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IOT based Air and Sound Pollution Monitoring System

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Abstract*: The project focuses on a solution to monitor the air and noise pollution levels in industrial environment or by using wireless embedded computing system a particular area of interest is proposed. The technology like Internet of Things (IOT) is included within the sort of solution which is outcome of merged field of computing and electronics. For monitoring the fluctuation of parameters like noise and pollution levels from their normal levels during this case the sensing devices are connected to the embedded computer system. For the need of continuous monitoring, controlling and behaviour analysis this model is adaptable and distributive for any infrastructural environment.
Keywords: IoT, Wireless embedded computing system, Air and noise pollution.

I. INTRODUCTION

In this era of modernization, technologies are advancing rapidly. Every day realize some new technology coming in market to simplify lives more than ever. Back in time checking the pollution a really "> during a particular area was a very tedious task which wasn't very efficient also. With the increasing pollution and advancing technology various new methods were introduced to stay an eye fixed on the rapid increase in pollution more efficiently. Internet of things is one among the newest works that has been wiped out this path. The increment in use of internet and therefore the interaction of human with machine gave rise to IoT It allows exchange of data among various devices like fridge, washer, automobiles, watches etc.

This exchange of data takes place with the assistance numerous sensors. The account for the success of IoT is its efficiency and makes it a feasible technology at low cost. Air and noise pollution are two main constituents that have the foremost adverse effect on humans also because the entire earth. Therefore, it's vital to see and control it. Traditional methods involve manual work in which data loggers used to visit the site to collect the data, analyse it and perform comparisons to provide the output which was very lengthy and time consuming besides being inefficient. The pollution monitoring system involves use of sensors which measures the sound pollution concentration and level of harmful gases like CO and SO2 which mainly pollutes the air. Comparisons are done automatically using previously stored data in database and output is stored on cloud to form it accessible from remote areas. It involves description of the system that presents its output with the help of an android application which the user can download in their mobile phones and access it whenever they want. This device may be a useful asset to save lots of precious lives of individuals and property. This project proposes and analyses a system which is used for air and sound pollution monitoring. The system is fully Internet of Things (IoT) based and highly desirable in field of pollution control. In this system can detect the level of pollution (Air or Sound) time by time. The project explains the different units such as hardware and software used in the proposed system and also explains the modelling and working of the basic components used in the proposed system such IoT and its working, Microcontroller (Arduino Uno R3) and its architecture, Gas sensor and its features, Sound sensors and its specifications and ESP8266 Wi-Fi Model.as a society need to make sure that all the pollution levels are maintained to the minimum, both first and second tier cities in Indian perform extremely poorly in cases of Air and Sound pollution India tops the world in pollution related deaths, accounting to 2.5 million deaths of the total 9 million worldwide. project will be a boon to the society as project will be making sure that every individual will be able to keep a track of the pollution.

II. BACKGROUND

Some of the prevailing instruments for pollution monitoring are Fourier transform infrared (FTIR) instruments, gas chromatographs, and mass spectrometers. These instruments provide fairly accurate and selective gas readings. The existing monitoring system largely uses smart transducer interface module (STIM) with semiconductor gas sensors, which uses the 1451.2 standard. STIM was found to an efficient monitoring system except for the facility requirements and skill to expand for giant deployment. Some of the implemented systems are:

In 2014, Dan Stefan Tudose, Traian Alexandru Patrascu, Andrei Voinescu, Razvan Tataroiu, Nicolae Tapus et al. [1] proposed an environmental air pollution monitoring system that measures CO2, NO2, CO, HC & NH4 concentration using mobile sensors in urban environment. The acquired information about pollution in surroundings is then stored on central on-line repository system periodically. It uses a wireless GSM modem connection for transferring data to a central computer. Also, the appliance can share the info publicly by displaying it on a fanatical internet site. In 2012, Amnesh Goel, Sukanya Ray, Prateek Agrawal, Nidhi Chandra et al. [4] proposed a wireless sensor network to monitor air pollution levels of various pollutants due to environment changes. A wireless network is comprising of large number of sensors modes. This system proposes a method which mainly focuses on longer sustain time period of sensor network by effectively managing energy in sensor network, effectively processing of collected information and less overhead in transferring information between various sensor nodes. In 2013, Wenhu Wang, Yifeng Yuan, Zhihao Ling et al. [5], in order to comply with requirements of oil and gas industry, an air quality monitoring system was proposed based on ZigBee wireless sensing technology. It uses ZigBee wireless network to send results to the monitoring centre in order that, if some abnormal situations happens, a fast warning are going to be generated to remind staff. John, I Curries, Graham Capper proposed how Road Traffic is responsible to the Pollution and its Effect on the Environment. The monitoring period was chosen to hide a period of street closures and hence plan to isolate a number of the traffic related pollutants. Traffic flow information was available for the world, from which traffic emission data was wont to test an integrated model for street canyon pollution**.**

III.PROPOSED SYSTEM

R5F100LEA microcontroller from Renesas RL78 series which may be a 16-bit microcontroller is employed to implement this project. Microcontroller acts because the heart of this project, which controls the entire system. It contains of Flash ROM 64KB, RAM 4KB and Data Flash 4KB, and its high-speed on-chip oscillator, Self-reprogrammable under software control, 58 GPIO's, 3 UART's, Simplified I2C, 10-bit resolution ADC, 28 Interrupt Sources, ISP programming support etc.

