Air Pollution and Weather Monitoring System using IOT

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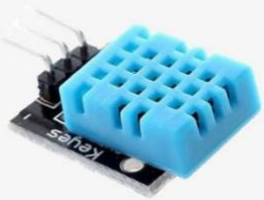
Abstract: Air pollution is a major environmental issue that affects the health and well-being of people around the world. Monitoring air quality and weather conditions can help mitigate the negative effects of pollution. In this paper, we present a system that uses the Internet of Things (IoT) to monitor air pollution and weather conditions in real-time. The system consists of a set of sensors that are deployed in different locations to collect data on air quality and weather conditions. The data is then processed and analysed using machine learning algorithms to identify patterns and trends. An alert system is also integrated into the system to notify users of any significant changes in air quality or weather conditions.

Introduction:
Air pollution is a growing concern in many parts of the world. It is caused by various factors, including industrialization, transportation, and urbanization. Air pollution can have serious health effects, including respiratory problems, heart disease, and cancer. It is important to monitor air quality and weather conditions to better understand the causes of air pollution and take steps to mitigate its effects.
The Internet of Things (IoT) is a technology that allows for the interconnection of physical devices, sensors, and software to collect and exchange data. IoT technology can be used to monitor air pollution and weather conditions in real-time. In this paper, we present a system that uses IoT to monitor air pollution and weather conditions and alert users of any significant changes.
Methodology:
The system consists of a set of sensors that are deployed in different locations to collect data on air quality and weather conditions. The sensors are connected to a microcontroller that collects data from the sensors and sends it to a central server for processing. The data is processed and analysed using machine learning algorithms to identify patterns and trends.
The system also includes an alert system that notifies users of any significant changes in air quality or weather conditions. The alert system can be configured to send notifications via email or SMS. Users can also access the data collected by the system through a web-based interface.
IOT
IoT stands for the Internet of Things, which refers to the network of physical objects or "things" that are embedded with sensors, software, and connectivity to enable them to exchange data with other devices and systems over the internet. These connected devices can range from simple sensors and actuators to more complex devices such as smartphones, smart appliances, and even vehicles.
The main idea behind IoT is to create a network of connected devices that can interact with each other and with humans in a seamless and intuitive way, leading to increased efficiency, productivity, and convenience. IoT has numerous applications in various domains, such as healthcare, transportation, agriculture, manufacturing, and smart cities, to name a few.
IoT devices typically collect data from their surroundings using sensors, process the data using on board or cloud-based algorithms, and then take appropriate actions based on the insights gained from the data. IoT devices can be controlled and monitored remotely using web-based or mobile applications, allowing for real-time feedback and control.
Overall, IoT has the potential to revolutionize the way we live, work, and interact with the world around us, leading to a more connected, efficient, and sustainable future.
Sensors used
MQ-3, MQ-7, and DHT-11 are types of sensors commonly used in IoT applications for monitoring air quality and weather conditions.
MQ-3 is an alcohol sensor that is often used to detect the presence of alcohol vapours in the air. It is commonly used in breathalysers, as well as in industrial and automotive applications to monitor alcohol emissions.
MQ-7 is a carbon monoxide (CO) sensor that is used to detect the presence of CO gas in the air. CO is a colourless, odourless gas that can be deadly in high concentrations, so monitoring its levels is crucial for safety in many applications.
DHT-11 is a temperature and humidity sensor that is often used in weather stations and HVAC (heating, ventilation, and air conditioning) systems. It measures temperature and humidity levels and provides the data in a digital format, making it easy to integrate with other IoT devices and systems.
All three sensors are relatively inexpensive and easy to integrate into IoT systems. They typically require a microcontroller or other processing unit to read the data and transmit it to other devices or systems for further analysis and processing. By integrating these sensors into IoT systems, it is possible to monitor air quality and weather conditions in real-time and take appropriate actions based on the data collected.

MQ-3

MQ-7



DHT-11

Node MCU (Microcontroller ESP8266)

NodeMCU is an open-source firmware and development kit that allows developers to easily build IoT applications using the Lua programming language. It is based on the ESP8266 Wi-Fi module, which provides a low-cost, low-power, and highly-integrated solution for IoT applications.

NodeMCU comes with a built-in Wi-Fi module anda powerful Lua interpreter, which makes it easy to connect to the internet and interact with other devices and services. It also includes a number of built-in libraries for common IoT tasks, such as HTTP and MQTT communication, GPIO control, and sensor reading.

