IOT BASED SOLAR POWERED AIR POLLUTION MONITORING SYSTEM

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Abstract -To Design and develop a IoT based solar powered air pollution monitoring system. The proposed system alert, notify data of polluted area that has been checked for the immediate surroundings. The proposed system has various parameters such as solar panel, battery,MQ7, MQ135 and DHT11 sensors with nodemcu microcontroller which collects and upload data into the cloud using nodemcu Wi-Fi module. The data is transmitted to the cloud platform using MQTT (Message queuing Telemetry Transport) protocol and alerts the user through an application.

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Index Terms— Internet of Things, Blynk, nodemcu, arduino IDE, sensors, Air pollution.

1. INTRODUCTION

Internet of things system is a rapidly expanding idea in this era of industrialization technology meanwhile. It has become important for many manufacturing companies and other industries care about employee health, safety and other side effects.. Air pollution is the biggest problem of every nation, whether it is developed or developing. Many times the emission of gases affects both the human beings and animals are affected by lung cancer, irritation of eye, breathing. Some other harmful effects caused by pollution are mild allergic reactions near throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma.To overcome this problem, proposed work is one step forward towards the environment and pollution levels around the manufacturing industries needs to be monitored efficiently, reliably and accurately. By monitoring harmful gases present around industry it also checks high pollution rate and compare it with standard levels and when quality goes down beyond a certain level it sends notification to human that it's not safe. Existing System only uses arduino controller, three sensors MQ7,MQ135 and DHT11. For output it uses LCD (Liquid Crystal Display).

I) Objectives

The objective of our research is simple: to monitor the air quality over a web server using internet and will trigger an alarm when the air quality goes down beyond a certain level means there are amount of harmful gases present in the air like,alcohol ,ammonia ,sulphur and carbon monoxide.

II) Problem Statement

Inhaling pollutants for a long time causes damages in human health traditional air quality monitoring methods, such as building air quality monitoring station, are typically expensive this project is suitable for air quality monitoring in real time.

III) Proposed Solution

Our research makes it solution that can provide accurate and real-time data about the air quality in a particular area.

2. LITERATURE SURVEY

The air pollution is considered as the major problem which is caused due to the increase of the vehicles. To reduce the air pollution, many countries has explained different technologies like Zigbee based monitoring system which is used to measure the quality of an air. In this project a Wireless Inspection and Notification System (WINS) is proposed through the concept of Internet of Things (IOT). By implementing the system, it is possible to identify the harmful gases that present in the environment. In this WINS system, it uses GPRS based technology as a low cost and smart wireless communication method is adopted to collect and transmit the information about the harmful gases. The collected information will be stored for future purposes. To detect the environment pollution, proposed system uses different gas sensors i.e., CO sensor, MQ135 gas sensor and LM35 temperature sensors which is used to detect the pollution that present in the environment. (1)

Using empirical analysis, conventional air automatic monitoring system has high precision, but large bulk, high cost, and single datum class make it impossible for large-scale installation. Based on introducing Internet of Things (IOT) into the field of environmental protection, this paper puts forward a kind of real-time air pollution monitoring and forecasting system. By using IOT, this system can reduce the hardware cost into 1/10 as before. The system can be laid out in a large number in monitoring area to form monitoring sensor network. Besides the functions of conventional air automatic monitoring system, it also exhibits the function of forecasting development trend of air pollution within a certain time range by analyzing the data obtained by front-end perception system according to neural network technology. Targeted emergency disposal measures can be taken to minimize losses in practical application. (2)

Air pollution is the foremost concern especially in modern cities, because of its noteworthy influences on the community health, and the global economy. The significance of the air quality statistics makes the highly accurate real-time monitoring systems vital. The partial data access, high cost and the non-scalability of conventional air monitoring system enforce the researchers to develop future air pollution monitoring system employing advance technologies such as internet of things (IOT), wireless sensor network (WSN) and low-cost ambient. (3)

3. Methodology

3.1. System requirement

MQ7(CO):MQ-7 is a Carbon Monoxide (CO) sensor, suitable for sensing Carbon Monoxide concentrations (PPM) in the air. The MQ-7 sensor can measure CO concentrations ranging from 20 to 2000ppm. This sensor has a high sensitivity and fast response time.