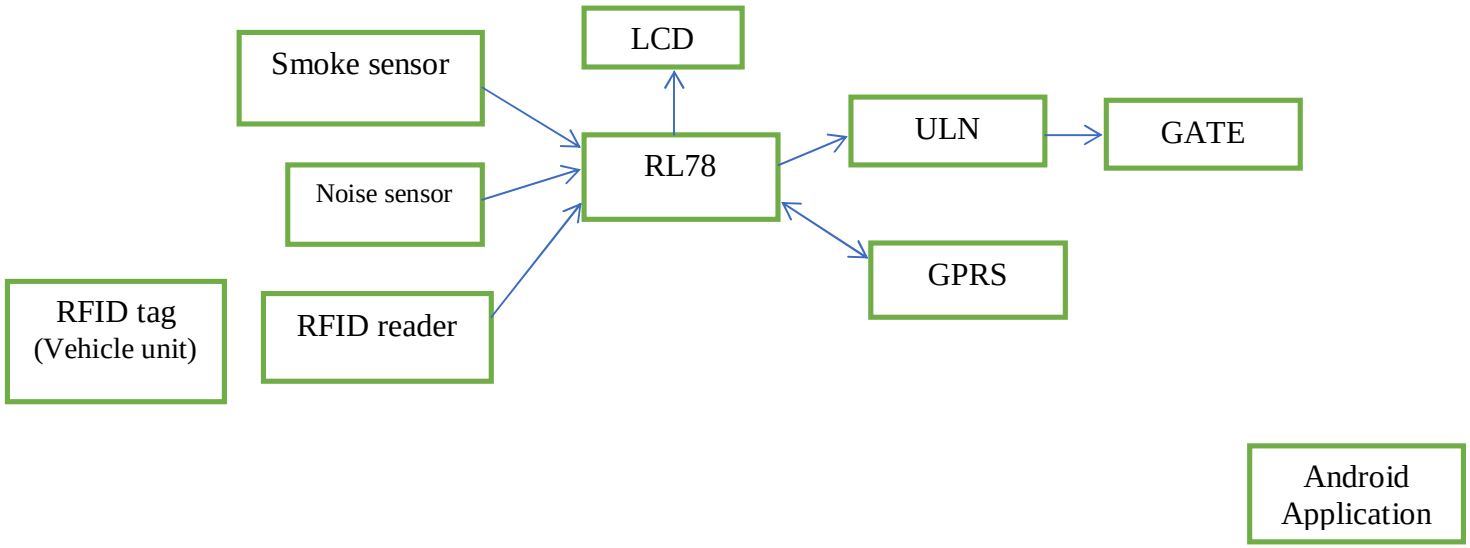

Fig 1: Block diagram

Many embedded systems have substantially different designs consistent with their functions and utilities. In this project design, structured modular design concept is adopted and the system is mainly composed of a single microcontroller, smoke sensor, RFID reader and tag, noise sensor, stepper motor, ULN stepper motor driver and GSM/GPRS. The microcontroller located at the centre of the diagram forms the control unit of the whole project. Embedded within the microcontroller may be a program that helps the microcontroller to require action supported the inputs provided by the output of the sensors. In this project the pollution level at each sensor node is often provided to server by using GSM/GPRS system or we will display the pollution level information on large display close to square. People generally more than one alternate path to reach some destination; if person knows the pollution information in advance, he can follow safe path & simultaneously pollution can also control. At each sensor node, the sensors such has smoke sensor, noise sensor and RFID reader are interfaced with single microcontroller to read the pollution level from each vehicle on road, each vehicle will be provided with Unique number (RFID), the sensors value will be uploaded to server/cloud for every instant of time so that the user can know the pollution level at any time using internet.