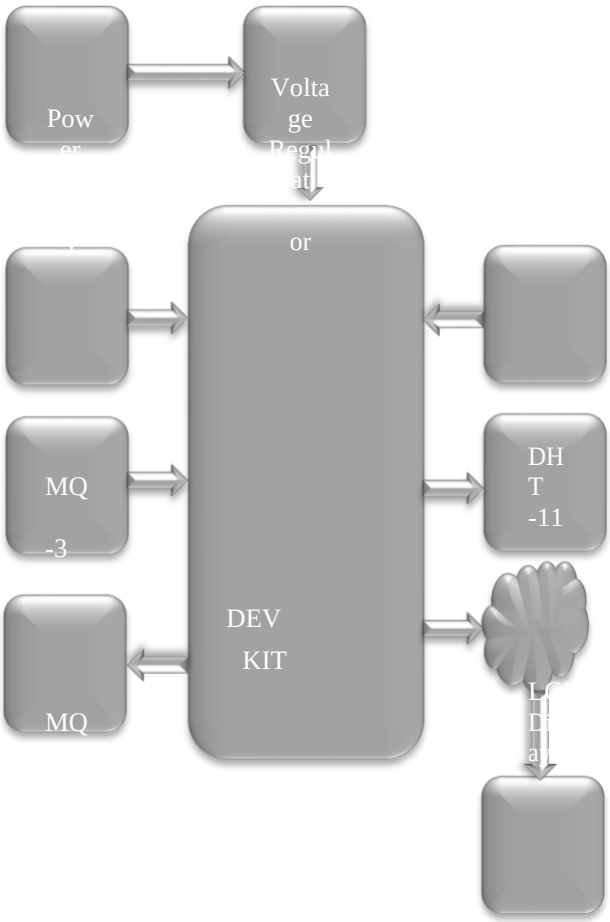
NodeMCU can be programmed using the Lua programming language, which is easy to learn and has a simple syntax. The firmware and SDK for NodeMCU are open-source, which means that developers can modify and customize the code to suit their specific needs.

One of the main advantages of NodeMCU is its low cost and ease of use. It can be easily programmed using a USB cable and a computer, and it can be used to build a wide range of IoT applications, including home automation, environmental monitoring, and industrial control systems.

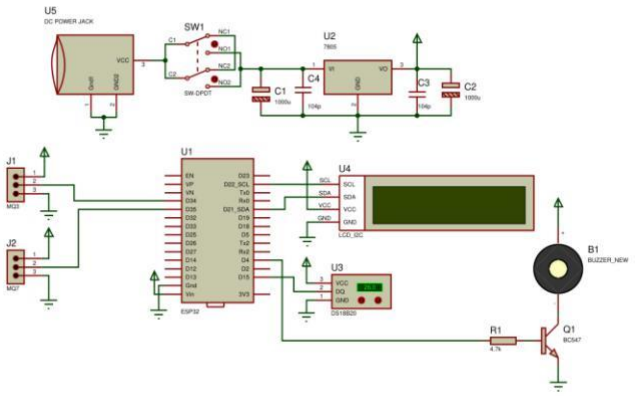
Overall, NodeMCU is a powerful and flexible platform for building IoT applications, and its open-source nature and low cost make it an attractive option for developers and hobbyists alike.

Model

lock Diagram of system



Circuit Diagram of system



Software overview

In this proposed model, blynk app Inventor service is used to remotely monitor sensor data and operate the hardware. The Blynk App Inventor has an easy-to-use interface. It may show sensor data in the form of graph The main components of Blynk App Inventor are the application building service, libraries and servers. A user can operate the device through the Internet using these components. It is also cable of connecting by WiFi, and serial USB. . It may also send the user a notification via Email and message.

The flow chart of this proposed model is shown which was created using the Flowchart Maker.

