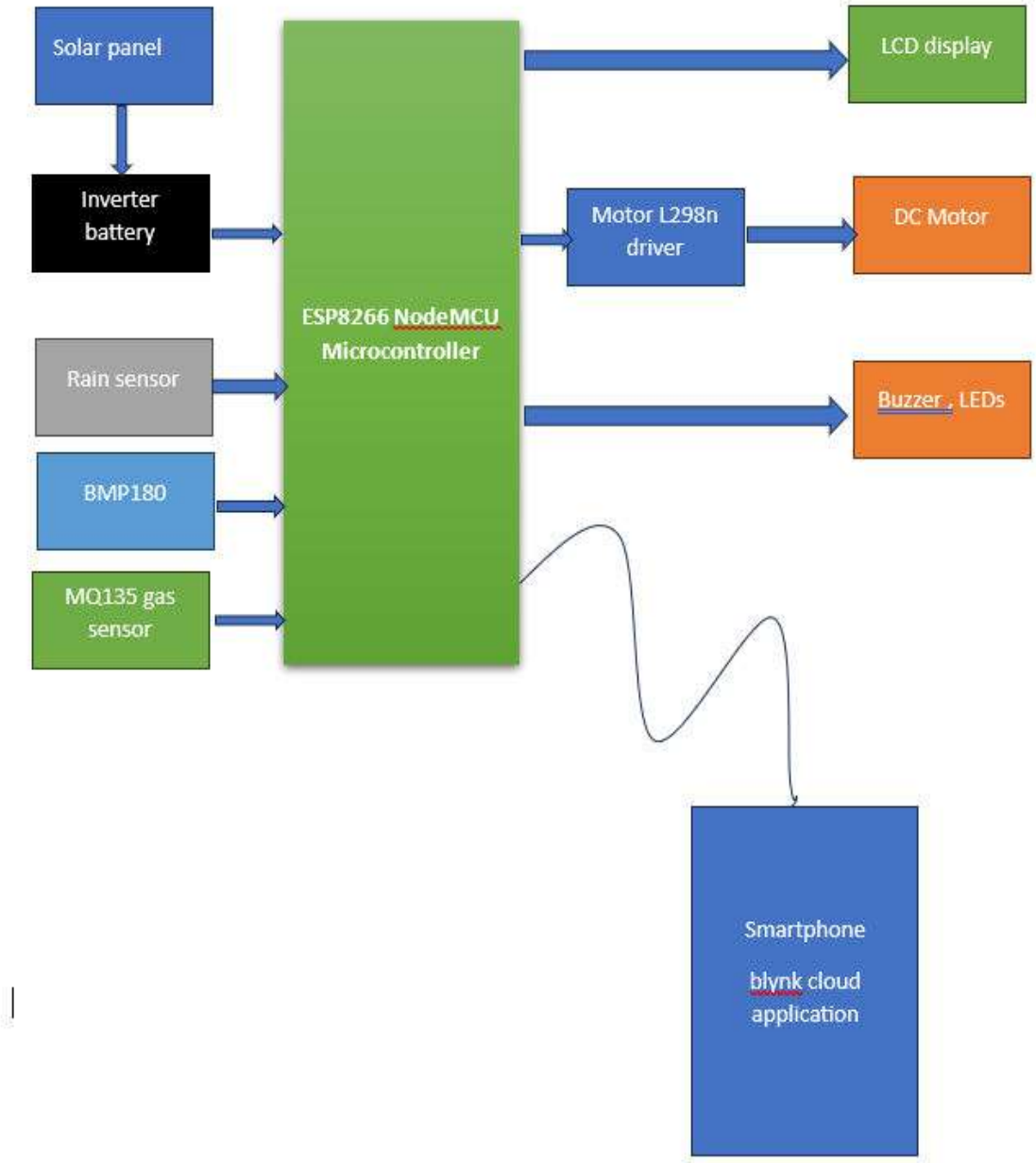



**Fig:3.3** Architecture of Proposed System

### 3.4 WORKING PRINCIPLE:

This project will focus on the development of Blynk, an IoT platform for sharing sensor data. This method is divided into two parts: hardware development and software development. Hardware development includes electrical design and prototype design. The software also deals with IoT coding, circuit diagrams, circuit

