

# AIR QUALITY MONITORING SYSTEM

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# 1.INTRODUCTION

- Internet of things system is a rapidly expanding idea in this era of industrialization technology meanwhile. It has become important for many manufacturing companies and other industries care about employees health, safety and other side effects. The internet of things that can monitor the physical objects that are connected to the Internet (wireless networks) and can be controlled from anywhere in the world.
- Air pollution is the biggest problem of every nation, whether it is developed or developing. Many times the emission of gases affects both the human beings and animals are affected by lung cancer, irritation of eye, breathing. Some other harmful effects caused by pollution are mild allergic reactions near throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma.
- These are the problems that usually occurs while the industry does not take proper steps to reduce the gases as per government rules. 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.



- IOT – The Internet of Things(IoT) describes the community of bodily gadgets—“things”—which might be embedded with sensors, software, and different technology for the motive of connecting and changing statistics with different gadgets and structures over the internet. These gadgets variety from normal family gadgets to state-of-the-art business tools. With greater than 7 billion linked IoT gadgets today, professionals are watching for this variety to develop to ten billion via way of means of 2020 and 22 billion via way of means of 2025. Oracle has a community of toolpartners.
- Arduino – Arduino is an open-source electronics platform supported easy-to-use hardware and software. Arduino is designed to make electronics more accessible to artists, designers, hobbyists and anyone interested in creating interactive objects or environments. Board can perform specific operations by sending a set of instructions to the microcontroller on the board. To do so the Arduino programming language (based on Wiring), and the Arduino Software (IDE) is used based on Processing.
- Blynk – Blynk is a toolset for all makers, inventors, designers, teachers and geeks who would love to use their smart phones to control electronics like Arduino, Raspberry Pi and similar ones. Blynk will work with all popular boards and shields. It allows users to enjoy the convenience of Blynk Cloud. By the way cloud is free and open-source. Blynk is not an application that works only with a particular shield. Instead, it's been designed to support the boards and shields. It also works on iOS and Android.Sensors



# 2.SYSTEM REQUIREMENTS

- **HARDWARE REQUIREMENTS:**

- ESP32 Microcontroller can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. It can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interface. I2C 16x2 Arduino LCD display module. It is able to display 16x2 characters on 2 lines, black characters on green background. It only needs 4 pins for the LCD display: VCC,GND,SDA,SCL.

- **SOFTWARE REQUIREMENTS:**

- Embedded C is a set of language extensions for the C programming language. The embedded C system requires an unexpected expansion of the C language to support advanced microprocessor features such as fixed-point arithmetic, multi- memory, banking, and basic I/O(input-output) function. Embedded C uses most of the syntax and semantics of –C standard.Arduino IDE contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus



# HARDWARE IMPLEMENTATION:



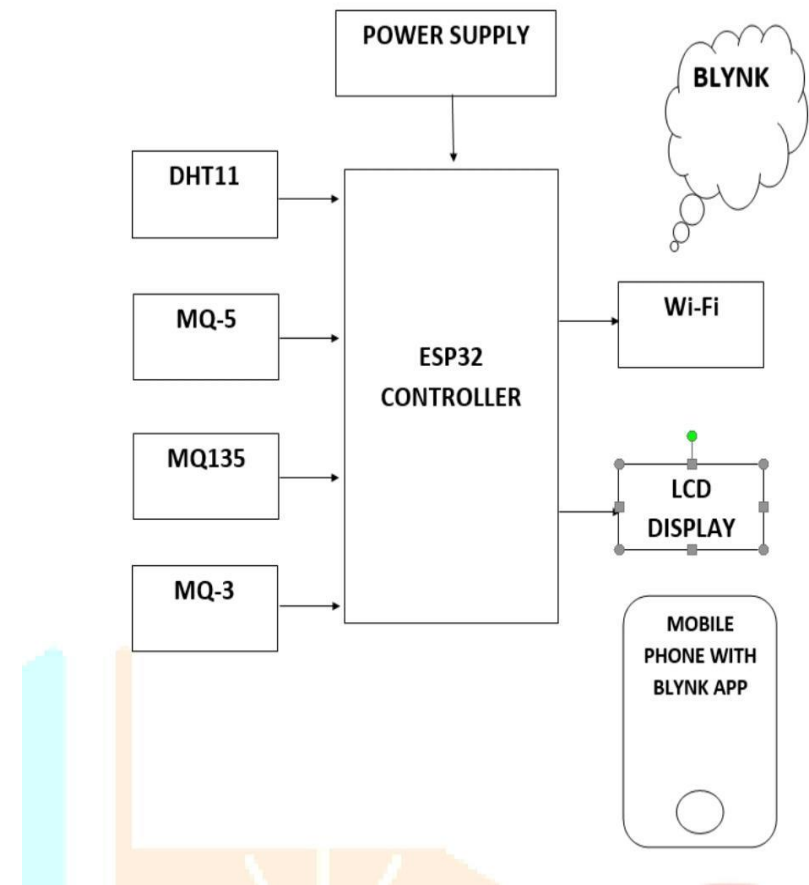


# 3.PROPOSED SYSTEM

- In this section, the description of the proposed system is provided. This system will monitor the Air Quality over an application using internet and will trigger a notification 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 CO<sub>2</sub>(carbon dioxide), smoke, alcohol, benzene and NH<sub>3</sub>(ammonia), LPG(liquefied petroleum gas).
- It will show the air quality in parts per million(PPM) on the LCD and as well as on mobile application that can be monitored very easily.
- LPG sensor is added in this system which is used mostly in houses. The system will show temperature and humidity, they are displayed on LCD.



- The system is developed with help of sensors, microcontroller, I2C and mobile phone with blynk application. All sensors used in system are connected to ESP32 microcontroller.
- The sensors used in system will sense all gases, and it will give the Pollution level in PPM (parts per million). MQ135, MQ3 and MQ5 gas sensor will give the output in form of voltage levels.
- If the gas concentration increases output voltage increases and the voltage values are converted it into PPM. So for converting the output in PPM, MQ135, MQ3 and MQ5 gas sensor libraries are used
- ESP32 microcontroller sends data to blynk application as well. In Blynk application humidity and temperature is seen in graph manner. This application has it's own cloud for storing data. According to the information received the data is displayed in application and graph is been shown, it includes the previous data that has been collected..



# 4.FLOW CHART DIAGRAM

- A flow chart is type of diagram that represents a workflow or process. The hardware part of the system need to get connected to power and then the sensors and devices present are initialized.
- If initialization is not done, hardware connections need to be checked and once connection is successful. The sensors start reading data and values are read.
- Next when values are available the data is displayed and data is send to cloud through Wi-Fi module. Data is checked on blynk application retrieved from blynkserver.





# 5.RESULTS AND DISCUSSION

- The values produced by system can be seen in the table and the experimental result. There is difference of 2-3% accuracy from experimental results.
- In proposed system we used 3 sensors that captures the gases and collect data and display it on screen and send it to Esp32 and from that data is send to Blynk and we can see results in that application.

	Experimental result	Expected result
Temperature	29 ppm	28 ppm
Humidity	83 ppm	80 ppm
Mq2	400 ppm	383 ppm
Mq5	905 ppm	912 ppm
Mq135	1230 ppm	1252 ppm



# 6.CONCLUSION

- The proposed system which can monitor the leakage of toxic gases and the level of pollution using blynk application, ESP32 microcontroller and IoT is proposed. In this paper, a model is developed using MQ135, MQ2, MQ5 and DHT11 sensors where we can monitor the level of air pollution and the poisonous gases can be sensed of the surroundings and get notified when air quality drops to some degree.
- Microcontroller serves as the heart of this module which controls the entire process. Wi-Fi module connects the whole process to blynk application and LCD is used for the visual Output.
- Proposed Air pollution monitoring system is checked with experimental results. The system has given a successful results which yields an accuracy rate of 97%. By the help of this system monitoring air pollution can be made easier.
- Soon everyone will know the quality of the air around them and take appropriate action if the quality drops. The air monitoring system can help in the innovation of new practices to overcome the problems of the highly polluted areas, which is a major issue. Further by additional sensors for the system pollution levels of more different harmful gases can be monitored.

