DESIGN AND DEVELOPMENT OF ADVANCED AIR QUALITY MONITORING SYSTEM FOR REAL TIME APPLICATIONS

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ABSTRACT: In this project design and development of advanced air quality monitoring system for real time applications is implemented. In present generation air quality monitoring plays very important role. The entire system is controlled by the ARM controller. Whenever there is less percentage of oxygen in air then Oxygen level detection sensor will detect and gives buzzer sound. Similarly it will send the alert message to the corresponding phone number and shares the location. In the same way, when ever fire explodes then the fire detection sensor will detect and gives buzzer sound & it will send the alert message to the corresponding phone number and shares the location. Hence, this project gives effective results.

KEY WORDS: ARM, GSM (Global system for Mobile Communication), GPS (Global Positioning system), Buzzer, oxygen level detection sensor, Fire detection sensor.

I.INTRODUCTION

The main aim of designing this is that increasing air pollution is a global issue. The problem related to health is growing at a faster rate because an increasing number of vehicles and industries produces a large amount of harmful gaseous pollutants. Due to an increase in air pollution, many diseases like heart disease, bronchitis, heart disease, pneumonia, lung problem, also irritation in the throat, eyes, and nose, etc. As per the observation, with the increase in the air pollution in worldwide, approximately 50,000 to 100,000 early or untimely deaths per year happen in the United State of America separately and about 300,000 to 3,000,000 deaths per year occur in European Union [1].

As we all know that various types of harmful emissions known as primary pollutants are emitted in the environment and after the certain chemical reaction, results in the formation of new types of pollutants which is basically known as a secondary pollutant.

Many examples are seen in day to day life, according to the Intergovernmental Panel on Climate Change (IPCC) which come under the Fifth Assessment Report, about all climate-changing pollutants either it directly or indirectly (also by including the secondary pollutants which are present in the atmosphere) cause the severe form of health problem in the living beings [2]. Most of the citizens or people spend 90% of their daily time in the indoor atmosphere [3].

In the recent period of 10 years, the quality of air of outdoor area in the developed countries improved but indoor air quality decreases in the same time because of the some of the factors like decrease in ventilation, reserving of energy and also due to the new appliances used for the household purpose [4]. As we all know that the Internet of Things becomes very popular in the modern present era. In the air, there are enough amount of harmful gases like CO2, benzene, smoke, alcohol, NH3, NOx, etc.

With the help of this system, we can monitor the quality of air via a web server and ring the alarm where pollution goes beyond the threshold condition. It shows the quality of air in ppm on LCD module and on the webpage where it can be controlled very easily. Mostly in houses, LPG sensor can be used. It also shows the humidity and temperature. IoT based system can be used anywhere but mostly used in industries and houses where harmful gases are found and give an alert message when the system reaches its threshold value.

Air pollution is the major existing and increasing risk factor day by day. The polluted air refers to the condition in which the occurrence of toxic substances in the atmosphere such as ammonia, carbon monoxide, sulphur dioxide, nitrous oxide, methane and chlorofluorocarbons. These causes allergic to human health leading to pollution related diseases, respiratory infections, heart diseases, COPD, stroke and lung cancer. Pollutants may be indoor or outdoor. The speaking about the indoor pollutants, formaldehyde that is emitted from building materials such as carpentering and plywood.

Similarly, paints and solvents also emit some volatile organic compounds. Same as that the outdoor pollutants are many, as we all know pollutants emitted from vehicles, construction work, industry chemicals, etc. Hence, considering the difficulty in breathing pattern for a general person, we are about to design a smart mask. The smart mask purifies the impure air around the person wearing it. The people feel comfortable in breathing and this widely reduces the stroke and other breathing issues. At recent times, the air pollution in New Delhi is under severe conditions.

II. LITERATURE SURVEY

IOT Based Air Pollution Monitoring System Using Node MCU Arduino Poonam Pal, Ritik Gupta, Sanjana Tiwari, Ashutosh Sharma

The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor In this project we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air Quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile.

IOT Based Air Pollution Monitoring System
Harsh N. Shah, Zishan Khan, Abbas Ali Merchant, Moin Moghal, Aamir Shaikh

Air pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma.

IOT Based Air Quality Monitoring System
Ch.V.Saikumar, M.Reji P.C.Kishoreraj

The main objective of this project is to monitor the air eminence in industrial and urban areas. The proposed outline includes a set of gas sensors (CO, and NO2) that are positioned on masses and structure of a IOT (Internet of things) and a dominant server to support both short-range realtime incident management and a continuing deliberate planning. In this Arduino platform is used to communicate the data simply and quickly. WSN (Wireless sensor network) acts as the trans receiver. This provide a real-time low rate monitoring system over the use of low rate, low information rate, and little control wireless communication technology. The projected monitoring system can be transferred to or shared by different applications. Through IOT we can able to visualize the values from the globe.