IV. METHODOLOGY

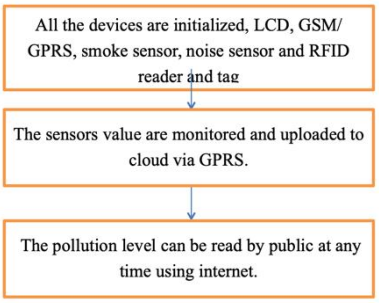

Fig: Flow Chart

The framework utilises air sensors to see the nearness of hurtful and dangerous gases/mixes [such as Methane, propane, Butane, alcohol, noxious gases, carbon monoxide gas etc. noticeable all around and furthermore utilise the sound sensor to continue estimating sound dimension within the environment. MQ2 is that the air sensors which are utilise to collect pollution and a sound sensor module mic is utilise to catch sound. These sensors cooperate with Arduino which forms this information and afterward transmit it over the versatile application. To send the knowledge over remote area WI-FI modem is additionally introduced. Furthermore, at whatever point the pollution is identified, a bell quickly signals and when there's a sound pollution a LED begins squinting constantly. With this framework the specialists also because the limited individuals can check the transmitted information through their telephone which too without spending single penny and thus the overall population can act against it on their dimension and plan to bring the pollution level in check. This framework would contribute as a neighbourhood within the working of a sound society. Mobile phones or smart phones those are cap abled and in built with sensors are applicable for impact on social including how technology of mobile has got to be used for to guard environmental, sensing and to influence just-in-time information to make movements and actions eco-friendly. mobile sensors were deployed and used on urban areas for monitoring and it had been categorised into two major classes, participatory sensing where user is directly involved and opportunistic sensing where user isn't involved, but its limitation includes power and static information science or mobility restrictions.

A Wireless Sensor Network inbuilt of the various wireless sensors those are inexpensive, which are able to collect, store, process an environmental information, and to talk with nodes those are neighbours to every other. responsible of node authentication, message buffering, the gateway works because the network coordinator where you'll collect, process, analyse, and present your measurement data. Wireless sensor network management model consists of end device, router, gateway node and management monitoring centre. to gather wireless sensor network data, and to forward them to parent node, hence end device is trustworthy then data are forward to gateway node from parent node directly or with the assistance of router. Gateway node extracts data after getting data from wireless sensor network, then analyse and packaged them into Ethernet format data, forward them to the server.

A server is an occasion of a bug that's used to accept then reply to a special program request; called as a client. Client could say that to run the server software any device might be considered a server. To manage network resources Servers are used. within the servers, the services or information are provided through the online those are connected through LAN and made available for users via smart phones, browser or other browser devices to make the system more intelligent, adaptable and efficient.

V. RESULT & CONCLUSION

A. Result

The air and sound pollution monitoring system monitors air and noise pollution employing a mobile application. It shows the digital value of air and noise pollution and user can analyse it with a graph. It becomes very easy for us to rectify the amount and air and sound pollution around and plan for a healthy living and surrounding. The figures that are included in our paper shows the way the system works and the way the output is obtained from the input after processing. After sensing the information from totally different device devices, which are placed especially square measure of interest. The perceived information are going to be mechanically sent to the web server, once an accurate connection is established with sever device the web page provides the knowledge regarding the intensity of sound and also the CO level variations during this specific region, wherever the embedded monitoring system is placed. To implement this, want to deploy the device devices within the environment for collecting the knowledge and analysis. By deploying device devices within the environment , we are ready to bring the environment into world i.e., it'll act with alternative objects through the network.

When there is no noise or smoke is introduced near any of the sensors, the output is in its lowest forms. But due to background noises the noise sensor picks up few noises and shows the amount of 60db. When the smoke sensor is introduced with a paper lit up with fire and produces smoke, the smoke sensor picks up the quality of the smoke and shows the Air quality index as 175, which is suffocating. When Noise is introduced, the noise sensors picks up the noise and shows the data according to the level of noise in this case it is 104db. All the data picked up by the sensors are sent to the mobile application which is registered with the gsm model in the module.