MQ135 Gas sensor: An MQ135 air quality sensor is one type of MQ gas sensor used to detect, measure, and monitor a wide range of gases present in air like ammonia, alcohol, benzene, smoke, carbon dioxide, etc. It operates at a 5V supply with 150mA consumption.

LCD: It is electrically modulated optical device that uses the light modulating properties of liquid crystal. It is used to display the threshold values of harmful gases like co2 and co. it also indicates gases values in PPM.
Battery: Lithium polymer battery is a rechargeable battery of lithium ion technology using a polymer electrolyte instead of a liquid electrolyte.

NodeMCU: NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from express if Systems, and hardware which was based on the ESP-12 module.

DHT11: The DHT-11 Digital Temperature and Humidity Sensor is a basic, ultra low-cost digital temperature and humidity sensor. The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy.

Solar panel: A Solar panels (also known as) PV panels. PV is used to convert sunlight energy, which is formed by energy particles known as “photons”, into electricity that can be used to power electrical components. The combination of PV modules is called PV panels. The energy produced by the solar panel is measured in volts or watts. It will vary according to the type of system and the solar cell you are using. Each of the array’s solar panels (modules) consists of a group of solar cells packed jointed in a metal frame.

Buck Converter: Buck Converter is a type of chopper circuit that is designed to perform step-down conversion of the applied dc input signal. In the case of buck converters, the fixed dc input signal is changed into another dc signal at the output which is of lower value. This means it is designed to produce a dc signal as its output that possesses a lower magnitude than the applied input.0

3.2 BLOCK DIAGRAM

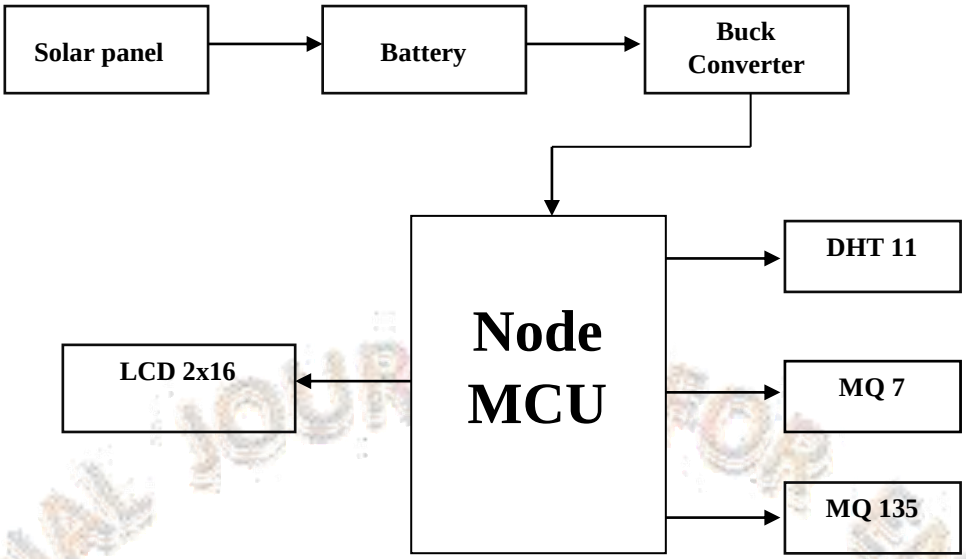

Figure 1: Block diagram

3.3 WORKING PRINCIPLE

- The system is developed with help of sensors, microcontroller, and mobile phone with blynk application.
- All sensors used in system are connected to nodemcu microcontroller. The sensors used in system will sense all gases, and it will give the Pollution level in PPM (parts per million).
- MQ135, MQ7 and DHT11 gas sensor will give the output in form of voltage levels.
- MQ135, MQ7 and DHT11 gas sensor libraries are used. According to the model developed three sensors are used that works as input data, to know the concentration levels of gases, humidity and temperature values.
- LCD and blynk application are the output devices. When the system is power the sensors start working and acts like input take and sends the collected data to nodemcu microcontroller.
- The module sends the collected information to LCD where output is displayed on LCD the values are displayed in PPM for gases levels, temperature in degrees and humidity in percentage.
- Nodemcu microcontroller sends data to blynk application as well. In Blynk application humidity and temperature can be seen in form of widgets. This application has its own cloud for storing data.