Arduino Based Weather Monitoring System
Karthik Krishnamurthi, Suraj Thapa, Lokesh Kothari

The values read from the sensors are processed by the Arduino micro-controller and stored in a text file which can be processed upon to derive analysis. The readings are also displayed on an on board LCD for quick viewing. All these readings can be analyzed to get the weather characteristics of a particular area and record the weather pattern. These recorded parameters are essential and vary from places to places.

III. PROPOSED SYSTEM

The below figure (1) shows the block diagram of proposed system. The entire system is controlled by the ARM controller. Whenever there is less percentage of oxygen in air then Oxygen level detection sensor will detect and gives buzzer sound. Similarly it will send the alert message to the corresponding phone number and shares the location. In the same way, when ever fire explodes then the fire detection sensor will detect and gives buzzer sound & it will send the alert message to the corresponding phone number and shares the location.
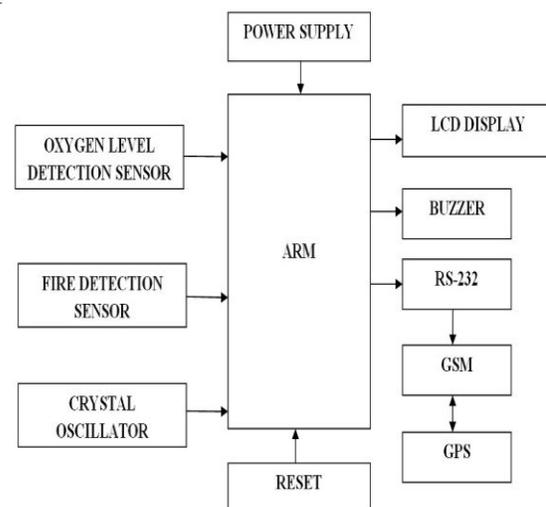

Fig. 1: PROPOSED SYSTEM

ARM (stylized in lowercase as arm, previously an acronym for Advanced RISC Machines and originally Acorn RISC Machine) is a family of reduced instruction setcomputing (RISC) architectures for computer processors, configured for various environments. Arm Ltd. develops the architecture and licenses it to other companies, who design their own products that implement one of those architectures including systems-on-chips (SoC) and systems-on-modules (SoM) that incorporate different components such as memory, interfaces, and radios. It also designs cores that implement this instruction set and licenses these designs to a number of companies that incorporate those core designs into their own products.

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden.

IV. RESULTS

Simulation of the circuit was done on proteus software and the operation of circuit according to the HEX file created in the keil software was observed. The step by step simulation circuit design of proposed system is shown in below figures 4.1 to 4.3.
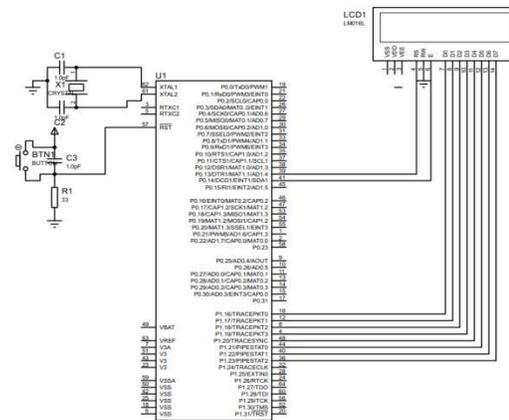

Fig. 4.1: SIMULATION DESIGN OF BASIC CIRCUIT

The figure 4.1 shows the simulation design of basic circuit which was common in all the system operations. It includes the crystal oscillator, Reset and LCD interface connection to the main controller ARM.
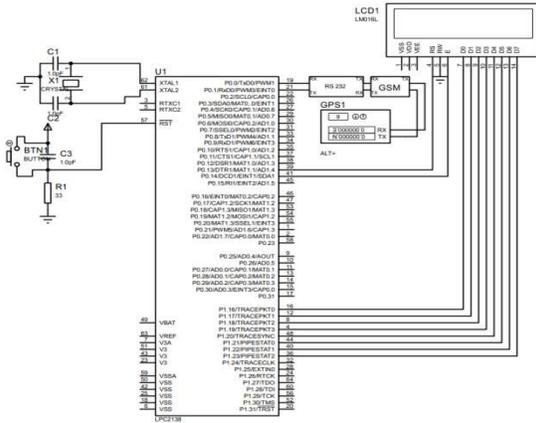

