

IoT-Based Real-Time Weather Monitoring System

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ABSTRACT

The system proposed in this paper is an advanced solution for monitoring the weather conditions at a particular place and making the information visible anywhere in the world. The technology behind this is the Internet of Things (IoT), which is an advanced and efficient solution for connecting things to the internet and connecting the entire world of things in a network. Here things might be whatever like electronic gadgets, sensors, and automotive electronic equipment. The system deals with monitoring and controlling the environmental conditions like temperature, relative humidity, and air quality level with sensors and sends the information to the firebase database, and then retrieves these data in the android application. The data updated from the implemented system can be accessible in the internet from anywhere in the world.

1. INTRODUCTION

Here we introduce a smart weather reporting system over the Internet. Our introduced system allows for weather parameter reporting over the Internet. It allows the people to directly check the weather states online without the need of a weather forecasting agency. System uses temperature, humidity as well as air quality to monitor weather and provide live reporting of the weather statistics. The system constantly monitors temperature using temperature sensor, humidity using humidity sensor and also for air quality. Weather monitoring system deals with detecting and gathering various weather parameters at different locations which can be analyzed or used for weather forecasting. The aim of this system is achieved by technologies such as Internet of Things (IOT) and Cloud. The idea of internet of things is to connect a device to the internet and to other required connected devices. Using Internet, the information from the IOT device can easily be transferred to the cloud and then from the cloud to the end user. Weather Monitoring is an essential practical implementation of the concept of Internet of Things, it involves sensing and recording various weather

parameters. Also, we will try to identify and display trends in parameters using graphical representation. It is expected that the internet of things is going to transform the world by monitoring and controlling the phenomenon of environment by using sensors/devices which are able to capture, process and transmit weather parameters. Cloud is availability of computer system resources like data storage, computing power without direct active management of user

2. OVERVIEW: -

Assemble all system as per circuit diagram. Program the NodeMCU using Arduino IDE. You will get confirmation on your screen once The NodeMCU is a programmable controller which has inbuilt wi-fi module. We connect three sensors 1) DHT11 and 2) AIR QUALITY to NodeMCU. By using these sensors, we can collect the required weather data for monitoring purpose.

3. Literature Review

In this paper, the author elaborates how the weather prediction system is becoming a crucial challenge in every Weather extreme event that causes an adverse effect of the system on lives and property as well. Hence the accuracy of weather data is being one of the critical challenges to enhance the weather prediction skills and build up the resilience to effect of detrimental weather report condition. The author describes that Uganda and various other developing countries have looked challenges in developing timely & accurate weather data due to scarce weathers observation. The scarce weather monitoring is a part of the high cost of developing automatic weather situations. The restricted funding is available to national meteorological services of the respective countries. In this proposed system the author firstly takes care of the problems and then applies them. The author proposed an Automatic weather monitoring Station based on a wireless sensor network. The planning of the author is to develop three generations of

Automatic weather stations or AWS prototypes. In this research, the author evaluates the 1st-generation AWS prototype to improve the 2nd generation depending upon the need and generation. The author provides a suggestion to improve the nonfunctional requirement such as power consumption, data accuracy, reliability, and data transmission in order to have an Automatic Weather Station.

4. THEORY

IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system. IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.

4.1 IoT-KeyFeatures

The most important features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below

AI – IoT essentially makes virtually anything “smart”, meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks. This can mean something as simple as enhancing your refrigerator and cabinets to detect when milk and your favourite cereal run low, and to then place an order with your preferred grocer.

Connectivity – New enabling technologies for networking and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.

Sensors – IoT loses its distinction without sensors. They act as defining instruments that transform IoT from a standard passive network of devices into an active system capable of real-world integration.

Active Engagement – Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.

Small Devices – Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.

