IoT based Pollution Monitoring and Controlling using Arduino

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Abstract— **Industrial monitoring is the collection of information at different locations of industries and at regular intervals of time in order to provide the data which may be used to define current conditions. Due to the complexness of parameters large variations are found between different industries. To build a robust system that can measure the industrial pollution and help to cut back it and to decrease human interference in monitoring the industrial pollution to cut back pollution and provide a healthy environment for the workers to work in. The various industrial pollutants like smoke, radiation, over temperatures, are monitored using smoke and temperature sensors. These sensors will sense the pollutants from the organizations and give the signals to the Arduino controller. The Arduino controller produces the control signals to the GSM through UART using the MAX232 IC. When the sensors reach tolerated pollutant levels it will produce high signals to the controller. The controller processes the signals and gives them to the GSM module. The GSM module will send short messages to the registered mobile. Immediately through IOT, we can cut the power supply of those industries. That means when the signal receives from the IOT with the help of the GSM module, the Arduino controller provides the signal to the relay driver for turn off the power supply. This system inherits lots of advantages due to Arduino and IOT controller.**

I. INTRODUCTION

Pollution is an important factor affecting the quality of the lives of millions. Most of the pollutants in the air are a result of emissions from vehicles, factories and natural occurrences like volcanic eruptions and forest fires. When people breathe in contaminated air, they are exposed to many health risks, such as cancer, premature death or asthma attacks. In industries, the polluted air is emitted in the atmosphere which in turn increases the temperature causing Global Warming. Also, the machines in the industries produce pollution like Noise pollution, Radiation, etc. the Radiation produced by the industries can cause cancer even for their labors. It is necessary to monitor pollution and keep it under control for a better future and healthy living for all. Due to flexibility and the low-cost Internet of things (IOT) is getting popular day by day. With the urbanization and with the increase in the industries pollution is caused. In this paper, we propose a pollution monitoring and controlling system that allows us to monitor and control pollution in different industries of an area using GSM and IOT. The system uses sensors to sense the presence of pollution in the industries and constantly transmit this data. The sensors interact with Arduino Uno which processes this data and transmits it through GSM. This allows authorities to monitor smoke, radiation, temperature and different types of pollution in different industries and act against it. Also, authorities can control the pollution by cutting the power supply of the polluting industry. Hence we can control pollution effectually.

II. RELATED WORK

The industrial pollution is controlled using the monitored data. But there is a problem in storing big data. There are several methods are used for real-time data storage. [8]The Clean Wi-Fi network constantly monitors the air for pollutant gases, uses that information to feed a Big Sensor Data system, and uses the same data for the automatic configuration of the public Wi-Fi service, displaying information about the quality of the air to the user, and rewarding less Polluted areas with a better service. That way it raises public awareness about the state of air pollution and how important it is to reduce it, promotes the use of renewable energies and brings Wi-Fi connectivity to the people. But using more electronic components may consume more electricity. [12] Propose a new method that uses an interference alignment technique to mitigate interference effects in Wireless Sensor Networks. It overcomes the challenge arises in forming a data gathering network to maximize the network capacity. In the IA technique, multiple transmitters jointly encode their signals to intended receivers such that interfering signals are separated and eliminated. Simulation results demonstrate that compared to TDMA algorithms, which increase the performance of the network delay and throughput. [7] An experimental wireless system that extends beyond the hotspot's capabilities to provide wireless connectivity at distant areas and at a low cost. The system combines the paradigm of Wireless Mesh Networks with the Captive Portal technology to supply a large varies of Internet-based communication services and applications. Finally, some experiments in terms of context services and traffic modeling, and demonstrate that the developed system can be easily deployed in terms of coverage, management, and offered services. [9] Explores 5 key challenges during this field and supply a response through a detector information platform "Concinnity" which might take detector information from assortment to final product via a data repository and workflow system. This will activate the rapid development of applications built on sensor data using data fusion and the integration

and composition of models to form novel workflows.[11] Classify the prevailing works into 3 classes as Static detector Network, Community Sensor Network and Vehicle Sensor Network based on the carriers of the sensors. High spatial-temporal resolution is crucial owing to the restricted information handiness and non-scalability of typical pollution observation systems. This can be acquired by the concept of The Next Generation Air Pollution Monitoring System achieved by utilizing the advanced sensing technologies. However, there is a lack of 3D data acquisition ability and the flexibility of the sensor network. The comprehensive reviews and comparisons among these three types of sensor networks were also performed.

III. PROPOSED SYSTEM

Due to recent technological advances, the development material for little and low price sensors became technically and economically possible. Even though, Industrialization increase the degree of automation at the same time it increases the pollution by releasing the unwanted parameters in environment especially in industrial areas. So there should be a system to monitor and control the industrial pollution. Particular attention is given to factors which may affect human health and the environment.

The industrial observance is that the assortment of knowledge at completely different locations of industries and at regular intervals of your time so as to produce the information which can be wont to outline current conditions. Due to the complexness of parameters enormous variations area unit found between completely different industries. To build a solid system that may live the industrial pollution and facilitate to cut back it and to decrease human interference in observation the commercial pollution to cut back pollution and provide a healthy environment for the workers to work in also to make the industrial pollution monitoring a wireless system and to protect the environment from industrial pollution.