Fig. 4.2: SIMULATION CIRCUIT DESIGN WITH GSM AND GPS INTERFACE

Figure 4.2 shows the simulation circuit design with the GSM and GPS interface. The GSM and GPS are the communication devices interfaced to the ARM controller to send the alert message to the corresponding phone number and with location sharing. These two modules are interfaced to the ARM through RS-232 which is connector consists of MAX232 IC that coverts the TTl logics to Hexadecimal and vice versa.
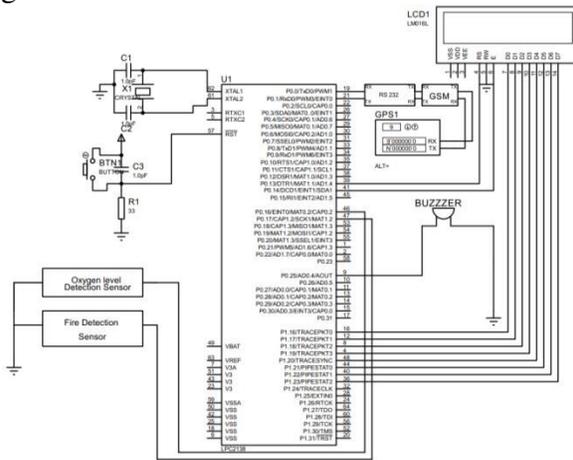

Fig. 4.3: FINAL SIMULATION CIRCUIT DESIGN

Figure 4.3shows the Final simulation circuit design of proposed system. The entire system is controlled by the ARM controller. The operation performed when the less percentage of oxygen in air was detected by the Oxygen level detection sensor is shown here. Whenever the oxygen level detection sensor activated it automatically gives buzzer sound and send the alert message to the corresponding phone number and shares the location using GSM and GPS modules. Similarly the operation performed when ever fire explodes was detected by the fire detection sensor is also shown here. Whenever the fire detection sensor activated it automatically gives buzzer sound and send the alert message to the corresponding phone number and shares the location using GSM and GPS modules.

V. CONCLUSION

Hence, in this project design and development of advanced air quality monitoring system for real time applications is implemented. In present generation air quality monitoring plays very important role. The entire system is controlled by the ARM controller. Whenever there is less percentage of oxygen in air then Oxygen level detection sensor will detect and gives buzzer sound. Similarly it will send the alert message to the corresponding phone number and shares the location. Hence, this project gives effective results.

V. REFERENCES

[1] Z.Gai and J.Zhang, "Automatic air purification and adjusting device," 2011 International Conference on Electronics, Communications and Control (ICECC), Ningbo, 2011, pp. 1905-1908, doi:10.1109/ICECC.2011.606794

[2] Cynthia J., Saroja M.N., P. Sultana and J. Senthil, "IoT -Based Real Time Air Pollution monitoring System", International Journal of Grid and High Performance Computing, vol. 11, no. 4, pp. 28-41, 2019.

[3]Jenifer and D. Aravindhar, " Iot Based Air Pollution Monitoring System Using Esp8266- 12 With Google Firebase", Journal of Physics: Conference Series, vol. 1362, p. 012072, 2019. Available: 10.1088/1742-6596/1362/1/012072.

[4]S.S.Chandrasekaran, S.Muthukumar and S.Rajendran, "Automated Control System for Air Pollution Detection in Vehicles," 2013 4th International Conference on Intelligent Systems, Modelling and Simulation, Bangkok, 2013, pp. 49-51, doi: 10.1109/ISMS.2013.94.

[5] R. Kiruthika and A. Umamakeswari, "Low cost pollution control and air quality monitoring system using Raspberry Pi for Internet of Things," 2017 International Conference on Energy, Communication, Data Analytics and SoftComputing (ICECDS), Chennai, 2017, pp. 2319- 2326, doi:10.1109/ICECDS.2017.8389867

[6]S. Abraham, X. Li, A cost-effective wireless sensor network system for indoor air quality monitoring applications, Procedia Comput. Sci. 34 (0) (2014) 165– 171.

[7]"ESP8266 Wi-Fi Module Sensors & Modules",Electronicwings.com,2020.

[8] Soumi Karmakar, Fourth Year Student, Tapan Kumar Rana Professor, ECE Dept., IEM. Kolkata, India "IOT Based Air Discomfort Reliever"978-1-7281-9615-2/20/$31.00 ©2020.

[9] Mahmoudzadeh, B., & Faez, K., "HCTT&R: A Complete Scheme for Object Tracking and Recovery of Lost Objects in Cluster-Based Wireless Sensor Networks", in Telecommunications (IST), Sixth International Symposium IEEE conference, pp. 691-696, 6 Nov 2012.

[10] Qasem Abu Al-Haija, "Toward Secure NonDeterministic Distributed Wireless Sensor Network Using Probabilistic Key Management Approaches", Journal of Information Assurance and Security, Vol-6, issue-1, pp. 10- 18, 2010.