IOT BASED WEATHER MONITORING SYSTEM USING ARDUINO NANO

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ABSTRACT:

This paper describes an Arduino NANO based prototype for an automatic Weather Monitoring System. This system is based on the Internet of Things. The Internet of Things (IOT) is a vital part of modern living. The purpose of an IOT based Automatic Weather Monitoring System using an Arduino NANO is to detect, record and display different weather parameters like temperature, humidity, pressure, and various hazardous (harmful) gases like ammonia, alcohol, benzene, smoke (carbon monoxide), carbon dioxide, and other air pollutants. The Weather Monitoring System has a variety of sensors that are used to identify and keep track of weather-related parameters. Sensor senses the changes in the environment then Arduino NANO captures the data from the microcontroller. Utilizing output devices (Serial Monitor and Amazon Web Services), collected data can be viewed. The output can be shown in two distinct ways. The display of output parameters by using Serial Monitor and Amazon Web Services (IOT core).

KEYWORDS: Weather Monitoring, Internet of Things, Cloud Computing, Arduino NANO, Node MCU.

INTRODUCTION:

A weather station is regarded as a technical method that enables measuring weather parameters based on air circumstances for a suggested place using certain devices in order to actualize expected weather conditions and to study climatic qualities, whether on land or at sea. The aim behind the internet of things is to link various connected gadgets as well as a device to the internet. Information from an IOT device can simply be sent to the cloud through the Internet, and subsequently from the cloud to the end user. The climate of that region can be severely impacted by even a slight change in weather phenomena. These might result from atmospheric pressure, solar radiation, and tides. Since the environment is always changing, it also gets difficult to predict the weather more than a few days in advance. Other meteorological phenomena may have a greater impact on the climate tomorrow.

LITERATURE REVIEW:

[1] Jamal Mabrouki and MouradeAzrour have proposed the Iot based data logger for weather monitoring using Arduino based wireless sensor networks with remote graphical application and alerts for real-time data analysis and visualization. Overall, the system demonstrates a practical and scalable solution for monitoring weather conditions.

[2] Liu Kaiyi and his team has designed a new generation of weather radar temperature and humidity monitoring system based on zigbee technology utilizes wireless sensors to collect data and Zigbee protocol to transmit the data to a base station. The system also includes a graphical user interface for real-time data visualization and analysis. Overall, the proposed system offers a reliable solution for weather monitoring in various environments.

[3] The paper on the design and implementation of a weather monitoring system using the Internet of Things (IoT) technology has been proposed by R.Kavin and his team in 2020. The system includes various sensors to collect weather data and transmits wirelessly to a cloud server using IoT protocols and can be accessed remotely through a web application. The system provides real-time data analysis and visualization using data analytics tools.

[4] Rosen Miltiev along with his team has proposed the paper which presents a multichannel Internet of Things (IoT) system for weather and air quality monitoring. The system includes multiple sensors to measure various weather and air quality parameters. The system includes a web-based user interface for real-time data visualization and analysis.

WORKING EXPLANATION:

The Arduino NANO microcontroller is the main component in the system that is connected to all the components as shown in the figure. The sensors for the system are connected to the analog input of the Arduino microcontroller. The Arduino is also linked to the Serial Monitor and Amazon Web Services through the Node MCU Wi-fi Module (ESP8266). Sensors collects the data from the environment based on the given area then Microcontroller collects the data from the various sensors. The Arduino NANO sends the data to the serial monitor and Amazon Web Services(IOT core) through the Wi-Fi module(ESP8266).

