



IOT BASED AIR POLLUTION MONITORING SYSTEM

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Abstract-Air pollution affects our day-to-day activities and quality of life. It poses a threat to the system and also the quality of life on earth. Hence monitoring air quality is extremely obtrusive. Because of exaggerated industrial activities over the past years. People have to be compelled to understand the extend to that their activities have an affect on air quality.

This system can be developed using the Arduino microcontroller. The real time air pollution monitoring system is designed to monitor and analyse air quality in time period and log data to a remote server. Keeping the data updated over the internet. Air quality measurements can/will be displayed on the LCD and will be accessed via open source android application (here Telegram/signal Application) on any smart mobile device.

Keywords-Air quality, sensors, Internet of Things.

I.INTRODUCTION

Considering the daily newspaper and the other electronic or media, a devastating news that is spreading day by day folk is changing into sick and also the climate is dynamical such how that it's become miserable for the living of individuals. From the aspect from top to bottom, every people are suffering the curse of global climate change. The main reason for the global climate change, and people health is air pollution. It has brought changes in climate like global warming, global dimming, over raining, drought, storms, acid rain, foggy weather etc. The living things on earth and underneath water square measure suffering several issues like change in life because of lack of correct facilities of life. Air is the most useful thing for each and every living thing. Researching on this serious issue this system's main purpose was to estimate the standard of air for people, and the other living thing that exist on earth. Very important to know for our living is that how much safe we are now and how the weather and climate has changed for air pollution and it will sustain sound. This system will ease to know the answers for air quality.

Four major gas that are accountable for the foremost pollution principally are used in the system to understand the most effective results of the entire condition of the air. CO₂, CO, LPG, humidity are declared to be the most accountable for pollution and in the system all are used. Noise sensor is also added to measure the presence of noise in the environment. A server and an android app are created to understand the

statistics as a result of currently days virtually everybody has an android operational device and access to internet.

II.MOTIVATION

Not a single living thing can survive without air. Air is the most important element for living. According to SDG (Sustainable Development Goals) by the

International organization (United Nations) there are seventeen goals to

remodel the world to clean, healthy, and natural way to live in because as a result at this point there are many issues in human life. The SDG says, Goal 3: Ensure healthy lives and promote well-being for all at all ages, Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all, Goal 12: Ensure sustainable consumption and production patterns, Goal 13: Take urgent action to combat climate change and its impacts, Goal 14: Conserve and sustainably use the oceans, seas and marine resources, Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss. These are the main reason the subject was chosen for the research purpose.

III.LITERATURE SURVEY

Pollution is increasing in alarming rate every day. Air is the most sensitive element of the environment that is contaminated momentarily by the elements emitted to air. To understand the amount of air pollution and air quality this proposed system is a wireless sensor network that works primarily monitoring the pollution happening in the environment. It is a low budget monitoring system with low-cost but efficient sensors.

Some previous works like Smart Environment Monitoring System [1] on vehicles was introduced on 2015. It primarily worked out the emission rate of toxic gasses that are responsible for pollution. Industrial Air Pollution [2] monitoring system for safety and health

enhancement was introduced to understand the hazardous gases and their impact. Low cost air quality system [3] was discussed on 2008 as a result of that the sensors were quite expensive and also the system. By using mobile GPRS [4] system air pollution may be detected. Wireless sensor network based pollution monitoring system in metropolitan cities was introduced to understand the air quality [5]. Pollution Dynamic Monitoring System [6] is additionally done before.

By reviewing the future researches that have done before we are able to say that pollution has increased in alarming rate. If it is not stopped instantly the entire world goes to face a filthy and extreme weather for the future. There are additional pollutions e.g. water pollution, pollution, noise pollution, soil contamination however, from the future studies we are able to say that pollution is the most threat issue, and this could be studied for the sake of saving the world.

According to World Health Organization: WHO, from smog hanging over cities to smoke within the house, air pollution poses a serious threat to health and climate. The combined effects of ambient (outdoor) and household air pollution cause about seven million premature deaths each year, for the most part as a result of increased mortality from stroke, heart disease, chronic obstructive pulmonary, lung cancer, and acute respiratory infections. Quite 80% of individuals living in urban areas that monitor pollution are exposed to air quality levels that exceed the World Health Organization guideline level of $10 \mu\text{g}/\text{m}^3$, with low and middle income countries suffering from highest exposures.

The major outside pollution sources include vehicles, power generation, building heating systems, agriculture/waste incineration and industry. Additionally, more than three billion individuals worldwide have relied on polluting technologies and fuels (including biomass, coal, and kerosene) for household cooking, heating, and lighting, releasing smoke into the house and leaching pollutants outdoors.