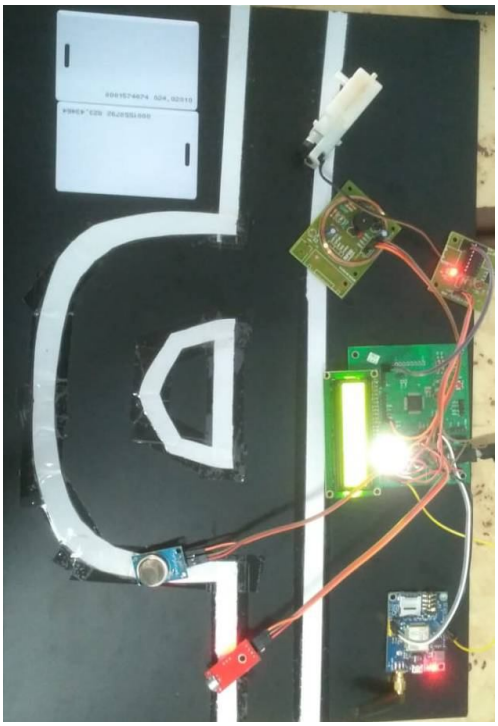

Fig 3: Assembled Prototype

Fig 4: Data received from GSM module to the App

B. Conclusion

This IoT based air and sound pollution display could also be a pleasant step towards a healthy sup- port. With the help of this device not solely the municipal authorities however even the people will participate within the tactic of dominant pollution and guarantee safe setting. This automatic device, once put in is capable of unceasingly chase the pollution level and analyses the detected data. the foremost lightness feature of this device is that the output is drawn in digital additionally as analog format with the help of a straight- forward mobile application that's usable on all automaton devices like sensible phones, tablets, PDA's etc. The device itself is incredibly eco-friendly and doesn't hurt the set- ting in any means. Science is discovering or creating major breakthrough in various fields, and hence technology keeps changing from time to time. Going further, most of the units are often fabricated on one alongside microcontroller thus making the system compact thereby making the prevailing system simpler. to form the system applicable for real time purposes components with greater range must be implemented.

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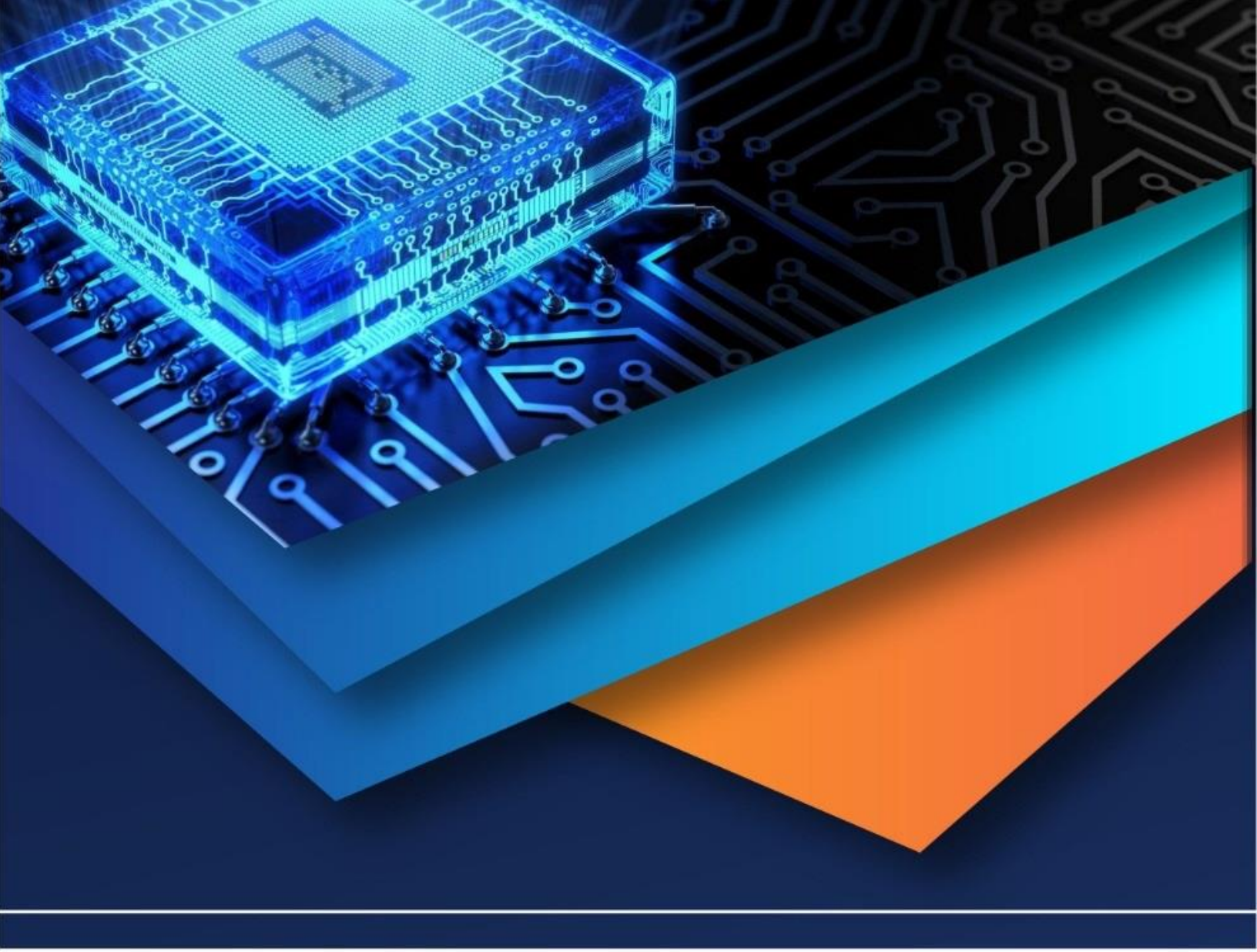

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