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CENTRE FOR RESEARCH

SHODH PRAVARTHAN

Research Grant

RP002 - AIR POLLUTION MONITORING AND CONTROLLING SYSTEM USING ROOF COMPUTING

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AIR POLLUTION MONITORING AND CONTROLLING SYSTEM USING ROOF COMPUTING

Abstract

Air pollution and its impact is one of the significant challenges for any manufacturing industry. Current situation of air quality control systems in our country is based on information monitored few times a day. Obtaining accurate results, triggering regulatory actions whenever pollution occurs are also prohibitively expensive by ambient pollution monitoring equipment in most companies because industrial companies can rely on the local air quality monitoring network or invest in their own equipment. This Project helps to monitor industrial air pollution based on ROOF architecture. This framework enables sensor and other IoT devices data to be delivered within the industry. It provides various decision and automation tools that operate autonomously within the context of the local environment. An accurate real-time response allows regulatory agency/person to take necessary actions. The proposed system reduces human health effects of industrial air pollutants, monitors the health of industrial components and potential damage to other aspects of the environment. As monitoring is done seamless, we can send and share monitoring news at real time too. Positioning, analyzing and synchronous display can be done with the help of an UI.

Problem Statement

Air pollution in developing countries is increasing at a high rate, as a result of rapid industrialization and growing number of vehicles. Therefore, governments of these countries are framing regulations to curb air pollution. This is resulting in increased demand for devices for monitoring air quality in countries such as China and India, which, in turn, is creating lucrative opportunities for the air quality monitoring market players.

The aim of the project is to provide important information both for taking real time decisions based on triggers set for the various gas sensors. The gas sensors used in the Air monitoring system are “MQ2, MQ7 and MQ135” which are capable of monitoring various proportions of gases such as carbon monoxide and various other combustible gases line “LPG, Methane”. The system should provide a maintenance schedule for devices which allows the user to know the failure of the component and trigger mail alerts maintenance person.

It has a backup system that backups the sensor data to the cloud at frequent intervals of time which helps in providing analysis of the environment. The system tends to be more effective then cloud systems as there is a more reliable control over the entire system from the remote locations as well as the system does not require to be connected with the internet at all times. The system can be deployed at various places such as for personal and Industrial use at home and hotels e.g. “Kitchen” and in industrial warehouses that keep perishable items and harmful items that can release harmful gases, also in mining and gas filling stations.

Proposed work presents effective use of the Internet of Things to address industrial pollution. Continuous monitoring of air quality is obligatory to ascertain level of pollution and presence of certain harmful pollutants. Various gas sensors may be pressed into service for this purpose. This system design represents the working flow based on IOT industrial pollution monitoring and controlling

Objectives

Various government organizations and market vendors are actively focusing on research to develop, evaluate, and implement new air quality technologies. Hence, advancements in technology, which are resulting in the development of low-cost and portable air quality monitoring sensors, continue

to offer growth opportunities to the market players.
Objective of the proposed project includes the following modules
Dash Board: It provides the display for monitoring the status and real time flow of data from various sensors in the form of interactive graphs.

Device Maintenance: Allows adding device and setting maintenance for those devices which are active.

Alert Management: allows to set and delete alerts for the sensor reading and to start and stop them.

Data Backup Management: Allows the system to back-up the data from the sensors

to the user provided cloud account.
Alert Report: Provides a concise report on the alerts sent.

Maintenance Report: Provides a report on maintenance pending and completed.

