IOT Based on Industrial Air, Noise, Temperature Monitring System

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Abstract: globalization, and industrialization is negatively affecting the equilibrium of the environment by releasing untreated harmful toxic elements into the atmosphere this resulted in contamination of basic elements of the ecosystem like water, air, and soil which are essential for humans to sustain, the 4 major types of pollution caused by the industries are air pollution, water pollution, soil pollution, and noise pollution. This leads to air and water borne diseases in both humans and animals. Hence the control of these pollution parameters is a great challenge. This paper presents IoT based industrial air, water and sound pollution monitoring system, the main objective of this project is to design an efficient and robust system to monitor the parameters which are causing pollution. The working methodology of this project/system is to read and monitor pollution parameters and inform pollution control authorities when the release of any of these pollutants goes higher than industry standards. The system investigates the level of PH in industrial effluents, level of CO, carbon dioxide, combustible gas, humidity in the air and the minute optical dust particles released during industry process and also the level of sound produced by the industry, using various sensors like PH sensor, MQ6, MQ9, temperature sensor, humidity sensor, noise sensor, and dust density sensor

Key Words: CO, MQ6, MQ9, Iot, LM35, LM393, DENSITY SENSOR, CLOUD TECHNOLOGIES

INTRODUCTION

Pollution is an important and major factor that is negatively affecting the quality of the lives of millions. Most of the pollutants in the environment are a result of untreated emissions and the release of industrial wastes from factories to the environment, with the growing world population and industry advancement, Environmental pollution became a big concern. Many Processing and manufacturing industries majorly contribute to 4 types of pollution

- Air pollution.
- Water pollution.
- Soil pollution.
- Noise pollution

Air pollution is caused by the emission of a high amount of untreated industrial waste such as carbon dioxide, carbon monoxide, sulphurous oxides, nitrous oxides, minute particulate matters like optical dust, and also a considerable amount of vapours of polymers such as methane's and butanes which are formed as a by-product due to burning coal, burning natural oils, fossil fuels and petroleum products to perform industrial processing activities. As per estimation made by the Indian pollution control authority that every year nearly a 1.2million Indians die because of airborne diseases Similarly, the Major reason for water pollution through industries is caused by discharging the untreated industrial waste that is generated during various processing activities, the industrial wastes include asbestos, lead, mercury, nitrates, phosphates, sulphur, and other petrochemicals, etc. The untreated acidic effluents which are released to natural reservoirs decrease the pH value of the reservoir water resulting in a decreased microbial activity affecting the growth of the algae and other aquatic plants resulting in a decrease in the level of BOD (biological oxygen demand) that is the level of dissolved oxygen in the water which affects in the breathing of the aquatic animals resulting in their death. Likewise, Thermal pollution can be defined as the sudden increase or decrease in the temperature of a natural water reservoir, which may be oceans, ponds, rivers, lakes, etc. due to human activities. Thermal pollution usually occurs when the processing plants take the water from the natural reservoir and let out the used water back to the reservoir with extreme differences in temperatures. The sharp increase in the temperature of the water reservoir causes a decrease in the level of dissolved oxygen in the water affecting the life of aquatic plants and animals.

1.1 Major reasons for Industrial pollution

1. Lack of policies to control pollution.
2. Unplanned industrial growth
3. Use of outdated technologies in treating toxic effluents.
4. Industries purposefully neglect thinking that the cost of pollution control will reduce their profit margins.

1.2 Solution through IoT

IoT is one of the powerful tools in modern technologies which help to access data from remote locations and Save them in cloud storage. With the increase in pollution and advanced technologies, various new methods were initiated to watch over the rapid increase in pollution more efficiently, where the Internet of things is one among them which played a major role in this domain. With the increase in the use of the internet and devices connected to the internet works on the principle of artificial intelligence IoT has become the most popular tool for the exchange of information among the devices connected to the internet. IoT helps exchange of information among various devices maybe household devices like fridges, washing machines or industrial machines, automobiles, watches, etc. The exchange of information occurs with the help number of sensors. IoT has become one of the most used technologies because of its flexibility, efficiency, and low-cost properties

2. PROPOSED MODEL

This paper presents an 'IoT based industrial air, water and noise pollution monitoring system'. The proposed system helps to monitor all 4 types of pollution caused by the industries are monitored using the following methods.