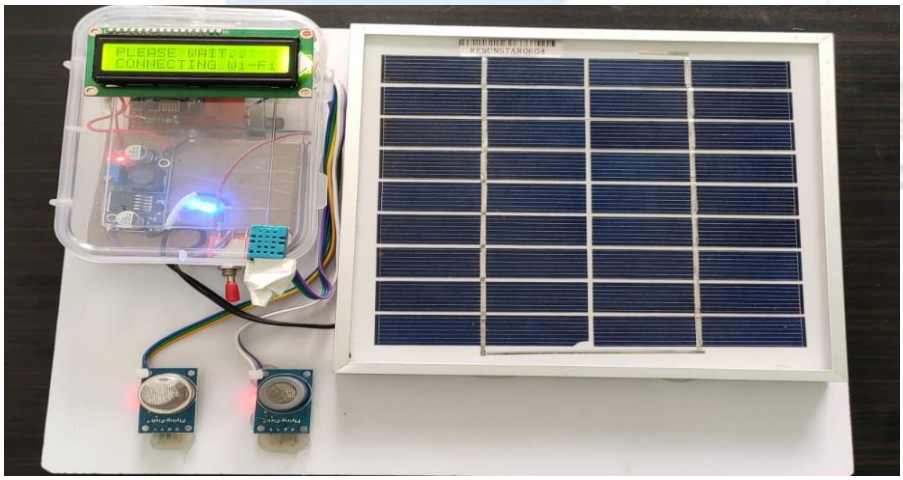

Fig.2: Assembled Hardware

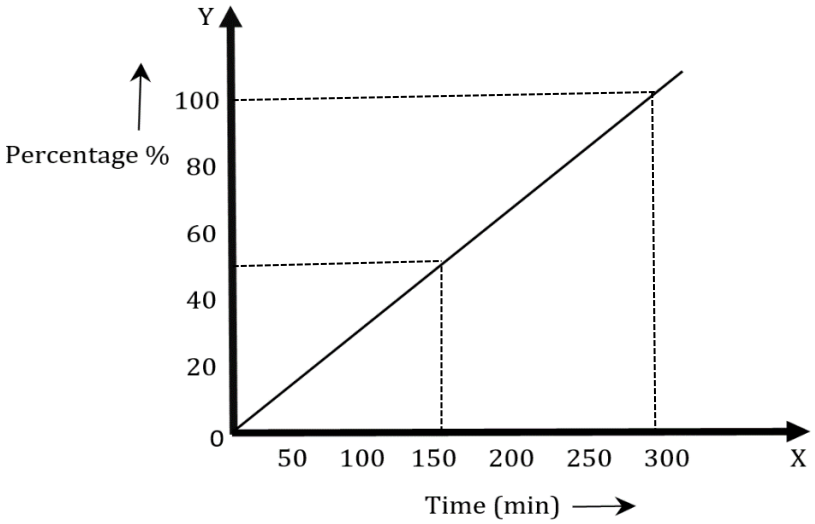

Fig. 3: Percentage & Time graph of battery charging

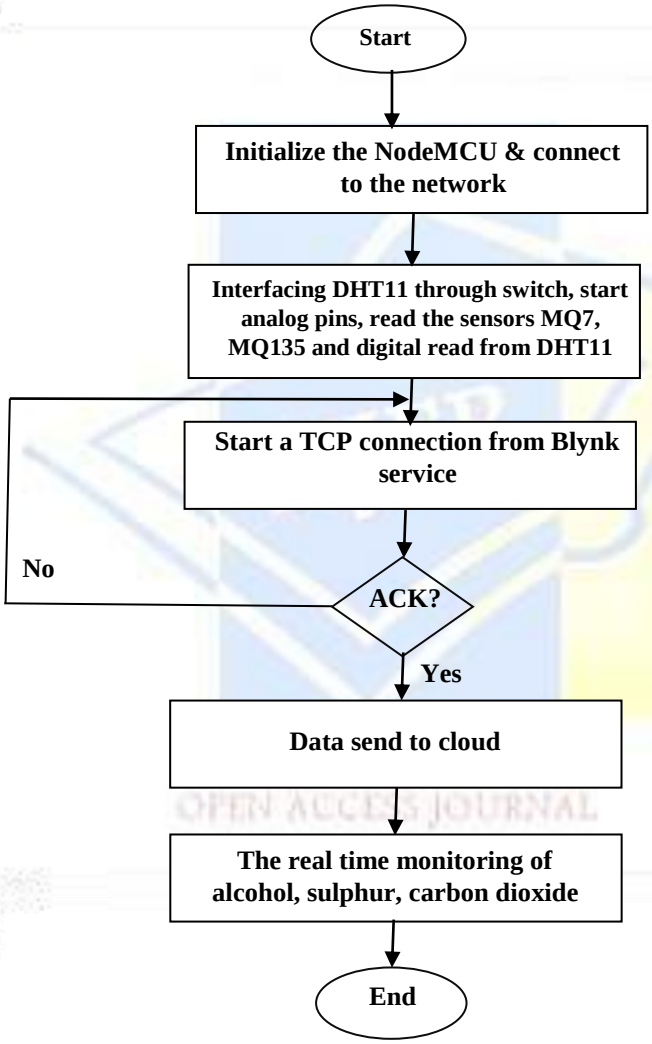

Fig. 4: Flowchart

4. Result

The values produced by above system can be seen in the blynk application.

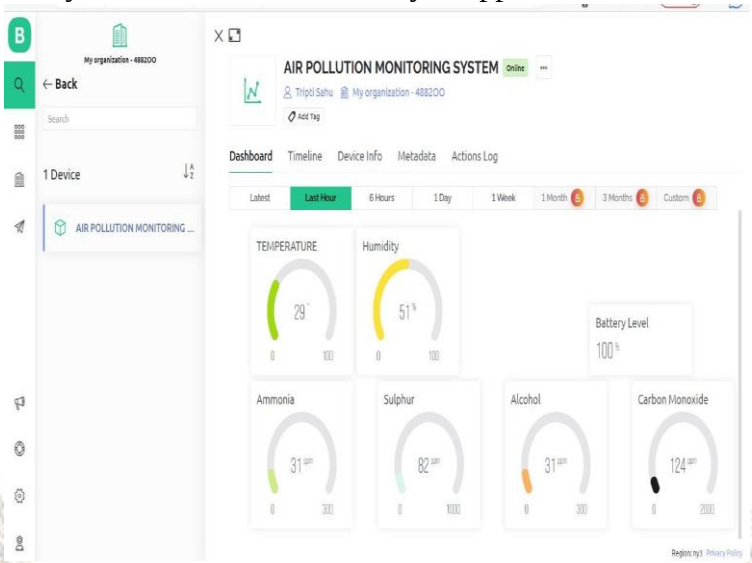

Fig. 5: Result

5. CONCLUSIONS

- The proposed system which can monitor the leakage of toxic gases and the level of pollution using blynk application, nodemcu microcontroller and IOT is proposed.
- In this paper, a model is developed using MQ135 and DHT11 sensors where we can monitor the level of air pollution and the poisonous gases can be sensed of the surroundings and get notified when air quality drops to some degree.
- Microcontroller serves as the heart of this module which controls the entire process. Wi-Fi module connects the whole process to blynk application and LCD is used for the visual Output.

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