Iot Based Environment Monitoring Robotic with an Arduino

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Abstract:
Air pollution is an emerging public health concern as there are increasing evidences that the quality of air adversely affects human health due to the presence of various toxic pollutants. Decision makers need relevant, comprehensive estimates of the disease burden attributable to different risk factors. This project focuses on the Indian scenario as a case study and presents the current status of air quality in India with special reference to particulate matter. The technology behind this is Internet of Things (IOT). The arduino uno system is interfaced with temperature, pressure, humidity, light density and carbon monoxide sensor. When incentive from the sensor surpasses the given edge arduino processes and delivers the information to mobile device through Bluetooth. It is fully automated and portable in size. It gives alertness about carbon monoxide, temperature, light intensity, pressure and humidity.

Keywords: Temperature sensor, Carbon monoxide sensor, Pressure sensor, Humidity sensor, LDR sensor Noise sensor, Embedded C, Arduino UNO, Bluetooth module.

1.1 INTRODUCTION

A weather station is considered a technical method that allows measuring weather parameters based atmospheric conditions either on the land or on sea for a proposed location with specific devices in order to realize forecasted weather conditions, and to study climate properties. Weather prediction issues started formally since the nineteenth century, then as soon as altered based measuring and recording honest data about a specific location under certain atmospheric conditions. The collected data allows deciding and confirming the warranty of the proposed chosen location. The weather is appreciated mostly by two parameters, temperature and the humidity. Generate the proposed weather station based data packing and acquisition. These five weather parameters identified by Temperature (T), Humidity (H), Light density (L), pressure (P), carbon monoxide (CO) and Noise. Besides, light sensing module and air conditioning framework are employed to measure light intensity and to control weather conditions respectively. Light module specifies (day/night) periods and hence automatically turns location lights (ON/OFF) based light sensor output. Employing light sensor allows extracting the recorded data specified in a certain time without ambiguity. The measurement operation based (W) had shown few difficulties due to data structure circumstances based location area. As well as the respected sensors output. Whereas, the other parameters had displayed sensible behaviours particularly due to the measurements recorded freely indoor or outdoor. Finally, the idea is considered perfect particularly for controlling the devices of a specific house based on sensors readings. Employing carbon monoxide sensor allows extracting the recorded data specified in a certain time without ambiguity. 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1.2 EXISTING SYSTEM

The existing weather monitoring systems generally use weather stations that use multiple instruments such as thermometers, barometers, wind vanes, rain gauge etc. to measure weather and climate changes. Most of these parameters are fluctuated particularly in the places that have affected by temperature of the sun radiation and the perpendicular location of the sun that radiates over a specific location based the latitude of the tropical line. Weather station specialists remain predicting weather situation incessantly day by day based on the theoretical study of climate conditions. It has to be mentioned, that the struggling of human being in the past was following some poor parameters and terms such as measuring the pressure, humidity intensity study and its effect on the temperature, climate situation, and finally the condition of the sky that effects hardly on the proposed parameters. This project introduces five weather parameters employed. Whereas, the other parameters had displayed sensible behaviours particularly due to the measurements recorded freely indoor or outdoor. Finally, the idea is considered perfect particularly for controlling the devices of a specific house based on sensors readings. Employing carbon monoxide sensor allows extracting the recorded data specified in a certain time without ambiguity.
instruments use simple analog technology which is later physically recorded and stored in a database. This information is later sent to news reporting stations and radio stations where the weather report is given.

1.2.1 Limitations of the existing System

1. Existing weather monitoring systems that are used in the field generally consist of unconventional and heavy machinery that consists of numerous moving parts that require constant maintenance and need to be manually monitored and changed frequently.
2. Power requirements are one of many major constraints as these instruments are generally sited far from main power supply. This adds to the cost of using such instruments.
3. The use of thermometers to measure external temperature; however accurate is still outdated and constantly needs to be manually checked for any change in temperature.
4. Data that is collected by the instruments needs to be manually transferred from the logger to a laptop or computer via a cable.
5. Existing systems consist of large and heavy instruments that occupy a lot of space hence making it difficult to install them in remote location and places which have limited space.
6. The instruments used in the existing systems are expensive and add up to the already high cost of installation and maintenance.
7. The current system always faces problems such as delay in warning people about bad weather and sudden changes in the forecast.

1.3 PROPOSED SYSTEM

The system proposed is an advanced solution for weather monitoring that uses IoT to make its real time data easily accessible over a very wide range.

The system deals with monitoring weather and climate changes like.
1. Temperature using LM35
2. Humidity
3. Light intensity using an LDR
4. Pressure
5. Carbon monoxide levels in the air using MQ2.
6. Noise