4.2 Block Diagram

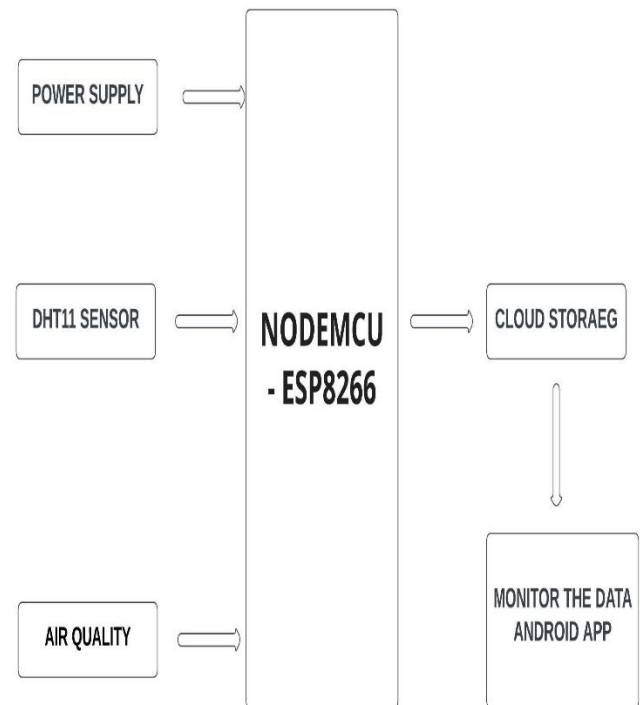


Fig Block Diagram

5. PROPOSED SYSTEM AND HARDWARE ARCHITECTURE

5.1 Features of purposed system

In IoT enabled weather monitoring system project, NodeMCU measures 3 weather parameters using respective 2 sensors. These sensors are a temperature & humidity sensor and. These 2 sensors are directly connected to NodeMCU since it has an inbuilt Analog to digital converter. The weather monitoring system gives high accuracy and reliability for weather monitoring and climate changing. Through the web, it accesses real time weather information and data. Low maintenance is required for end users.

5.2 Purposed Hardware Architecture

The implemented system consists of a microcontroller (ESP8266) as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller.