To build a robust system that monitors the industrial pollution continuously and indicates when there is an increase in the emissions using GSM and to control it through wireless technology called IOT. These enhancements may be accustomed to develop and implement its environmental policy and manage its environmental aspects. Furthermore, it is necessary for industries to develop and implement a pollution monitoring and controlling system. The industrial pollutions are not controlled since, so this project controls the power supply of industries using IOT. The block diagram consists of Arduino microcontroller, temperature sensor, smoke sensor, the radiation sensor, relay driver, relay, GSM, IOT. The input is given to the Arduino from the sensors. The input is processed and if the value goes beyond the threshold then the output is fed to the GSM. This helps to cut the power supply of the polluting industry through IOT.
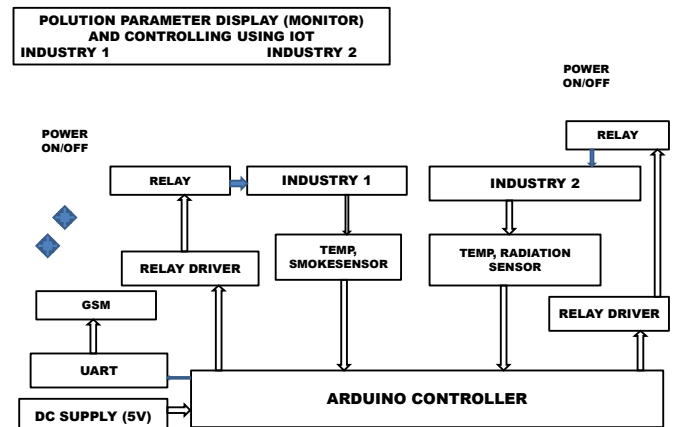
A. Block Diagram

Figure 1 Block Diagram

B. Operation

The various industrial pollutants like smoke, over temperatures, radiation are monitored using smoke, radiation and temperature sensors. These sensors will sense the pollutants from the industries and give the signals to the Arduino controller. The Arduino controller produces the control signals to the GSM through UART using the MAX232 IC. When the sensors reach tolerated pollutant levels it will produce high signals to the controller. The controller processes the signals and gives them to the GSM module. The GSM module will send short messages to the registered mobile. When the industrial pollution level detected, immediately through IOT we can cut the power supply of those industries. That means when the signal receives from the IOT with the help of the GSM module, the Arduino controller provides the signal to the relay driver for turn off the power supply. The proposed system inherits lots of advantages due to Arduino and IOT controller.

IV. RESULT

The Arduino board is chosen as the processor. Temperature sensors, smoke sensors, and radiation sensors are the sensors connected to the processor. The smoke sensor senses the smoke if it is greater than 613 it informs the processor and the processor immediately sends a message through GSM with the temperature recorded at that time. The same process will be done if the radiation sensor senses the radiation above 250.
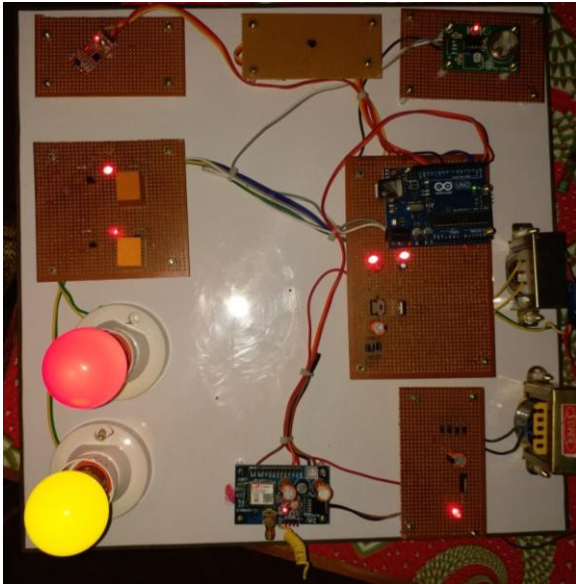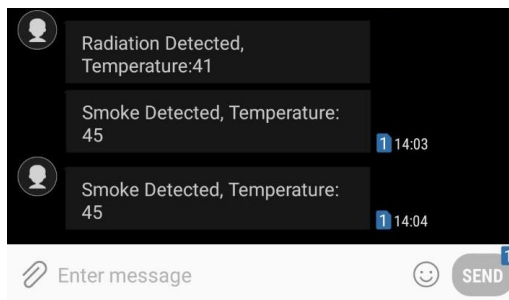
Figure 2 Hardware view

Figure 3 Message Received from GSM

When the pollution exceeds the threshold value a message is sent through GSM to the authorized person.

Figure 4 IOT Section

Immediately after receiving the message from GSM the power supply of the industry can be cut off through IOT.

V. CONCLUSION

The IOT based pollution monitoring and controlling using the Arduino system is designed to sense the smoke, temperature, and radiation. If any pollution is detected then the power supply of that industry will cut off. This will prevent further emissions of pollution. This is a robust system which is very useful in industries because of the increasing pollution due to increase in industries. The results of this project are accurate and hence can be implemented in any industries for the safety of workers and the environment. Each and every industry whether small scale or large scale should and must have this system to monitor the emissions. This system includes sensors that detect the parameters causing pollution. Whenever there is an increase in the level of these parameters the sensors sense the situation it sends as a message to authorized person through GSM. The authority can cut off the power supply of the polluting industry through IOT. The system is operated through the wireless system using the concept of IOT.

A. Future Enhancement

This IOT based pollution monitoring and controlling using the Arduino system can monitor only three parameters and hence can be expanded by considering more parameters that cause pollution especially by the industries. This system gives the availability of cutting power supply through the internet, it can be made to control like, if smoke rises above the threshold value then machines are terminated from working. Similarly, if the temperature is detected then exhaust fans are turned on. Many pollutants do not have sensors that sense them if available they are very expensive and hence building sensors for different parameters might be a future and very challenging task.

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