From 9 out of 10 individuals worldwide breathe contaminated air. To stop the pollution there ought to be launched green energy. World Health Organization: WHO estimates that ambient pollution alone caused some 4.2 million deaths in a 2016, whereas household air pollution from cooking with polluting fuels and technologies caused an estimated 3.8 million deaths within the same period. So, the idea is to create a system which can let individuals to know what quantity of toxic air is inhaled. This technique includes the studies from previous research how much it is important to work on such a topic. To create such a device which can be portable and easily installed was the main idea. Android device user and internet user has increased enormously. For ease of individuals the results of the device can be seen in a website as well as in android app.

By measuring pollution regarding air, water, and sound on day to day life, it might be great significance for the health of human if the amount of pollution is measured. For detecting the pollution differing types of pollution monitoring gas sensors are going to be placed in several points of the town. The main priority will be the contaminated area, and the area that contains harmful particles to human. These sensors can collect sensible information in real time from totally different affected areas on different gases (for air and water) that are present in the environment e.g. nitrogen gas (NO_2), carbon monoxide gas (CO), gas (CH_4) and humidity. It will also collect information regarding the pollution level of the sound within the town. The proposed system permits monitoring primarily air quality, water quality, sound quality, and therefore, the pollution condition of a environment on a desktop/laptop through application designed using Graphical User Interface (GUI) programming that offers signal when pollution nature exceeds the suitable levels.

IV.IMPORTANCE

Air is one of the most basic and important elements for human being to survive. Clean and Sound air is the key to a good and healthy life. But now days in city life it has become the most threatened factor. Pollution of air has become the most concerned and affected issue now for us. A variety of air pollutants have known or suspected harmful effects on human health and the environment. In most areas, these pollutants are principally the products of combustion from space heating, power generation or from motor vehicle traffic. Pollutants from these sources may not only prove a problem in the immediate locality of these sources but can travel long distances.

Generally, if someone is young and in a good state of health, moderate air pollution levels are unlikely to have any serious short-term effects. However, higher levels and long-term exposure to air pollution can lead to more serious symptoms and conditions causing human health. This not only affects the respiratory and inflammatory response systems, but can also lead to more serious conditions such as heart disease and cancer. People with lung or heart conditions may be more susceptible to the effects of air pollution. Air pollution has also been recognized by doctors as one of the world's greatest 10 killers seeing some 29,000 premature deaths in UK and 430,000 worldwide in one year.

Air pollution can cause both short term and long-term effects on health and many people are concerned about pollution in the air that they breathe. These people may include:

- People with heart or lung conditions, or other breathing problems, whose health may be affected by air pollution.
- Parents, careers and healthcare professionals who look after someone whose health is sensitive to pollution.
- People who want to know more about air pollution, its causes, and what they can do to help reduce it.

Monitoring air quality is essential for local authorities as well as for major public and private industries to understand and prevent air pollution and measure emission sources, in order to preserve health and contribute to the fight against the greenhouse effect. Industrial operators use air quality monitoring equipment to cost effectively monitor and manage emissions on their perimeter, which helps them improve relationships with regulators and communities. With air quality regulation shifting the burden from publicly funded monitoring to monitoring funded by industry, it has been increasingly important for businesses to acquire their own quality monitoring equipment. To get the best results from the environment about the pollution level of air, toxicity and harmfulness for human, air quality monitoring device is vastly used.

An air quality monitor is a device that measures the level of common air pollutants. Monitors are available for both indoor and outdoor settings. Indoor air quality monitors are typically sensor based instruments. Some of them are able to measure ppb levels and come as either mixed gas or portable units. Sensor based instruments and air quality monitoring systems are used widely in outdoor ambient applications.