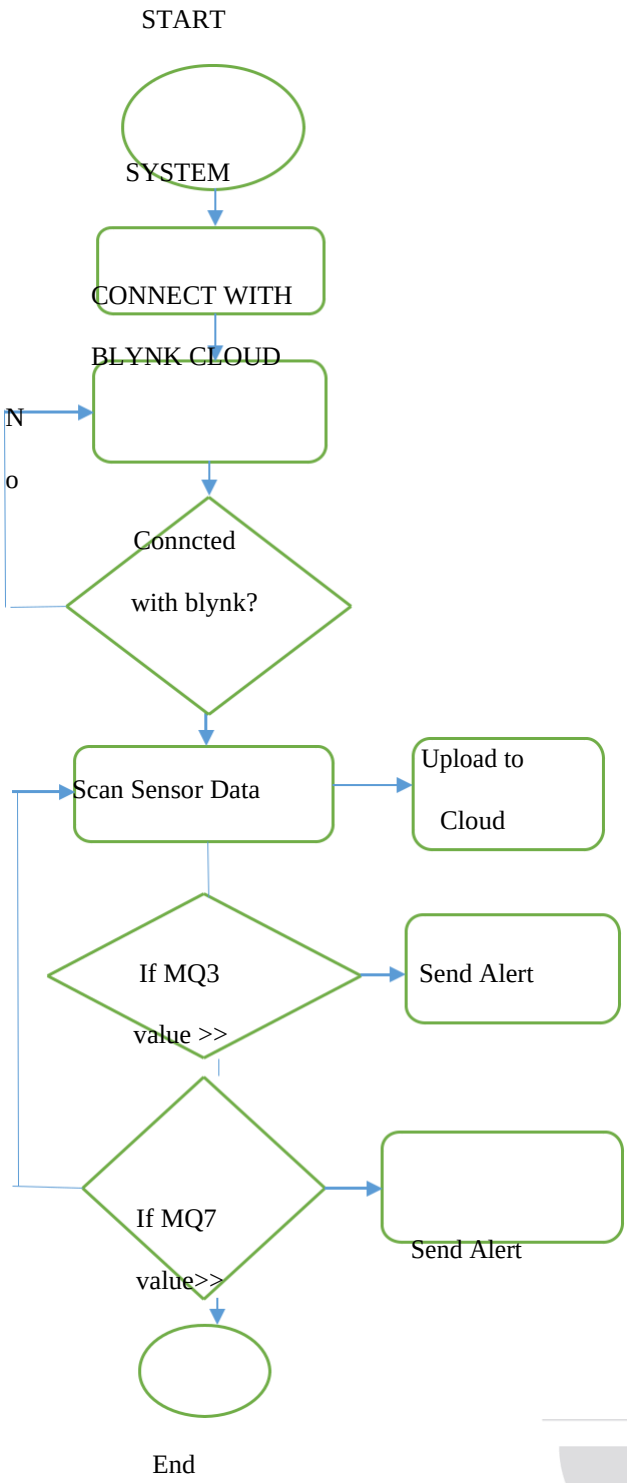
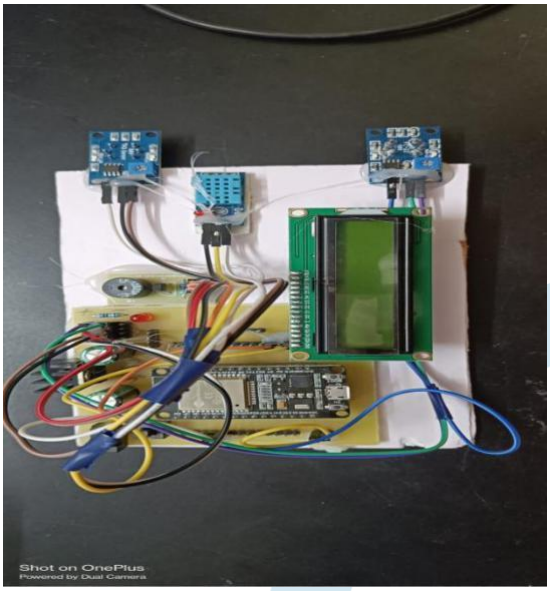


Fig: Flow Chart Of the Whole System

The Fig. shows the implemented proposed model in real



Results:

The system was deployed in several locations to monitor air pollution and weather conditions. The data collected by the system was analysed using machine learning algorithms to identify patterns and trends. The results showed that the system was able to accurately monitor air pollution and weather conditions in real-time.

The alert system was also effective in notifying users of any significant changes in air quality or weather conditions. The users were able to take appropriate action based on the notifications received from the system.

Conclusion:

Air pollution is a serious environmental issue that affects the health and well-being of people around the world. Monitoring air quality and weather conditions can help mitigate the negative effects of pollution. The system presented in this paper uses IoT technology to monitor air pollution and weather conditions in real-time. The system was able to accurately monitor air pollution and weather conditions, and the alert system was effective in notifying users of any significant changes. The system has the potential to be used in other locations to monitor air pollution and weather conditions and help mitigate the negative effects of pollution.

Reference

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