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AUTOMATIC DETECTION OF NOISE AND AIR POLLUTION BASED ON IoT

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***Abstract*— In the present era, air and noise pollution is the growing hazardous issue. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. We propose a system an air quality as well as sound pollution monitoring in a particular area and to identify the particular polluting vehicle. The developing system is placed in the vehicle. The sensor is interacting with vehicle muffler to sense presence of harmful gases/compounds and constantly transmit this data to Arduino. This data are transmitting to the owner of the vehicle over the internet. The system also monitors the polluted areas and the sensed data are transmitted to the authorities over IoT. The vehicle which are reach the traffic signals and honking areas it automatically sends the arduino collected data to the raspberry pi over Zigbee. The raspberry pi sends the data, vehicle number, engine number, owner address to the corresponding authorities to monitor pollution in different vehicles, areas and take action against it. Also authorities can keep a watch on the noise and air pollution near schools, Hospitals and no honking areas.**

***Keywords*—Noise sensor, Gas sensor, Raspberry Pi 3, Arduino UNO, Zigbee, Web camera, SCU (Signal Control Unit).**

I. INTRODUCTION

The presence of particulates other harmful materials in the Earth's atmosphere causes an air and noise pollution. Now-a-days Air and Noise pollution leads to damage living organism. So we want to monitor air quality and noise quality for a healthy living for all. Here we propose an system that can monitor the air as well as noise pollution in a particular areas and vehicles through IoT. System uses air sensor to sense presence of harmful gases/components in the air and constantly transmit this data to Raspberry pi. The system keeps measuring sound level as well as air quality and reports it to the authorities over IoT. This allows authorities to monitor air and noise pollution in different areas and take an action against it.Also authorities can monitor the noise and air pollution near schools, hospitals and urban areas and if system detects air and noise issues, it can alert authorities with specified area and vehicle over the IoT. So they can take measure to control the air and noise pollution.

II. RELATED LITERATURE

The proposed consist of the air and noise pollution monitoring system contains sensors to monitor the interested pollution the sensors will send the collected data to the cloud. Analyzing the data, a report will be generated. Based on the report, the action will be taken against pollution [1].The design and development of IoT based vehicular pollution monitoring system for green revolution. The hardware architecture and software implementation are discussed in length. The performance of the system is also verified using IoT technology. The designed smart intelligent environmental system monitors the pollutants produced by the vehicles and also warn the vehicle owners to control the pollution. The system also sends the pollutant levels data to the server for future analysis. The air pollution agencies can able to analyze the data and also detect the vehicle registration numbers that causes more pollution in the atmosphere [2].

Once the pollution level exceeds permissible level, motorists may be avoiding that particular area. It may be done using the same Internet of Things. It may be enable to reduce the pollution level over a certain span of time. This framework may be integrated as an enabling tool to design intelligent transportation systems for Smart city. At a busy intersection where number of vehicles pass at any particular time, pollution level may increase due to

the emission of gases from any of the vehicles. Emission is expected to be high, here crops up the challenge to identify the particular vehicle which actually pollutes as numerous vehicles jostle for space there [3]. This project focuses on measuring the various sound levels present in library all in a bid to limit unnecessary noise in the library through audio announcement once the critical sound level has been exceeded. It measures sound level in decibels and can be used for activities [4]. A Wireless distributed mobile air pollution monitoring system was designed, implemented and tested using the GPRS public network. The pollution data from various mobile sensor arrays is transmitted to a central several that make this data available on the internet through a Google Maps interface. The data shows the pollutant levels and their conformance the local air quality standards [5].

III. DESIGN OF THE PROPOSED SYSTEM

The frame work of the proposed system uses IoT to address the polluted areas and polluting vehicle in the real –time applications. The Air and Noise sensor are used to monitor the pollutants continuously to maintain the quality of environment.

At the proposed system, the gas sensor and the noise sensor are integrated along with Raspberry Pi3.This system are placed in signals, schools, hospitals, no honking areas and vehicles. Whenever the sensor are sensed the data in the surroundings where the system are placed, the 360^0 relay camera rotates the mode and snap the image of the polluted areas and send the data to the corresponding authorities over the IoT. The system are also detects the polluting vehicle. The vehicle are also consists of air and noise sensor are sense the data and are integrated with the arduino. The arduino are interact with Zigbee and sends the sensed data to the system which are placed in the surroundings. Over the IoT the sensed data are send to the corresponding authorities.

IV. EXPERIMENTAL SETUP OF THE PROPOSED STSTEM

The block diagram of the experimental setup of the proposed system for monitoring pollution. The development of the proposed system is categorized into two parts: (i) hardware implementation and (ii) software implementation.