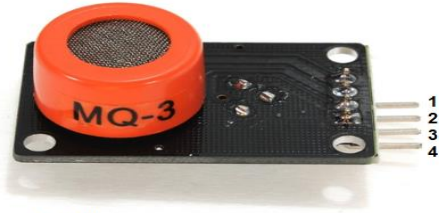
V.COMONENTS REQUIRED



MQ2 Gas Sensor

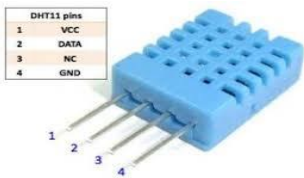


Wi-Fi Module NodeMCU ESP8266



1 = +5V
2 = DOUT
3 = AOUI
4 = GND

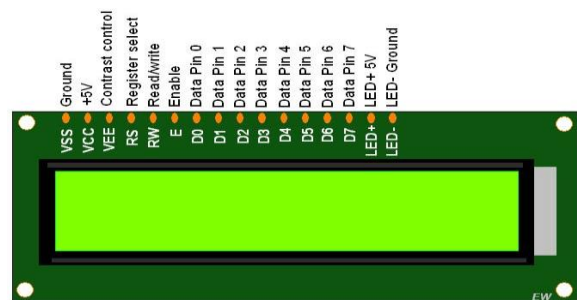
MQ 3 Alcohol Sensor



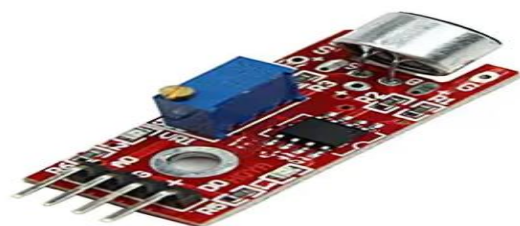
LM35 Temperature Sensor



Arduino Uno

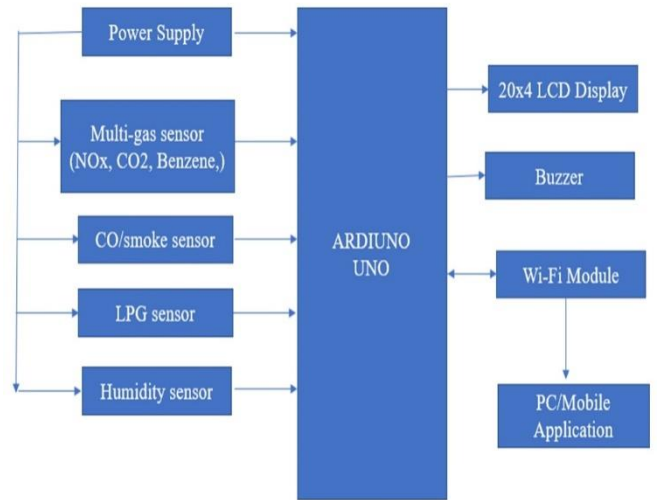


LCD Display

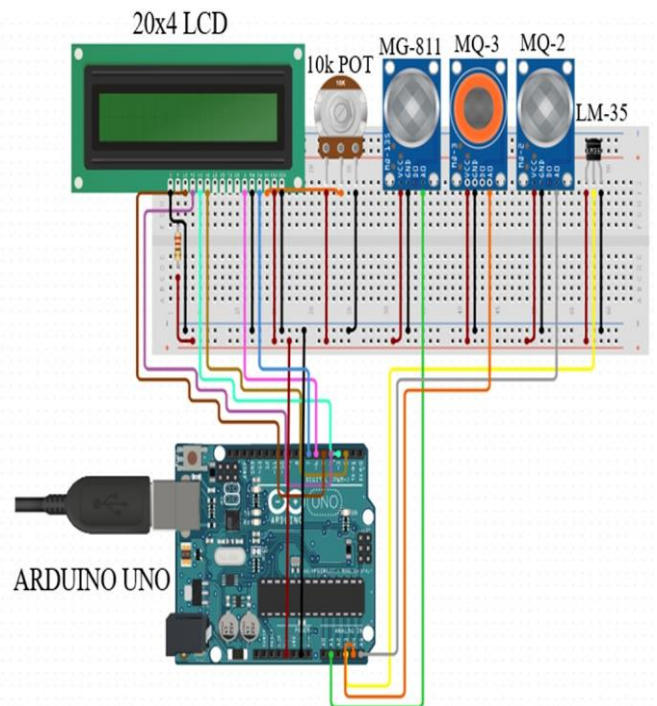


Sound Sensor

VIBLOCK DIAGRAM



VII.CIRCUIT DIAGRAM

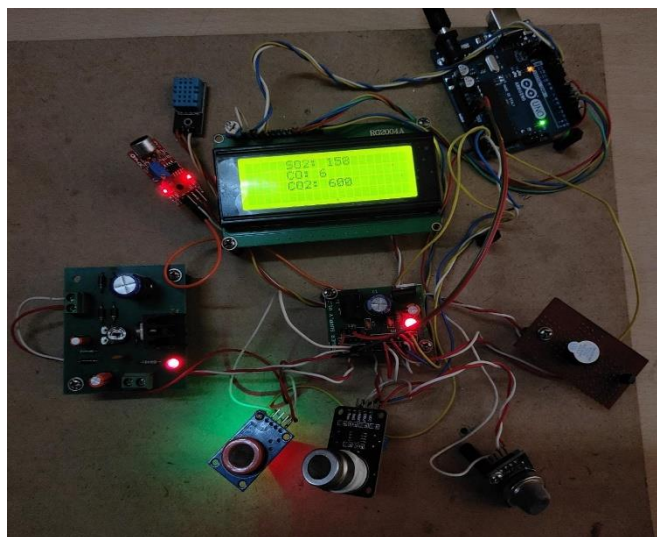


VIII.IMPLEMENTATION AND TESTING

The Environment Protection and Safety Section (EPSS) in Dubai has monitored Air and Sound quality since 1988. Their current system relies on six static observance stations situated round the urban center metropolitan space. These stations send Air and Sound waste information to a central server exploitation mounted line electronic equipment connections. The pollution

information is additionally accessible to the public through their website. This method has worked well. However, the information collected is proscribed to the section of the six observance stations. Consequently, a mobile system supported the hardware and software system design delineated earlier was designed and tested within the UAE.