1.3.1 Feature and advantages of the proposed system:

1. Our proposed ‘Smart weather monitoring system’ unlike conventional weather monitoring instruments is very small and compact allowing it to be installed easily on rooftops.
2. It is light and portable; this advantage allows us to easily carry it to remote location for installation. Due to its design it can be easily be carried by a weather balloon to measure atmospheric changes at high altitudes.
3. The power requirements for our system (sensors and boards) is much less compared to the existing instruments in the market hence enabling us to use solar cells as power supply. This not only cuts down on cost but allows us to leave the monitoring system in remote, areas where power is not easily available, for long periods of time. Addition of solar panels also helps our design be eco-friendly.
4. The sensors used in our product are much cheaper compared to the ones that are used in the existing weather monitoring systems making our design more cost effective.
5. These sensors send the data to a web page and the sensor data is plotted as graphical statistics. The data uploaded to the web page can easily be accessible from anywhere in the world. The data gathered in these web pages can also be used for future references. Unlike the existing system where data has to be physically transferred.
6. Due to the presence of fewer moving parts less amount of maintenance will be needed cutting down on maintenance charges.
7. The product even consists of an app that sends notifications as an effective alert system to warn people about sudden and drastic weather changes. This works as an efficient warning system for bad weather and storms.
8. For predicting more complex weather forecast that can’t be done by sensors alone we use an API with the help of a Raspberry pi that analyses the data collected by the sensors and predicts an accurate outcome. This API can be used to access the data anywhere and at any time with relative ease and can also be used to store data for future use.

1.4 BLOCK DIAGRAM

Figure.1. Block Diagram of proposed system
1.5 HARDWARE DESCRIPTION

1.5.1 ARDUINO

Arduino is an open-source hardware and software company, project and user community that designs manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally. Its products are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.

1.5.2 TEMPERATURE SENSOR

The LM35 temperature sensor is a three pin device (VCC, OUT and GND) with an output voltage linearly related to Centigrade temperature. Since the LM35 output varies with dependent to the temperature, we need an ADC (Analog-to-Digital Converter) module to measure this voltage.

1.5.3 PRESSURE SENSOR

A pressure sensor is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed.

1.5.4 HUMIDITY SENSOR

A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.

1.5.5 LDR (Light Dependent Resistor)

LDR stands for Light Dependent Resistance. LDRs are made from semiconductor materials to enable them to have their light-sensitive properties. There are many types but one material is popular and it is cadmium sulfide (CdS). These LDRs or PHOTO RESISTORS works on the principle of “Photo Conductivity”.

1.5.6 CARBON MONOXIDE SENSOR

The MQ-2 gas sensor gives output voltage based on concentration of Carbon monoxide (CO) detected in surrounding. The voltage will be higher methane concentration is greater and vice versa.

1.5.7 NOISE SENSOR

The noise sensor detects sound. It gives a measurement of how loud a sound is. There are a wide variety of these sensors.

1.5.8 BLUETOOTH MODULE

The HC-05 module is a Bluetooth SPP (Serial port protocol) module which means that it communicates with the Arduino through serial communication. This module is designed for wireless serial communication and it is fully qualified Bluetooth V2.0+EDR (EnhancedDataRate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. The maximum range for wireless communication for this module is 10 meters.

1.5.9 16 x 2 LCD Display:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is a very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

6.1. FLOW CHART

![Flow Chart]

Figure 2. Flow Chart of proposed system

1.6.1. WORKING PRINCIPLE:

The working principle of this work describes the interdependent functionality of the components and their output. The circuit diagram is shown in Fig. 1. Firstly, all the components are initialized by supplying the required power of +5v. There are two temperature sensors, lm35 and dht11; we are using two temperature sensors to get a
accurate value of temperature reading and taking the average of the two values. Depending on the temperature, hot air or cool air introduced to maintain the temperature threshold value, which is preset. If the temperature is too low for the particular area hot air is blown in to bring the temperature to moderation. Otherwise, if the temperature is too high, cold air is blown and thereby raising the temperature to the required level. This is how temperature is manipulated. Secondly, there is an LDR which work based on light intensity. When the sunlight is too much or not enough for the plant to handle, the servo motor opens or closes the door of the glass box based on the readings of the LDR. This helps in recording the natural light incident on the area. The natural light intensity may vary from time to time. This is important in agricultural applications, where light is required for the growth of plants and some plants may not grow well in low light. On the other hand, when the light intensity is high throughout the year, such areas or places are suitable to set up solar power stations. Light intensity along with other parameters such as temperature and humidity can be used in predicting weather forecast without the use of any satellite data. The gathered data is serially fed into a computer, which uses the com port to communicate with the Arduino device and the data recorded is stored in a text file. The text file can be directly imported to an excel file with the functionality of a macro. The imported data is then sorted and formatted, and charts are then plotted with the imported data. The charts present a visual representation of the data, which shows the weather pattern over a recorded period of time. The visual patterns indicate the weather behavior of the particular region. This is the primary objective of the present work.

1.7 RESULT

All the modules were designed and all the components were assembled. The testing of each module was carried out successfully. The sensor readings were effectively retrieved in a stable environment and stored in files. The files were then imported to mobile application automatically and the data was cleansed and formatted for a neater representation. Digital values using the data which presented a nice analytical view of weather pattern based on sensor readings. Thus the testing phase was completed. This study was performed in a controlled manner. Thus, there is a need to conduct further experiments in environments more similar to real weather conditions.

![Figure.3. Results of proposed system in mobile app](image)

1.8 CONCLUSION & FUTURE SCOPE

This concludes that the present work was a success and it will provide a competent method for recording real time weather readings and help farmers whose livelihood depends on the weather in a country like India to produce better quality crops.

In future, sensors to analyze air quality using gas detectors could be included and a web interface or service to feed the data directly to Internet could also be built.

1.9 REFERENCES


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