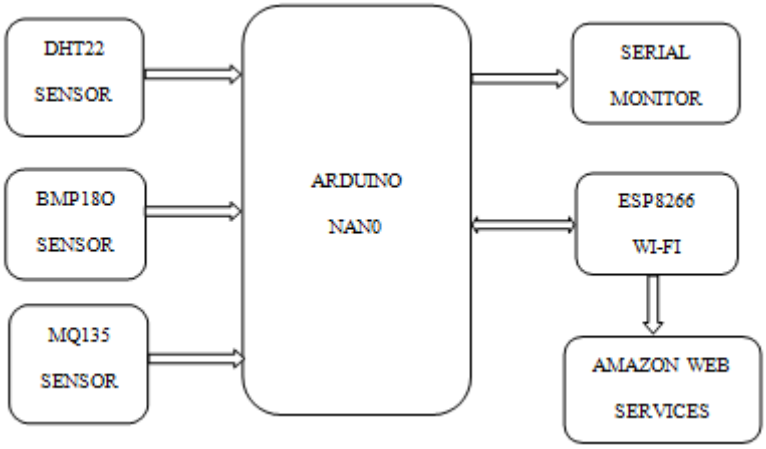

Fig1: Block Diagram of IoT based Weather Monitoring System using Arduino.

COMPONENTS DESCRIPTION:

ARDUINO NANO: The Nano board is defined as a sustainable, harmonious, and flexible micro regulator board. It is a complete, and breadboard-friendly board grounded on the ATmega328. The Arduino Nano is organized using the Arduino(IDE), which can run on colorful platforms.

Fig2: Arduino NANO Board.

DHT22: The DHT22 is a temperature and humidity sensor, it consists of a microprocessor that uses a capacitive humidity sensor, to measure the relative humidity of the air. This sensor is used at different weather station to measure temperature and ratio of moisture in the air for temperature or rain prediction.

Fig3: Temperature and Humidity Sensor.

MQ135: The MQ- 135 Gas detector can sense different gases like Ammonia(NH3), sulphur(S), Benzene(C6H6), CO2, and other dangerous gases, analogous to other MQ series gas detector, this detector also has a digital and analog affair leg. When the position of these feasts go beyond a threshold limit in the air the digital leg goes high.

Fig4: MQ135 Sensor

BMP180:BMP180 working principle is very simple, which is based on the weight of air. The air around us has a certain weight, with some specific pressure. BMP180 sensor senses that pressure and provides the information in digital output. The BMP180 measures both pressure and temperature.

Fig5: Pressure Sensor.

NODEMCU: Node MCU is an open source platform predicated on ESP8266 which can connect objects and let data transfer using the Wi- Fi protocol. Node MCU has 128 KB RAM and 4 MB of Flash memory to store data and programs.

Fig6: Node MCU(ESP8266)

SERIAL MONITOR: The periodical Examiner is an essential tool when creating systems with Arduino. It can be used as a debugging tool, testing out generalities or to communicate directly with the Arduino board.

AMAZON WEB SERVICES:AWS IOT provides the cloud services that connect your IOT bias to other bias and AWS cloud services. AWS IOT provides device software that can help you integrate your IOT bias into AWS IOT- based results.

METHODOLOGY:

you can build an IoT based weather monitoring system using AWS. Here are the basic steps:

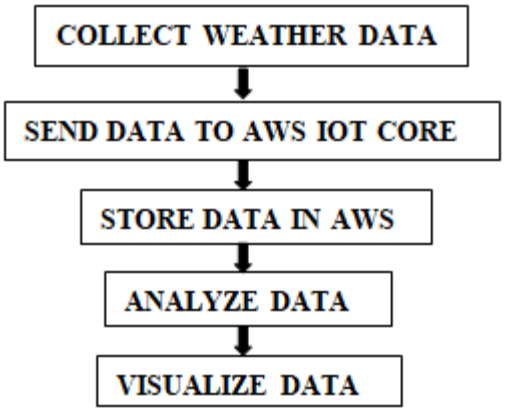

Fig7: Flowchart of Weather Monitoring System using AWS

Overall, this system will allow you to collect, store, analyze, and visualize weather data in real-time.

HARDWARE CIRCUIT CONNECTIONS:

The climatic parameters are measured by sensors. Further, the sensor gives the sample voltage to the Arduino and the Arduino converts the voltage into numerical values through the microcontroller by using analog to digital converter. The captured values can then be sent to the databases. After that stored values are observed through the Serial Monitor(Arduino IDE Software) and Amazon Web Services(AWS IOT Core).

