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Weather Monitoring System Using IoT

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Abstract: An innovative approach of tracking local weather conditions and making that data accessible from anywhere in the globe is presented in this study. This is all made possible by the cutting-edge technology known as the Internet of Things (IoT), which provides a streamlined and effective means of linking any and all physical objects to a global network. Here, objects may be anything from sensors to technological devices for automobiles. The system's main function is to use sensors to track and regulate environmental factors including temperature, humidity, light intensity, and CO level. It then uploads this data to a website and generates graphical statistics from the collected data. You may obtain the updated data from the system anywhere in the globe over the internet.

KEYWORDS
Internet of Things (IoT) embedded computer systems, smart surroundings, software, and the Arduino UNO microcontroller board.

I. INTRODUCTION

New technical advancements mainly aim at controlling and monitoring different processes. These are gaining popularity as a way for individuals to fulfil their requirements. The fundamental focus of this technology is the efficient regulation and monitoring of different processes. An efficient environmental monitoring system is required to detect and assess the situation in the case that certain parameters (such levels of noise, CO, and radiation) surpass the defined boundaries.

The integration of sensing devices, a microprocessor, and other software programmes into an item—a setting, for example—makes it capable of monitoring and safeguarding itself.

It is also known as a smart environment. With this configuration, the light or alarm will activate mechanically whenever an event occurs. The effects of changes to natural habitats on people, plants, and animals may be monitored and controlled using an intelligent environmental monitoring system. Integrating intelligence into the environment is one of the main objectives of creating a smart environment, which aims to make the environment more interactive with other purposes.

In order to meet human needs, several types of monitoring systems are required for the various types of data acquired by sensor devices. That which depends on event detection and that which makes use of spatial process estimation are the two main categories.

various uses are categorised. Data acquisition, computation, and controlling action (e.g., the variations in noise and CO levels with respect to the specified levels) begin with the deployment of sensor devices in the environment to detect parameters (e.g., temperature, humidity, pressure, LDR, noise, CO, radiation levels, etc.).

The behaviour of a certain region of interest may be predicted using data collected from sensor devices deployed at various places. This paper's primary objective is to propose and execute a reliable monitoring system that can remotely monitor the necessary parameters over the internet, store sensor data in the cloud, and display an estimated trend on a web browser. In this research, we suggest a wireless embedded computer system as a means to monitor environmental noise and CO levels—that is, any parameter

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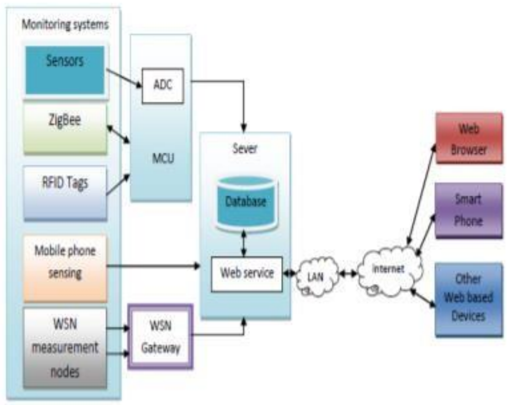
value that crosses its threshold value ranges, for instance, CO levels in the air in a specific location surpassing normal levels, etc. Intelligent remote monitoring of a selected region is another feature of the system. Along with the standard deviations and confidence intervals for individual metrics, this article also includes trending findings of sensed or collected data. The user may remotely access the different parameters and save the data in the cloud using the embedded system, which is an integration of sensor devices and wireless communication.

II. EXISTING SYSTEM MODEL

In today's world many pollution monitoring systems are designed by considering different environmental parameters. Existing system model is presented in figure 1 uses Zigbee [3] based wireless sensor networks to monitor physical and environmental conditions with thousands of applications in different fields.