A. Hardware implementation:

The hardware of the proposed air and noise pollution monitoring system consists of Raspberry Pi3,Arduino,Gas sensor, Noise sensor, Signal controlling unit, Analog to Digital converter. The developed air and noise pollution monitoring system is shown the figure

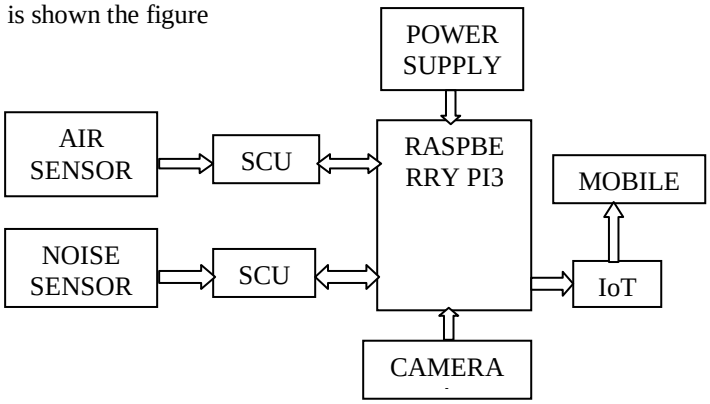

Fig 1(a): Block diagram for pollution monitoring system

i.Raspberry Pi3: The Raspberry Pi is a credit card sized computer that plugs into your TV and a keyboard.It is capable little computer which can be used in electronics projects.It is act as aMicrocontroller to control all the process in the system.LAN cable and camera are connected to it.

Fig 1.1: Raspberry pi3

*ii.Arduino:*The "Arduino UNO" board is a Microcontroller based on the ATMEGA328.It has 14 digital input/output pins,16 MHz ceramic resonator, an ICSP header, a USB connection,6 analog inputs, a power jacket and a reset button. It is placed in the vehicle which can act as a transmitter.

Fig 1.2: Arduino

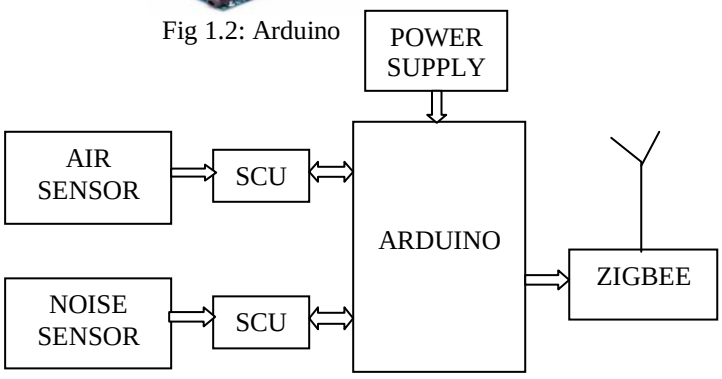

Fig 1(b): Block diagram for vehicle manufacturing system

iii.Noise sensor: The Microphone also called as "MIC" is a sound transducer that can be called as a "sound sensor".This is because it produces an electrical analog output signal which is proportional to the "acoustic" sound wave that can sense the noise level.

Fig 1.3: Noise sensor

iv. Gas sensor: The theory of operation of the not wire mass gas sensor is similar that of the not wire anemometer.When airflows past the wire, the wire cools, decreasing its resistance, which in turn allows more current to flow through the circuit.The supply voltage is constant.

Fig 1.4: Gas sensor

v.SCU: SCU (Signal Control Unit) is used to adjust manually as zero. The sensor are continuously sense the level of pollution. Hence it is used to span at initial level

Fig 1.5: Signal Control Unit

vi. IoT: The "Internet of Things" has two main parts; internet being the backbone of connectivity and things meaning objects and devices. In a simple way to put it, you have "things" that sense and collect data and send it to the internet.

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vii. Zigbee: Zigbee Communication is especially for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs) and it is the product from Zigbee alliance. The Communication standard defines physical and media access control (MAC) layer to handle many devices at low-data rates.

Fig 1.6: Zigbee

viii. Camera: A Camera is an optical instrument for recording or capturing images, which may be camera a may work with the light of the visible spectrum or with other. When you press the button take a photograph with a digital camera, an aperture opens at the front of the camera and light streams in through the lens.

