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AI to Analyze and Extract Data to Gain Insights about the Spread of Pollutants

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Abstract - *The change of ecosystem and the surrounding atmosphere by different forms of pollutants (Chemicals and energies) are called environmental pollution. Pollution affects the climate most.. The issue of environmental pollution and climate change has become an international concern due to their affects to the physical and biological entities of the environment. The main objective of our project is to find out the percentile value of the pollution causing elements (gases) such as carbon dioxide, carbon monoxide, etc. Air quality sensors are being use here in order to analyses the air. This system analyses the air and produces significant output. The output generated is in the form of LED indications, indicating whether the particular gas is present is in the air or not. This system has reduced hardware cost as compare to currently working systems.*

1. INTRODUCTION

The presence of particulates, biological molecules, or other harmful materials in the Earth's atmosphere causes air pollution, which leads to diseases, human casualties, and damage to other living organisms such as animals and food crops, or to the natural or built environment. Air pollution may originate from anthropogenic or natural sources. Large-scale industry, which is increasingly positioned outside metropolitan regions and urban areas, is not considered to be the primary source for the inferior air quality. Recent studies indicate that road traffic is the main source of urban air pollution. Road transport is responsible on average for 25% of all harmful emissions. For air pollution control, we need to measure the Air quality, Nitrogen Dioxide in air and Carbon Monoxide in air. We need Air-quality sensors to measure the level of air pollution. To communicate with sensors and produce a desire output, here we are using Arduino boards and having an interface where we can see the results. The main goal of our project is to develop low-cost, mobile, air quality sensor nodes and to investigate whether such systems can provide reliable results and indications about air quality and can be used in practice. This approach should provide easier access to air quality monitoring data to a wider audience of citizens, scientists and control authorities. This will help lot of Government organizations or Non-government organizations to develop some strategy in order to reduce air pollution of the polluted areas.

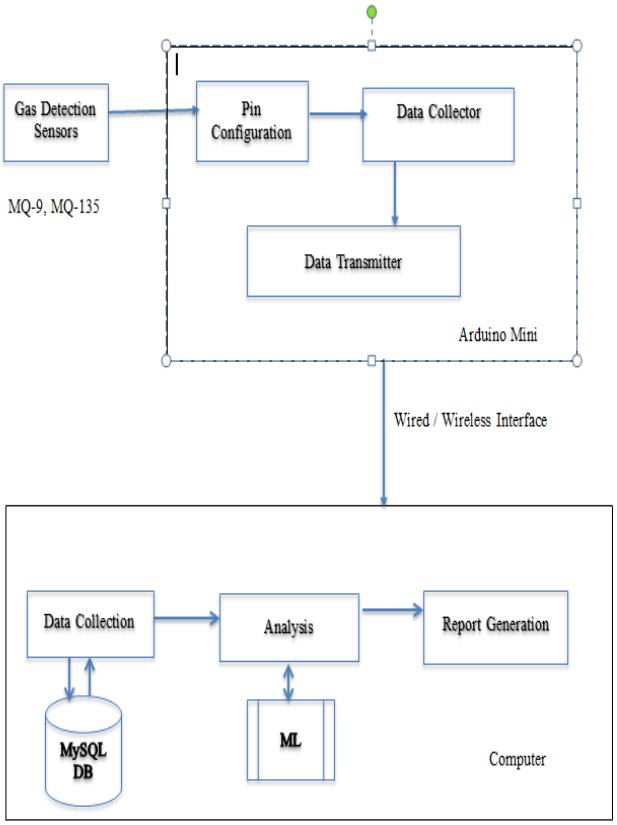
1.1 EXISTING SYSTEMS

According to the IEEE paper IEEE Air Quality Monitoring in Urban Environments dated on March 2009. We have summarized the Quality of the air in city and urban areas is the most important factor that directly influences the incidence of diseases and decreases the quality of life. Taking appropriate decisions in a timely period depends on the measurement and analysis of the parameters of the air, which creates the need for the development of real time air quality monitoring. According to the IEEE paper IEEE to the Design of Air Quality Meter and Pollution Detector dated on 2014. We have summarized the. This work describes the design and implementation of an Air Quality Meter and Air Pollution Detector. Using the Bluetooth communication technology and microcontroller board of Arduino, the work is implemented. A few sensors are also used such as temperature and humidity sensors and a few gas sensors to monitor changes.

1.2 CHALLENGES IN EXISTING SYSTEMS

Careful placement of sensor nodes requirement (This is because of the location dependence of air pollutants.)Large number of sensor nodes requirement (Data with sufficient geographic coverage and spatial resolution are only achievable by increasing the number of the stationary sensor nodes.)Resource wasting in certain level (The stationary sensor nodes are in sleep mode most of the time because continuously updating data at one location is pointless Inconveniences of calibration and maintenance (The professionals need to visit all stationary sensor nodes, which is a time and manpower consuming task, to perform operations.)2-Dimensional data acquisition (Only the air quality of urban surface is monitored.)Customized network requirement (A customized wireless or wired network is required when the cellular net.

2. PROPOSED ARCHITECTURE AND IMPLEMENTATION



The System architecture mainly consists of three components, namely the arduino circuit , the gas sensors and the user machine or server machine. Here we are using gas sensors to sense the gases present in the surrounding. The gas sensor being used is MQ-135. The arduino circuit is used to control and manage the external components like sensors and wifi module.. In the back-end, the data from the sensors is gets processed. To process the dara, we're using machine learning algorithms to predict the future observations.

Gas Sensors

Operating principle: MQ-135 gas sensor applies SnO2 which has a lower conductivity in the clear air as a gas-sensing material. In an atmosphere where there may be polluting gas, the conductivity of the gas sensor raises along with the concentration of the polluting gas increases. MQ-135 performs a good detection to smoke and other harmful gas, especially sensitive to ammonia, sulfide and benzene steam. Its ability to detect various harmful gas and lower cost make MQ-135 an ideal choice of different applications of gas detection. You can either use the digital pin or the analog pin to do this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned off meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this particular concentration the digital pin will go high (5V) else will remain low (0V).You can also use the analog pin to achieve the same thing. Read the analog values (0-5V) using a microcontroller, this value will be directly proportional to the concentration of the gas to which the sensor detects. You can experiment with this values and check how the sensor reacts to different concentration of gas and develop your program accordingly.

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The

board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

3. DATA PROCESSING OF THE SYSTEM

According to the relationship between current pollutant concentration and the pollutant concentration in the past 24 hours, a 24 hours' prediction network is established. The average pollutant concentration is adopted to train network and then predict the pollutant concentration per hour in next 24 hours.

3. CONCLUSION

The proposed system was designed and tested. The proposed system measures the air quality of a particular area with the help of the hardware module fixed at certain locations like lamp posts. The proposed system collected real time pollution statistics using various sensors which monitored percentage of gases like ammonia, oxygen and carbon monoxide. Using these inputs the algorithm predicted the air quality. Although there are a huge number of existing systems, the proposed system provides a unique feature by transmitting calculated information for traffic control purposes if air quality is detrimental. The additional benefit of the proposed system is the mobile application which will help the common man understand and be aware of the pollution status of localities. This awareness can also lead to people making a contribution directly to reduce pollution levels.

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