GNANAMANI COLLEGE OF TECHNOLOGY

Department: BIO MEDICAL ENGINEERING

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TOPIC – AIR QUALITY MONITORING

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AIR QUALITY MONITORING

INTRODUCTION:

The paper presents a network of indoor air quality monitoring systems, fire, and the prevention of accidents due to gas leakage. This portable device has embedded sensors that can be mounted at houses, malls, hospitals, garages, and industries. This is an IoT-based project. In recent days, air pollution has reached alarming levels in Pakistan especially in metropolitan cities According to the Ministry of Natural Resources and Environment, there are a lot of

factors that add to pollution. For instance, emissions from vehicles, development projects, industries, forest fires, power generation increase the concentration of CO2 [1].Air pollution greatly affects human health and leaves a significant influence on industry workers and the people around them. Numerous harmful gases affect the air quality and make it unsafe to breathe in. Also, there are some gases like methane gas that can cause major accidents if not eliminated or at least detected at the correct time [2]. In Pakistan, industries are more focused on equipping the fire extinguisher detectors rather than the air monitoring detector. Focusing on an individual's health is also very vital because this type of minor negligence leads to severe health concerns and sometimes even death.

System Model:

The system is designed by using hardware components operated by software and Programming tools that are discussed below.
Hardware Components :

The hardware components used in the system is NodeMCU as a micro-controller (see Figure 1). NodeMCU gives the ability to openly perform editing, modification, and Rebuilding of project programs and functions through different programming environ-Mentz [7]. MQ series gas sensors include MQ-7 to detect carbon monoxide [5], MQ-4 to Detect methane [6], MQ-2 to detect smoke and LPG [7], MQ-137 to detect ammonia gas, And MQ 135 to detect overall pollutants [8]. These sensors detect gasses like Methane, LPG, and overall air quality. MQ Series Gas Sensors are composed of micro-AL2O3 Ceramic tubes, Tin Dioxide (SnO2) sensitive layer, measuring electrodes, and heater, which's fixed into a crust, composed of plastic and stainless steel net [9]. MG-811 gas senor to Detect carbon dioxide is used from MG series sensors. This sensor has a rapid response and Recovery

characteristics with low-temperature dependency and humidity [10].

Software Components :

Arduino IDE is used to program NodeMCU to run the system. It is a platform used for compiling and uploading programs to the microcontrollers. It is exceptionally user-friendly and easy to use; therefore, even non-specialists can use it. This platform supports C and C+ [13]. Also, Thing Speak to show the graphical results and Push Bullet for notification purposes is used, and our own created Web App is used to collect data from both apps and present it on one platform.

System Design:

This project's methodology comprises investigating the rising air pollution levels in a specific environment. To precisely detect the gas level at each site or area, the deployment of different types of sensors has been made necessary. Different sensors have been connected to the microcontroller with the help of ADS1115. Each sensor measures analog values of different pollutants and the real-time data from the sensors is being processed and delivered to the microcontroller via ADC for further processing. After processing NodeMCU will send the sensor readings to the Internet and LCD connected to the microcontroller. Thing Speak is used as a medium to read the results from NodeMCU. As long as NodeMCU connects to the Internet, the result readings can be monitored every time. We have integrated our sensors with NodeMCU using IoT.

Results and Discussion:

We tested out the project in a highly polluted and highly crowded closed environment in the metropolitan city, and results suggested that the air there is unhealthy. Data was sent to Thing Speak by the NodeMCU; it was then collected by the web application that we created, the comparison was made against the

range of pollution levels stored, and then it was declared whether the air was healthy, unhealthy, or hazardous. We were able to acquire data from all the sensors but are discussing the findings of some of them in the subsequent paragraphs.

Conclusions:

In this paper, we have presented the results of a air quality and hazardous pollutants monitoring system using IoT. We have developed the hardware composed of NodeMCU and have incorporated a range of sensors capable of detecting and gauging various kinds of hazardous gases and pollutants. Such a system can be further improved to make marketable product.