Fig 1.7: Camera

B. WORKING PRINCIPLE

The block diagram of the experimental setup of the proposed system for monitoring air and noise pollution in the polluted areas is shown in fig 1.The system can be placed in the signals.Here, the gas and noise sensor are sense the amount of data. Amplifier role is to sense the low power signals from a bit line that represents a data bit. SCU (Signal Control Unit)is used to adjust manually as zero and span control are provided for calibration of retransmitted signal. Raspberry Pi3 is a controller to control all the action performed in a system. Web camera is used to snap the image. Then the controlled data are sending by the IoT (Wi-Fi, Zigbee). The message and mail are seen in the mobile phone or Pc with the image.

The block diagram of the experimental setup of air and noise pollution in vehicle is shown in Fig 2.This system can be placed in vehicle. Here, the gas and noise sensor are sense the amount of data. Amplifier role is to sense the low power signals from a bit line that represents a data bit. SCU (Signal Control Unit) is used to adjust manually as zero and span control are provided for calibration of retransmitted signal. Arduino is a controller that controls the performance of the system. LCD is

the display used for in Notebook and other smaller computer. It is thinner than CRT (Cathode Ray Tube) Technology .Web camera is used to snap the image. Then the controlled data are send by the IoT (Wi-Fi, Zigbee). The message and mail are seen in the mobile phone or Pc with the image.

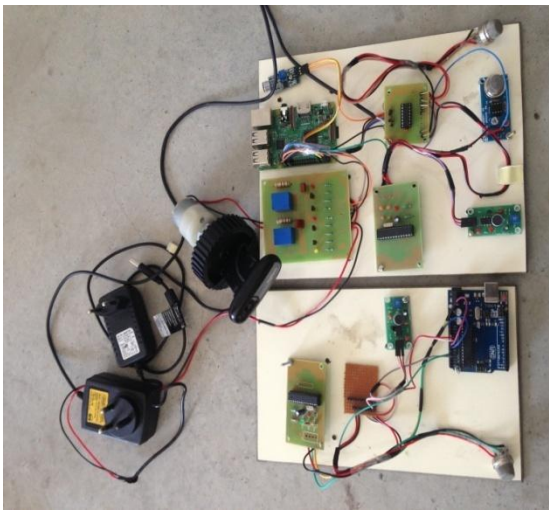

Fig 2: working principle

C. Flow chart

The Flow chart is explained the flow of proposed method is shown in fig 3. The system is starts to work on the sensor. The sensor which are the best choice to monitor the air and noise pollution. It can sense the level of pollution as a harmful gas and components which are cause the air pollution. It also monitors the unwanted sound that causes in the traffic over the horn and industry over the machinery. These levels are comparing with the normal levels which are not making harmful or hazards to our healthy. Then, the sensed value is greater than the normal values. The sensed data are sends to the raspberry pi3 which one are act as a microcontroller. 360^0 relay camera are used to snap a image of the particular area. The image of the polluted area and the content of the polluted levels are to the corresponding authorities by the Zigbee module. The messages are sending to the authorities by the mail or messages.