simulation and data collection. Air quality is monitored using two types of sensors: temperature, gas pressure and atmospheric pressure[13]. The system will be able to identify the current weather condition from the measured value data to display the weather condition. All data will be controlled by microcontroller ESP8266 and NODEMCU will act as user receiving sensor data from ESP8266. The system will be available on the Blynk channel, designed to make it easier for users to control it online[14]. The data collected will be analyzed and compared to ensure the accuracy of the data and current weather conditions. The Internet of Things (IoT) connects machines and users wirelessly, eliminating the need for manual inspection.

**3.5 COMPONENTS REQUIRED:**

- NODE MCU ESP8266
- BMP 180
- Rain sensor
- Air quality sensor
- Wifi device
- Buzzer
- Solar panel
- Inverter battery
- Power supply

**4. EXPERIMENTAL RESULTS:**

The implementation of software and hardware completes the entire software and hardware configuration. To access cloud services and the microcontroller, the client creates a WiFi network. The LCD screen starts to establish the WiFi connection after flashing the suggestions and updating the information about the Blynk app that it displays on the LCD. The system is tested instantly and the results are displayed on the LCD monitor.

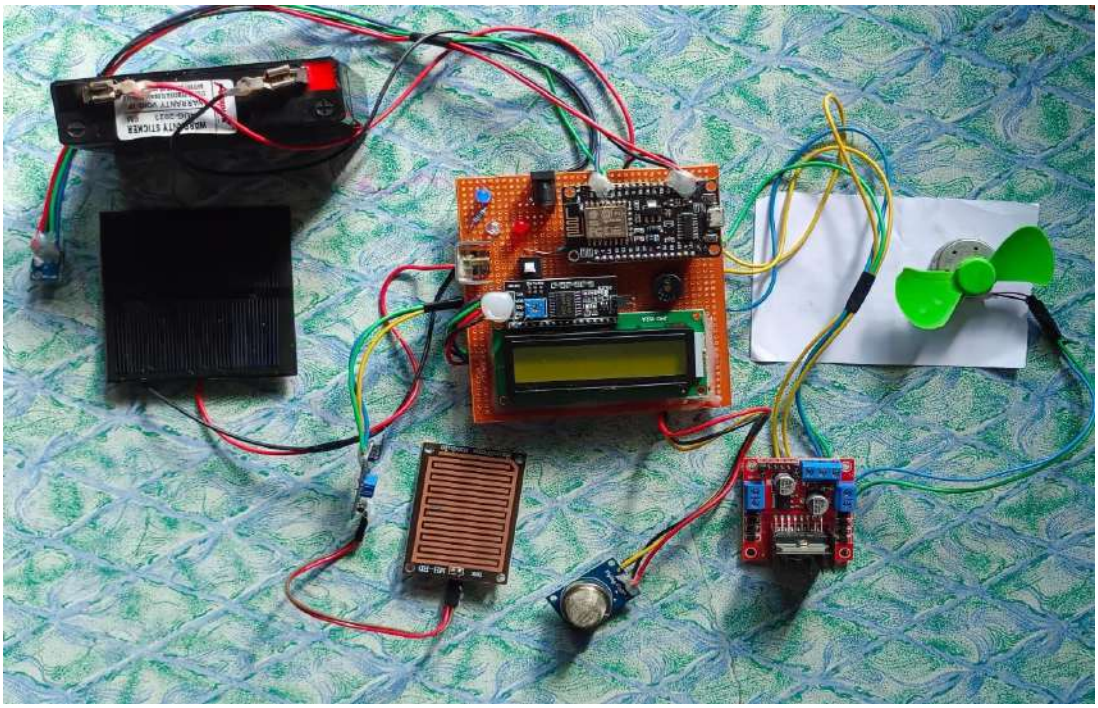


**Fig 4.1:** Complete snapshot of the kit

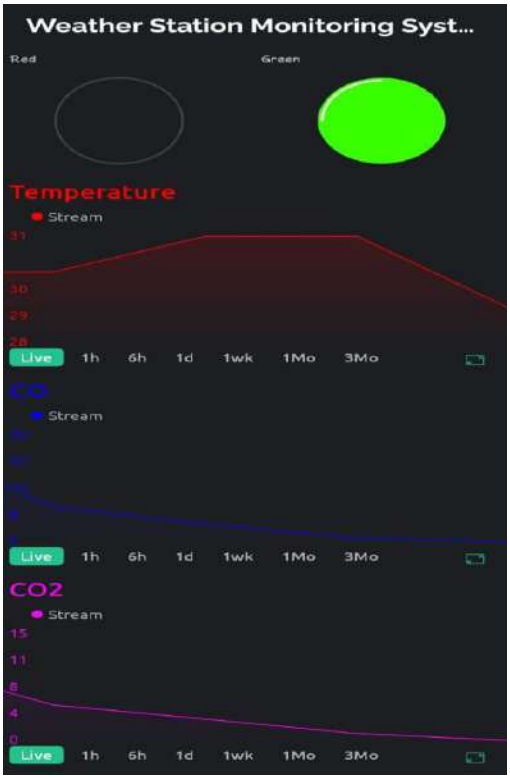



**Fig. 4.2** Real-time weather monitoring temperature, Aceton, CO, $CO_2$

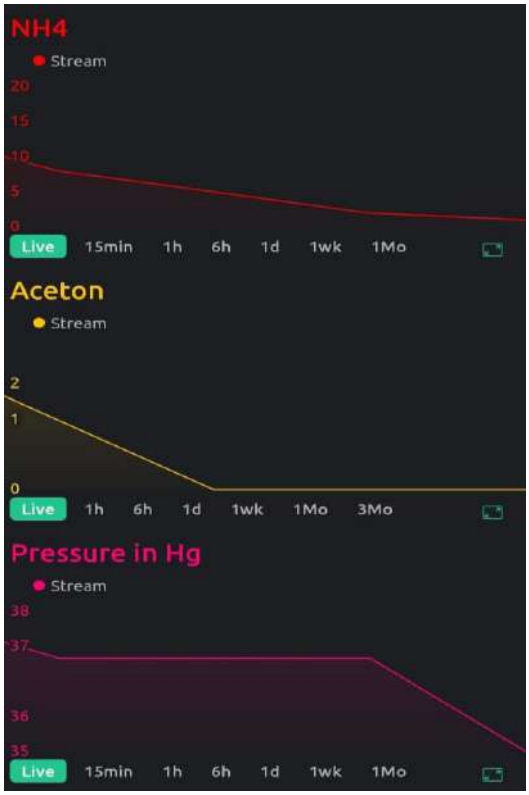