5.3 List of required hardware components

Name of the components

NodeMCU
DHT11
Air Quality Sensor
PCB board
Jumper Wire
7805 regulator

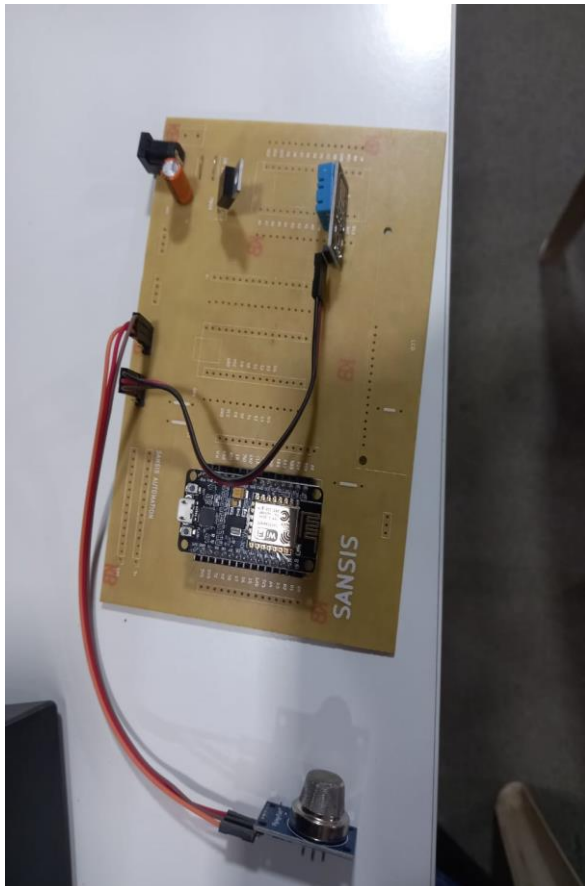


Fig: hardware component

6. OBSERVATION AND RESULT

6.1. Experimental Analysis along with Results

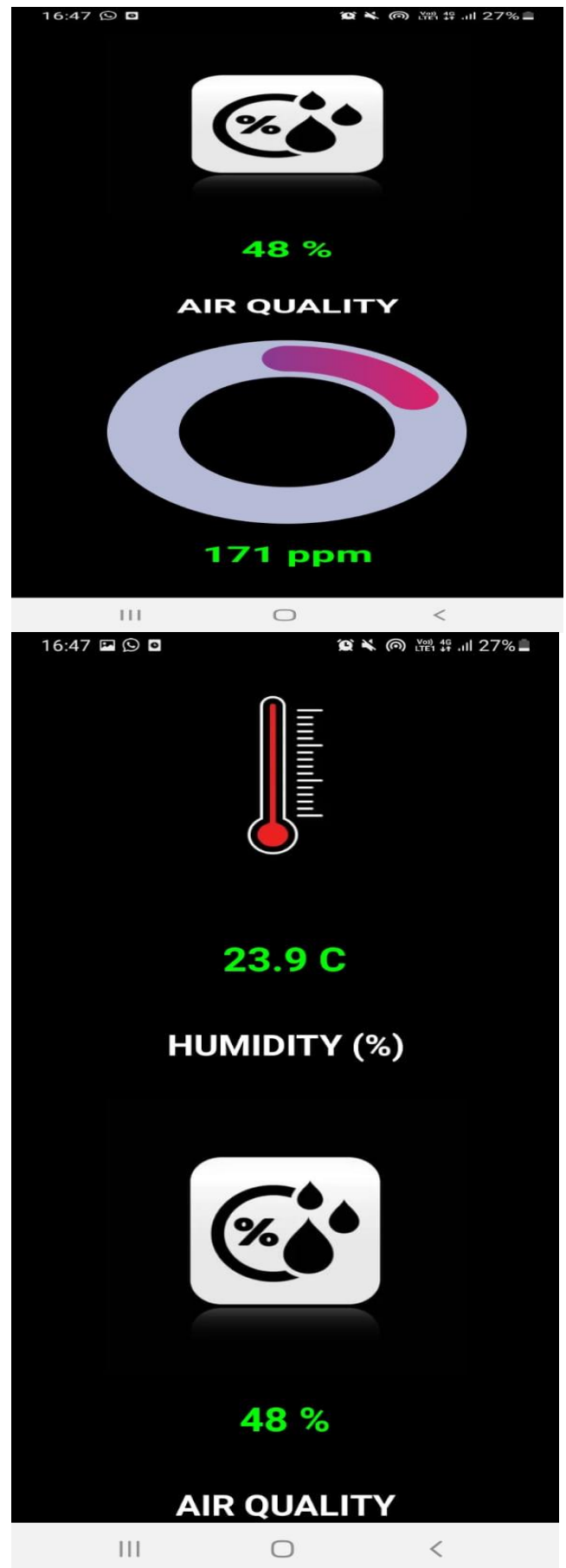


Fig: Result

7. CONCLUSION AND FUTURE SCOPE

7.1 Conclusion

By keeping the weather station in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to use the sensor devices in the environment for collecting the data and analysis. By using sensor devices in the environment, we can bring the environment into real life. Then the collected data and analysis results will be available to the user through the Wi-Fi. The smart way to monitor the environment an efficient, low-cost embedded system is presented in this paper. It also sent the sensor parameters to the cloud. This data will be helpful for future analysis and it can be easily shared to other users also

7.2 Future Scope

One can implement a few more sensors and connect it to the satellite as a global feature of this system. Adding more sensors to monitor other environmental parameters such as CO₂, Pressure and Oxygen Sensor. In aircraft, navigation and the military there is a great scope of this real-time system

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