The designed device arrays consisting of CO, NO₂ and SO₂ was interfaced through a symbol learning circuit through analogue channels five, vi, and seven of the HCS twelve microcontrollers. The sensor output voltages representing the level of gas for each pollutant (V_g) were converted to a ppm value for each gas. The GPS module was connected to COM0 and the GPRS-Modem was connected to COM1 of the microcontroller. Fig.2 shows atypical information frame format being transmitted from GPRS-Modem to the Pollution-Server. The Mobile-DAQ was mounted on a University bus that was driven round the field of the yank University of Shariah (AUS) to collect waste information. The Mobile-DAQ was mounted on prime front of the bus to avoid contamination from the bus exhaust. The waste information was collected for 12 hour. A user will use the net to access waste levels during a location coated by the bus. Because the figure shows, Google Maps is employed because the primary interface. Waste information is however exploitation completely different colored polygons that square measure super obligatory on the map. The color code used for these polygons was per the AQI index of the urban center Municipality. As the figure shows, different areas within the American University of Sharjah campus have different levels of pollutants. The yellow polygon shows slight pollution while the green polygons show clean Air and Sound according to the AQI index. A user can click any of the polygons to retrieve detail of the various pollutant levels. A user can further drill down by clicking to view the past data for any of the gases.



IX.RESULTS

The projected Wireless Air and pollution observance System provides time period info concerning the extent of Air and pollution in these regions, in addition as provides alerts in cases of forceful amendment in quality of air. This info will then be utilized by the authorities to require prompt actions like evacuating folks or causation emergency response team. A wireless distributed mobile Air and pollution observance system was enforced mistreatment the GPRS public network beside GPS. The system utilizes town buses together waste product gases like CO, NO₂, and SO₂. The pollution information from varied mobile sensing element arrays are transmitted to a central many that build this information accessible on the web

through a Google Maps interface. The information shows the waste product levels and their correspondence to native Air and Sound quality standards.

X.CONCLUSION

The smart way to monitor environment and air as well as sound pollution being a low cost but efficient and embedded system is presented in this paper. In the proposed architecture functions of different sensors and their working procedure were discussed. How they work, their functionality, their optimal uses and their data taking procedures and comparison with standard base data's are also discussed here. The noise and air pollution monitoring system was tested for monitoring the gas levels on different parts of the country. It also sent the sensor parameters to the data server. Our project device showed that it is effective and cheap and with some highly working sensors it can really be a reliable one to everybody and its data's will be a key to take some necessary steps for the betterment of the society as it will help to identify the affected area so that we can take early steps to reduce damages for the next generation.

XI.FUTURE WORKS

Our work can demonstrate vast opportunities to work on the device, on the app and also on the field using the device that we have worked with. The device can be used any time efficiently in different locations of a city and then research with the achieved data for that particular area in that city. The device can be updated with additional sensors that can sense data from the existence of other gases such as O₂ and H₂. These gases will provide the condition of the atmosphere and authority can take into further decisions accordingly. The sensors that we have been worked with can also be reset according to most recent time update. The android app which we have developed for turning on and off the device can be updated with newer features by implementing necessary codes. In future time, our device can be kept testing for checking whether the sensors still runs properly and give real time data. The webpage that we have designed, there is more opportunities to add options like related tables, pie chart, diagram that will be implemented by back-end programming (server side) so that those options can be visible to the administrator and user as well. With the future plan programmer can add PHP programsto create additional tables to show amount of O₂ or H₂ and pie chart to show which color represents which particular gas and also diagram that can show relationswith gas and time.

Like Through-out the year on which time the amount of gases are in what level and also the increase and decrease level and rates of the gases. Related app can notify when it is actual time to take data reading by sending the notification to user that will be programmed on the server-side by PHP language. Also other language can be used. In the hardware device it can be added light system. Light system will be work like automatic way. Such as, there are four lights for four types of gases. While a particular sensor detects the gas for that sensor, the related light beside that gas will be on and while the sensor stops getting that particular gas the light will be off automatically. For this matter, there will be necessity of PHP back-end code implementation also that is must.

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