**Fig.4.3** Real-time weather monitoring $NH_4$, Pressure

## 5. CONCLUSION

There has been a lot of research on climate monitoring over the years. A good test would be to monitor the weather in one place and share information from the Blynk cloud. Therefore, the system can be modified so that it can be used for other applications in the future. Weather forecasting is very important to predict the weather of an area based on the amount of bad weather. Therefore, the calculation method can be used to predict the weather in the region over time. By adding smaller components and increasing the measurement parameters, these small air conditioners can be made increasingly reliable. Since we use ESP8266 NodeMCU in this model, messages can be sent to the mobile phone instantly if it is not changed. Since the applications are not limited, other weather conditions cannot be easily monitored by adding relevant sensors to the system architecture. Technology is changing very fast. We can also use an application that supports Android and other operating systems. In this way, we can view information on the Internet anytime and anywhere. It's easy to install the app and check your data anytime. This is better for everyone because now every home has at least one smartphone. By adding small parts and increasing the measurement scale, the mini weather station can be made more efficient and reliable. Additionally, since it is quite economical, we can obtain a more accurate reading at a lower cost. The system is easy to monitor based on weather data provided by the weather data system. From the user perspective, IoT helps make systems more efficient. In the future, everyone will use sensors instead of preparing data from the source.

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