1. Air pollution is monitored using MQ-6 sensor, MQ-9 sensor, humidity sensor, and dust density sensor, by analysing the level of carbon-di-oxide, carbon monoxide, combustible gases like Butane, LPG, humidity in the environment, and thepresence of minute particulate matters like optical dust which are released during the industrial process.
2. Similarly, Water pollution is monitored using a pH sensor by investigating the pH of the industrial waste effluents before releasing them into the natural reservoir.
3. In the same way, the system investigates the degree of the temperature of the heat-treated water that is released from the industries using an LM35 temperature sensor to avoid thermal pollution.
4. Similarly, the intensity of the noise produced by various heavy machines used in the industrial process is investigated using the LM393 sound sensor.

3. OBJECTIVES

1. The proposed system can monitor all 4 types of pollution caused by the industries such as air, water, thermal, and noise pollution.
2. Real-time monitoring of the pollutants released.
3. The detailed recording of the sensor data obtained on a particular date and time.
4. The data obtained from the sensors are displayed on both the LCD screen and webpage portal.
5. The system sends alarming or warning messages to both user's SIM card and email regularly when the emission of the pollutants from the industries goes above the pre-set value of the user.
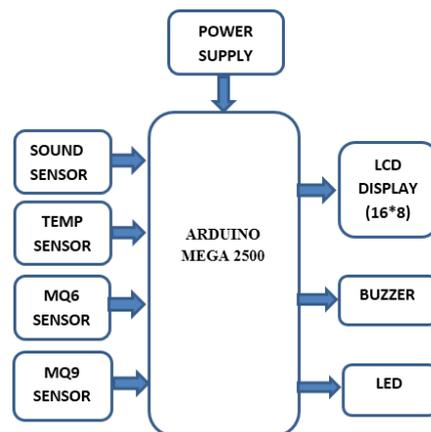
4. WORKING METHODOLOGY

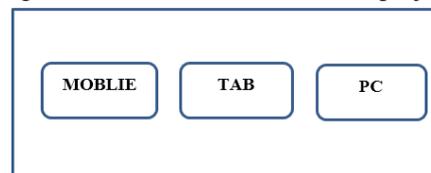Fig -4.1: Transmitter section of the project

Fig -4.2: receiver section of the project.

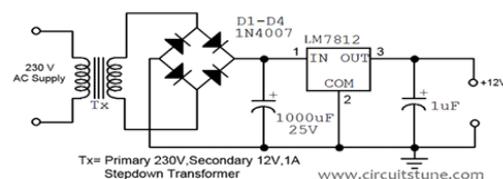5. HARDWARE DISCRIPTION

5.1. POWER SUPPLY UNIT

Fig -5.1: power supply unit

Initially, the Adapter having 9V 1A Output power with 5.5mm AC plugs. The circuit of the power supply unit consists of a bridge rectifier which rectifies the main AC input to the DC output which converts a 9V AC power to a 5V DC power which is supplied to the system, filter capacitor of 1000uf capacity which is connected in parallel with the output of the rectifier in a linear power supply. It is used to filter out the unwanted frequencies in the circuit. The 7805 regulator is connected in parallel to the bridge rectifier in order to provide the constant voltage to the system and an LED bulb in order to indicate the presence of the power.

5.2. MQ-6 sensor

Figure -5.2: MQ -6 sensor

The MQ-6 Sensor is used to detect the concentration of various combustible gases like propane, Butane, and LPG in the atmosphere; it also detects the presence of natural gases. The MQ-6 sensor can detect gas concentration nearly from 200 to 10000 ppm. The output of the sensor is dependent on the analog resistance. The maximum operating voltage is 5V.

5.3. MQ-9 SENSOR

Figure -5.3: MQ-9 Sensor

The MQ-9 Sensor is used to detect the concentration of CO in the atmosphere. The MQ-9 sensor is very sensitive to CO; the MQ-9 sensor can also be used to detect various other gases containing CO in them. Initially, the conductivity of the sensor is low in the clean or neat air, when the concentration of the gases increases the conductivity of the sensor increases the maximum operating voltage is 5V.