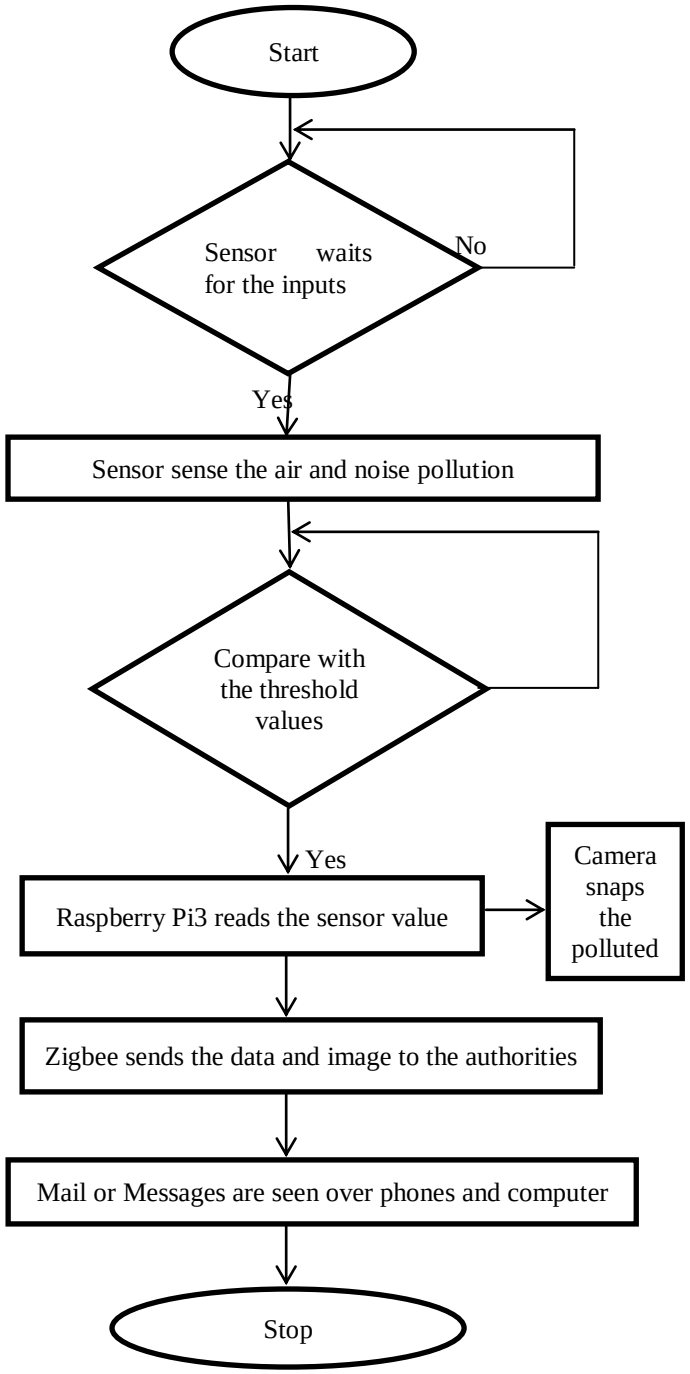

Fig 3(a): Pollution monitoring method

The structure is used in the vehicle during the manufacturing of automobiles. This system is similar to the above system which is combined to perform in effective manner. It also consists of the sensor that used to detect the

air and noise pollution the vehicle. The sensed values are compared to the reference values to identify which of the vehicle are producing the harmful gases and the contamination of noise. This system has an arduino to collect the data and acts as a microcontroller. The arduino is sending the data to the owner of the vehicle over the Zigbee protocol.

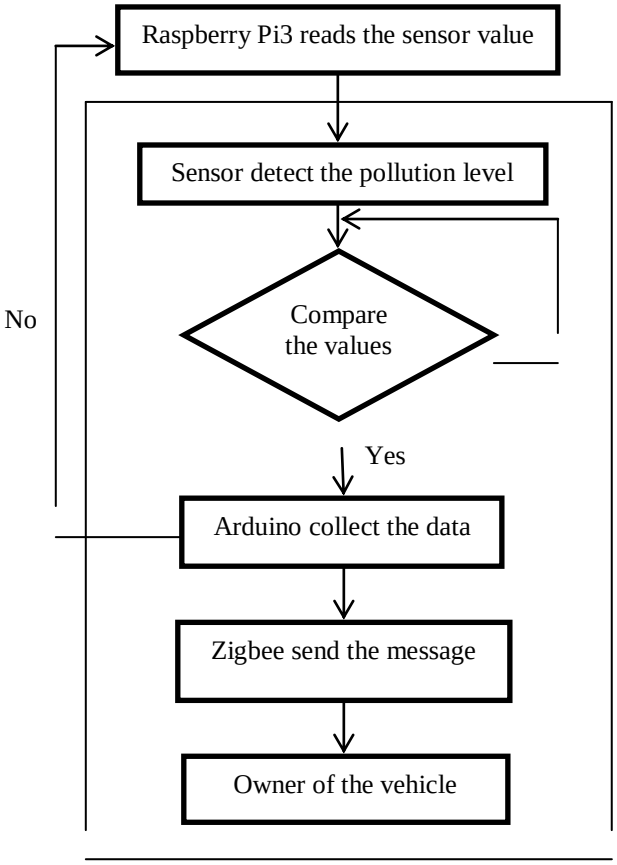

Fig 3(b): Vehicle monitoring method

The messages are not concerned by the user then it has one future that when the vehicle are cross over the traffic ,schools, hospitals and some no honking areas, it can able to transfer the data to the raspberry pi system which are placed in the often polluted areas. Over the Zigbee in the raspberry pi system it sends the message and mail to the RTO officer as vehicle number, Engine number, owner address and phone number.

V.CONCLUSION

The System to monitor air and noise pollution can be increased camera snap an image of the polluted areas and send the mail or messages can be sent the corresponding authorities, nearby police station and RTO offices. This system also monitors the air and noise pollution of the vehicle. By adding this system to the vehicle it can detect the pollution level and indicate to the owner through mail or message.

It can be enhanced by adding wireless network card for storage values from sensors attached to raspberry pi IoT technology for communicate the system.

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