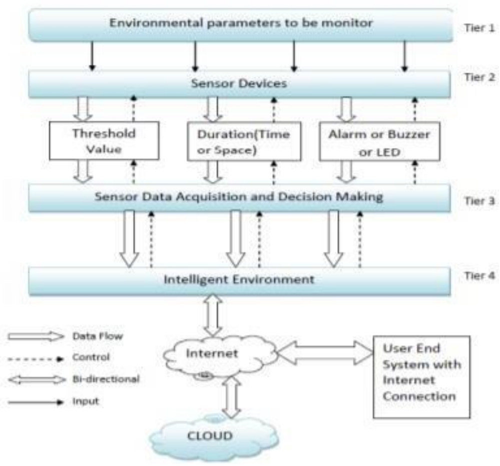
The sensor nodes communicated directly with the object of interest's movement nodes, cutting away the middleman and minimising local computations. Radio frequency identification's (RFID) primary objective is to read and write data to an RF-compatible integrated circuit [4]. Its principal purpose is to catalogue and track goods in supermarkets and warehouses. An RFID system primarily consists of readers and tags. In addition to an identifier, a tag's memory may include information on the product's kind, maker, and environmental factors like temperature and humidity. With the use of wireless broadcasts, the reader may read and write data to tags.
In a typical RFID application, tags are either connected to or implanted inside objects that need identification or tracking. Based on their power supply, there are three primary kinds of RFID tags: active, passive, and semi-active. Mobile phones [5] and other sensor-enabled cellphones are being used more and more for environmental protection, sensing, and the influence of just-in-time information on eco-friendly behaviour changes, all with the goal of mitigating negative social and environmental repercussions. There are two primary types of mobile phone sensors used to monitor urban areas: participatory sensing and opportunistic sensing. Participatory sensing involves the user actively but has limitations like limited power, static information processing, and mobility, while opportunistic sensing does not.
A Wireless Sensor Network is made up of several inexpensive wireless sensors that can collect, store, analyse, and transmit data about their environment [6]. For a long time, sensors have been connected by cables. The gateway is a convenient access method for WSN gateway nodes since data may be received from a WSN at any time and from any place. The gateway is responsible for node authentication and message buffering in addition to gathering, processing, analysing, and displaying your measurement data. It also acts as the network coordinator. Endpoints, routers, and gateway nodes form the paradigm for handling WSNs.



and the control room for management. The end device is in charge of gathering data from the wireless sensor network and transmitting it to the parent node. From there, either directly or via a router, data is delivered to the gateway node. The gateway node receives data from the wireless sensor network, processes it, and then transfers it to the server in Ethernet format after packaging. A computer programme that receives requests from another programme, called a client, and returns the requested information is called a server. In a less technical sense, any device capable of running server software might also be thought of as a server. Network resources are managed by servers. In order to make the system smarter, more adaptive, and more efficient, the information or services stored in the servers are delivered over the Internet and made accessible to users using web browsers, smart phones, or other devices linked through LAN.

III. PROPOSED MODEL

In order to create an intelligent or interactive environment, the suggested embedded device may monitor atmospheric conditions such as temperature, humidity, pressure, light intensity, sound intensity levels, and CO levels via wireless connection. In figure 2 we can see the suggested model, which is more distributive and flexible, used to track environmental variables. A four-tiered model outlining the suggested architecture and the roles played by its constituent modules in the development of noise and air pollution monitoring systems is presented.
The suggested model is structured with four levels. The environment is at the top of the hierarchy, followed by sensor devices in the second, data collecting and decision making in the third, and finally, an intelligent environment in the fourth.Figure 2 depicts the suggested architecture. When it comes to controlling noise and air pollution, tier 1 gives details on the factors under the monitored area. Sensor devices in Tier 2 are those that have the right features and characteristics; their sensitivity and sensing range determine how they are operated and controlled. The conditions determine the detecting and regulating activities to be conducted between tiers 2 and 3, such as setting the threshold value, sensing frequency, messages (alert, buzzer, LED, etc.), and so on.
Critical scenario and normal operating condition parameter threshold values are derived from data analysis conducted between tiers 2 and 3, as well as from prior experiences. Data collecting from sensing devices and decision making are both covered in Tier 3. The condition that the data represents is defined by the parameter.



In the proposed model tier 4 deals with the intelligent environment. Which means it will identify the variations in the sensor data and fix the threshold value depending on the identified level of CO or noise levels. In this tier sensed data will be processed, stored in thecloud i.e.in to the Google spread sheets and also it will show a trend of the sensed parameters with respect to the specified values. The end users can browse the data using mobile phones,

BLOCK DIAGRAM:

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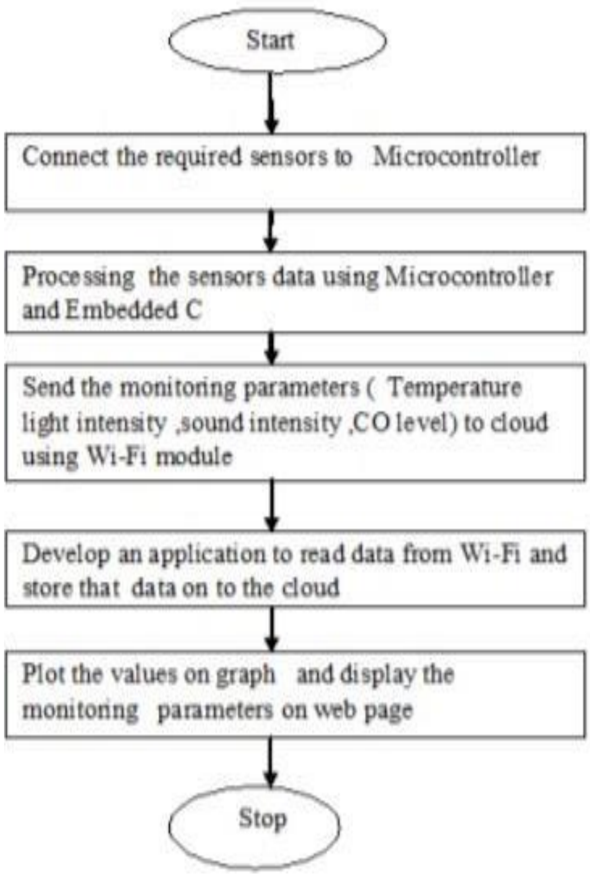
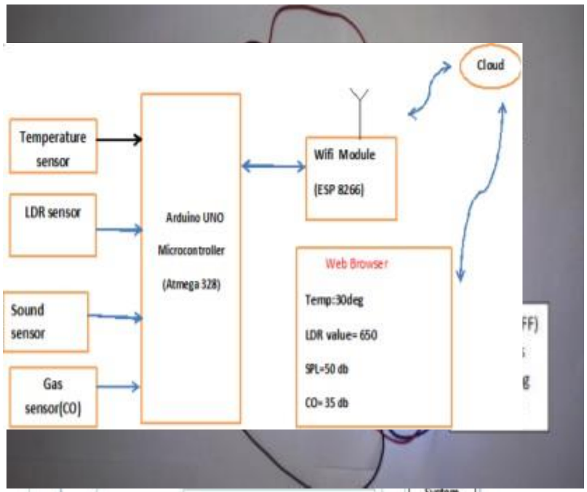
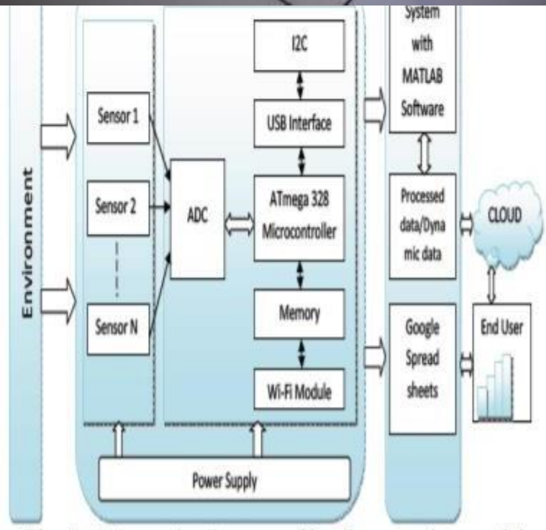
VI. IMPLEMENTATION

Figure 3 shows the functionality of the various sensor devices and other modules that we have selected as being most suited for implementation based on the architecture indicated in Figure 2.As an embedded device for sensing and cloud storage, we used an Arduino UNO board with a Wi-Fi module in our implementation approach. Analogue input pins (A0-A5), digital output pins (D0-D13), an integrated analog-to-digital converter (ADC), and a Wi-Fi module link the embedded device to the internet make up an Arduino UNO board. An Arduino UNO board is used to monitor environmental parameters by connecting sensors, which are then read by an analog-to-digital converter (ADC).



The Wi-Fi connection has to be established to transfer sensors data to end user and also send it to the cloud storage for future usage.





The components of an embedded system meant for environmental monitoring are shown in figure 5.For the aim of testing, the embedded device is put in a certain region. When the air quality in that area reaches a certain threshold, a controlling action (such as an alarm, buzzer, or LED blink) is triggered. The sound sensor detects the levels of sound intensity in that area, and the CO sensor (MQ-9) records those levels.With the help of the Wi-Fi module, every single sensor device may be linked to the internet.the embedded system with its components for reading and to store the pollutant parameters in cloud. The data will be analysed and saved in a database for future reference after sensing is successfully completed. We will establish the threshold values for controlling when we finish analysing the data.

VIII. CONCLUSION

By regularly checking in with embedded sensors, we can create an environment that can defend itself (a "smart environment"). To make this a reality, we need to set up

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environmental sensor devices to collect data and run analysis. Making the environment more interactive by the placement of sensor devices over it and enabling it to connect with other objects through the network is possible. Afterwards, the user will be able to view the analysed data and collected information using Wi-Fi. Our research presents a plethora of models for a cheap and effective embedded system with smart environmental monitoring capabilities. Every function of the module was taken into account by the proposed design. Both noise and air pollution were included in the experimental testing of the system that monitored both utilising the IoT idea. Plus, it saved the sensor readings to cloud-based Google Sheets. Future studies will benefit from this easily available data. This technique has the potential to be expanded to monitor pollution in urban areas and industrial zones. This method provides an efficient and economical means of constantly monitoring the environment, which is necessary to protect the public's health from pollution.

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