5.4. LM393 Sensor

Figure -5.4: LM393 Sensor

LM393 sensor is used to detect the intensity of the sound in the environment, it converts the difference in the air pressure into electrical signals. The sound waves produced will make the diaphragm of the sensor to vibrate, intern making the tiny magnets to vibrate which is present inside the sensor .this vibration induces the current in the coil which is a direct measure of the intensity of the sound. It develops a binary indication of the sound and also the analog representation of the sound obtained. The operating voltage is between 4-5V.
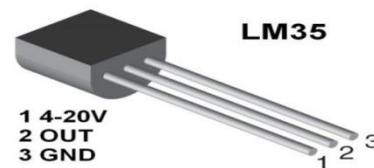
5.5. LM35 Temperature sensor

Figure -5.5: LM35 Sensor

The LM35 sensor is used to detect the ambient temperature. When there is a 1 degree change in the temperature the sensor shows a voltage difference of 10mV. Generally, an LM35 sensor has 3 terminals, an input terminal, an output terminal, and a terminal connected to the ground. It works on the principle that temperature is directly proportional to the difference in the voltage between the two terminals. It does not require any external calibration. It measures about -55 degrees to 150 degrees. The system uses an LM35 sensor to detect the temperature of the heat-treated water before letting it into the natural reservoir. The maximum output voltage is between 1.5V.

5.6. Arduino UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as

UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.
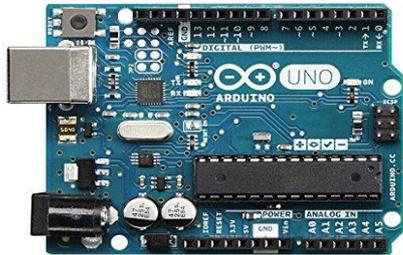

Figure -5.6: Arduino uno

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

5.7. LIQUID CRYSTAL DISPLAY (LCD) WITH I2C MODULE

This LCD screen is a 16x2 character LCD display with an I2C interface. It features two rows for displaying text, with each row capable of displaying up to 16 characters. The white characters will be displayed on a blue background, providing a clear and visually appealing display.

Fig -5.7. LCD Pin out

In traditional Arduino LCD display projects, there are often limitations in terms of available pins, especially when using Arduino Uno. Additionally, wiring and connections can become quite complex. To address these issues, we introduce this I2C 16x2 Arduino LCD display, which utilizes the I2C communication interface.
This means that it only requires 4 pins to connect the LCD display, including VCC, GND, SDA, and SCL.

By adopting the I2C interface, we can save at least 4 digital/analog pins on the Arduino, making the project's connections simpler and more convenient.

6. SOFTWARE DISCRIPTION

The Arduino Integrated development software is used to program the Arduino Mega 2560 microcontroller; the entire project is programmed using Embedded C programming language

7. RESULT

The IOT concept can be applied to a wide range of application. We implemented the use of IOT in Industrial pollution monitoring and this project, real time air pollution monitoring system based on IOT is presented. Real time monitoring of air quality parameters ensures that the industrial emissions levels are maintained throughout and helps us to track all the data in a single place (i.e) cloud and reduce the pollution based on the collected data.The implementation cost is very economical as the sensors and the microcontrollers are easily available. The online database system has increased the flexibility by updating all current parameters of the industries over a common server. The camera can be upgraded in future with image processing algorithms to enable a fully automated system for safety, such as fire alarm, gas leakage. This enables to generate automated control action in the absence of the authorized user.
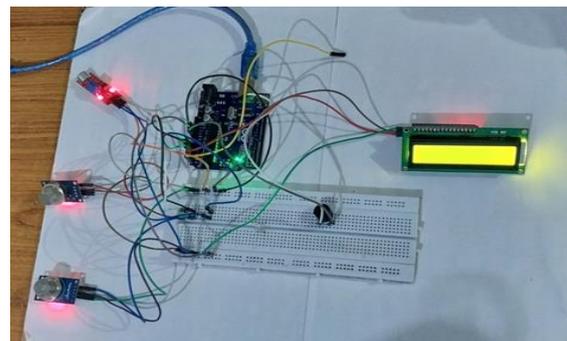

Figure -7.0: Result On IOT BASED INDUSTRIAL AIR, WATER AND NOISE POLLUTION MONITORING SYSTEM

CONCLUSION

The "Iot based industrial Air, water, and Noise pollution monitoring system" is designed to monitor and control the pollution caused by the release of harmful, untreated industrial pollutants in a costeffective and highly secured manner. This system is more effective than the existing system since it helps

the environmental pollution control authorities in monitoring the industrial environmental conditions with the help of 7 sensors interfaced to the advanced controller which collects and records the real-time data of various pollutants released by the industries through various means, which helps the authorities to keep control and decrease Air, Water, Thermal, and noise pollution caused by the industries. Also, the project webpage continuously records the data in detail along with its data and time of capture which cannot be erased or deleted and can get accessed to the sensor data on any date and time and Based upon the collected data, the respective action can be taken on controlling the environmental pollution.

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