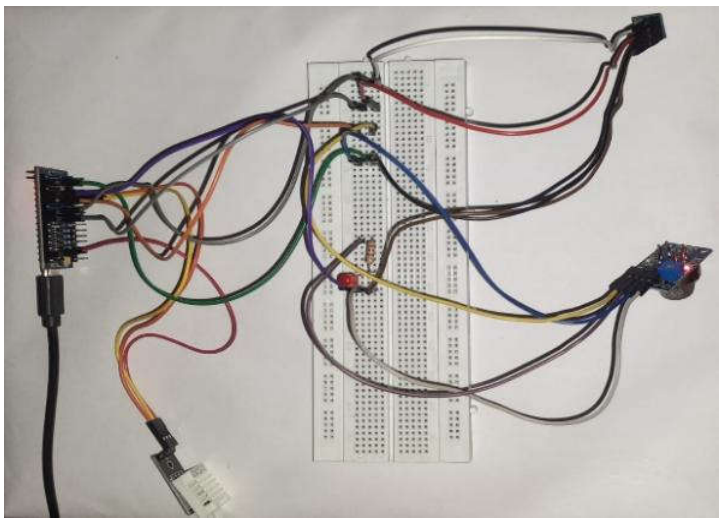

Fig 8: Hardware Circuit Diagram of Weather Monitoring System

CIRCUIT DIAGRAM:

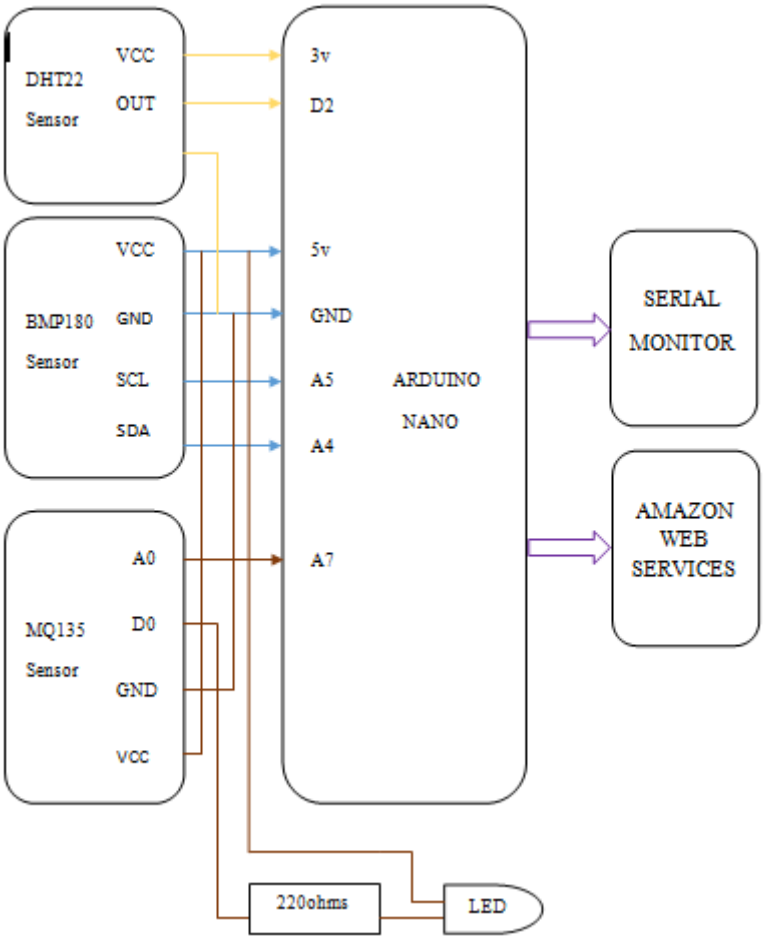

Fig9: Circuit Diagram for Weather Monitoring System Using Arduino NANO

WEATHER MONITORING SYSTEM OUTPUT IN SERIAL MONITOR:

Fig10: Output in Serial Monitor

WEATHER MONITORING SYSTEM OUTPUT IN AMAZON WEB SERVICES:

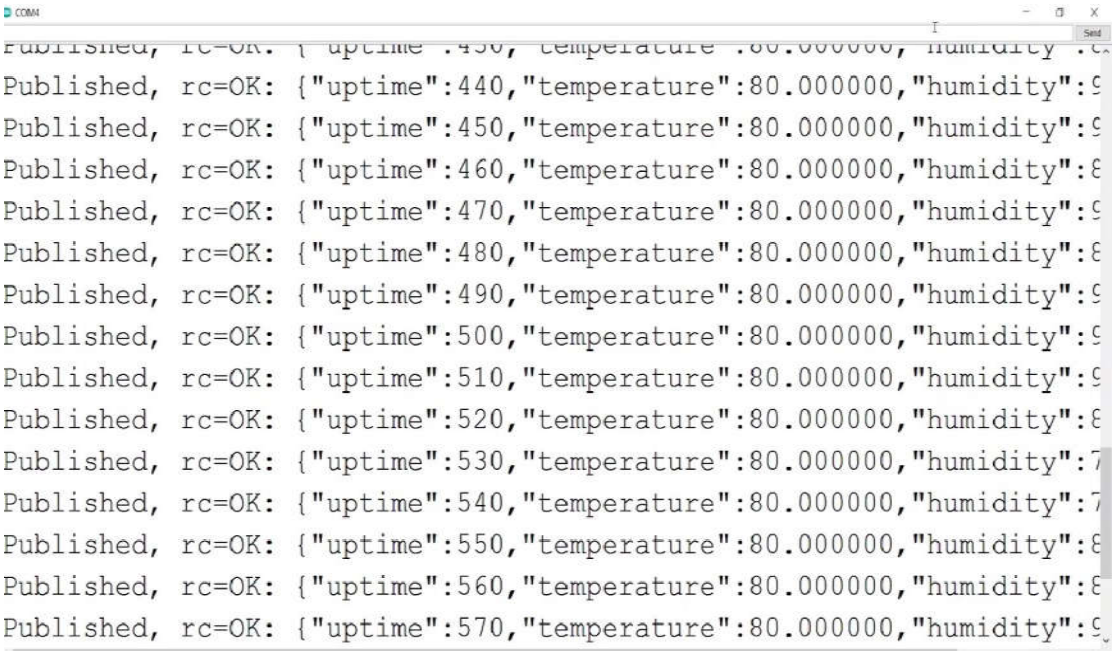

Fig11: Output in Amazon Web Services

CONCLUSION:

In conclusion, the IoT-based weather monitoring system using AWS and Arduino Nano is a powerful and efficient system for monitoring weather conditions in real-time. By leveraging the power of AWS, the system is able to collect and store large amounts of data, process it in real-time, and provide actionable insights to users.

The use of Arduino Nano provides a reliable and cost-effective solution for collecting data from various sensors and transmitting it to the cloud. The system can be easily scaled and customized to meet specific needs and requirements.

Overall, the IoT-based weather monitoring system is a valuable tool for individuals and organizations looking to improve their understanding of weather conditions and make informed decisions based on real-time data. It has the potential to impact various industries such as agriculture, transportation, and construction, among others, and help mitigate the effects of extreme weather events.

FUTURE SCOPE:

The suggested IOT and AWS-based weather monitoring system can be further customised to include a great number of additional features. A GPS device can be incorporated into the design so that the user can receive the location of the immediate area through message.

This system can potentially be improved by adding a few extra sensors to measure a variety of parameters, such as sun radiation and visibility, and then connecting those measurements to the satellite as a global feature. The technology is employed in numerous automation projects, including smart city initiatives and those involving aviation, navigation, and the military.

This real-time system can be used in hospitals or medical facilities for research and study in order to inform patients to the potential risks of weather-related illnesses.

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