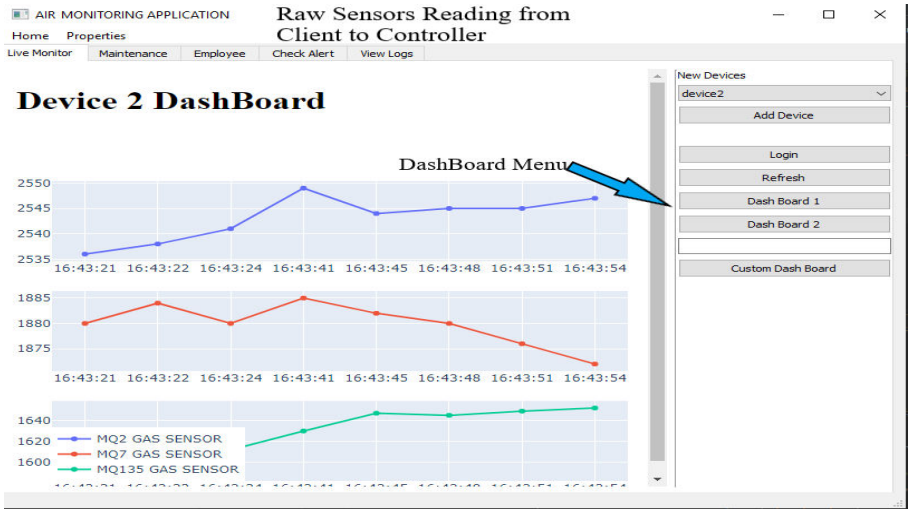
Methods

The system consists of components which are readily available in the market, cheap and efficient and can provide accurate readings. This system uses GSM and WiFi modules which allow the modules to transmit the sensor reading for observations and trigger creations. This system does not require to be connected to the cloud or internet 24/7 as the system contains a secondary controller which controls when and how the triggers are triggered by the system. Optionally the system provides maintenance alerts that help the user to identify issues with the system when they occur. Data plays a key role in evolving a system to be more accurate, this is achieved by the data backup provided at regular intervals which is stored in the personal space of the cloud user. Results

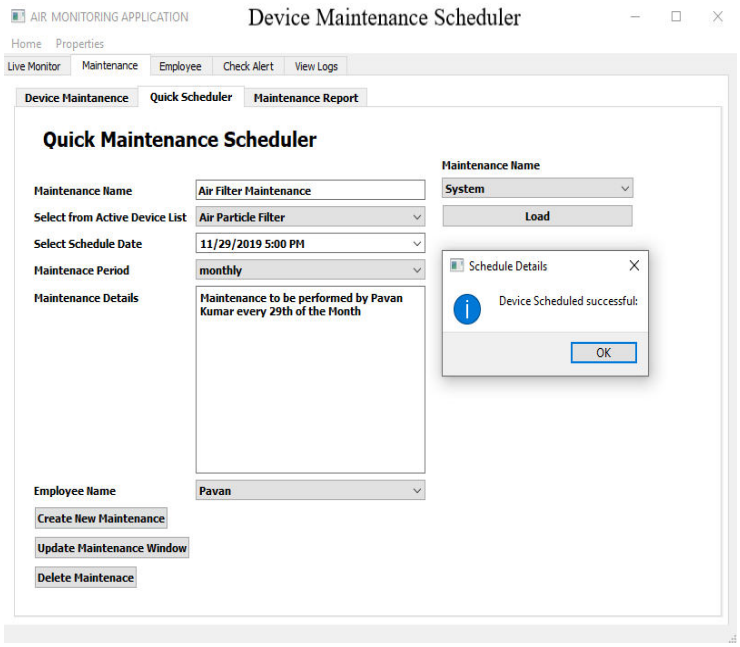
Results

The various industrial pollutants like smoke, over temperatures, radiation is 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 Raspberry Pi controller produces the control signals to the GSM through UART. 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 Air Quality Monitoring System will display the values in the laptop or the LCD display. It has the dashboard to display the values that is sent by the gas sensors. The data that is sensed by the gas sensors is sent through the ESP32 WIFI module to the display device that is connected to the same network that ESP32 is connected. This data is then calibrated in the at the display device and displayed in the dashboard.

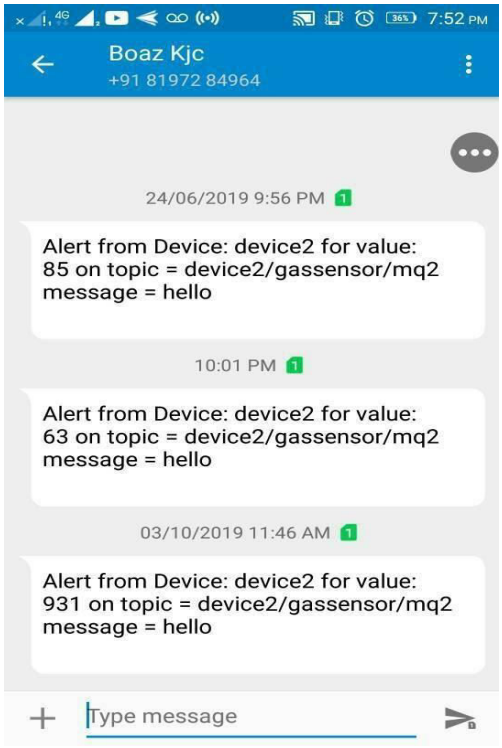
Dash Board



Device Maintenance Scheduler



Alert Message for device maintenance.



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