CONTENT

INTRODUCTION:

Considering the daily newspapers and any other electronic or print media, a devastating news which is spreading day by day is climate change. people is becoming sick and the climate is changing such a way that it has become miserable for living of people. From the aspect from top to bottom, every people are suffering the curse of climate change. The main reason for the climate change and people health problems 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 under water are suffering many problems like change in life due to lack of proper facilities of life. Air pollution refers to the release of pollutants into the air—pollutants which are detrimental to human health and the planet as a whole. According to the World Health Organization (WHO), each year air pollution is responsible for nearly seven million deaths around the globe. Nine out of ten human beings currently breathe air that exceeds the WHO's guideline limits for pollutants, with those living in low- and middle-income countries suffering the most. The effects of air pollution on the human body vary depending on the type of pollutant and the length and level of exposure—as well as other factors, including a person's individual health risks and the cumulative impacts of multiple pollutants or stressors.

Dust pollution also has many negative impacts on agriculture, including reducing crop yields by burying seedlings, causing loss of plant tissue, reducing photosynthetic activity and increasing soil erosion.

Health studies have shown a significant association between exposure to particle pollution and health risks, including premature death. Health effects may include cardiovascular effects such as cardiac arrhythmias and heart attacks, and respiratory effects such as asthma attacks and bronchitis. Exposure to particle pollution can result in increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days, especially for those with pre-existing heart or lung disease, older people, and children.

Air purifiers can refresh stale air, reducing the chances of health issues caused by indoor pollutants, which can trigger respiratory infections, neurological problems, or aggravate symptoms in asthma sufferers. Quality air purifiers eliminate several types of indoor air pollutants, keeping us healthy

1 in 12 people have asthma. People living with asthma have inflamed bronchial tubes. Pollutants such as pet dander, pollen, or dust mites irritate their airways, causing difficulty breathing.

Many breeds of dogs and cats shed throughout the year. When these pets scratch themselves, they spread a lot of hair and dander which keeps circulating in the air. Even if you don't have pets, there are other triggering factors for asthma such as pollen and dust mites.

These problems can be eliminated by using air purifiers. 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 quality of air for people and any other living thing which 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 sensors which are responsible for the most air pollution mostly, are being used in the system to know the best result of the whole condition of the air. CO2, CO, LPG, Humidity are declared to be the most responsible for air pollution.

OBJECTIVE:

The objectives of our projects are:

1. To measure and display temperature and humidity level of the environment.

2. To combine advanced detection technologies to produce an air quality sensing system with advanced capabilities to provide low cost comprehensive monitoring

3. To display the sense data in user friendly format using LEDs

4. Facilitate background concentration measurement

5. Monitor current level as a baseline for assessment

6. Check the air quality relative to standard or limit

7. Enable comparison of air quality data form different areas

8. Determining exposure an access effect air pollution on health, vegetation or building materials

9. Inform the public about air quality and raise awareness

COMPONENT:

Serial no	Name of component	Specification	No of components
1.	MQ135	Working voltage: DC5V. WorkingCurrent:150mA. DOUT: TTL output AOUT: Analog output Preheat time: Over 20s Dimension: 32mm x 22m x 27mm (HIGH 27mm)	1
2.	LED	An LED has a **positive (Anode) lead and a negative (Cathode) lead**. The schematic symbol of the LED is similar to the diode except for two arrows pointing outwards. The Anode (+) is marked with a triangle, and the Cathode (-) is marked with a line.	5
3.	Pleated air filter	Nominal Filter Size: 20x25x2 Application: Commercial & Industrial Filter Efficiency Rating: = 70% 3.0 - 10.0 micron Filter Type: Die-Cut Panel Materials: Moisture Resistant Beverage Board Frame Maximum Operating Temperature: 225 Pleat Separator Type: Wire Back Product Type: Pleated Air Filters	1
4.	Jumper wire	versions: male-to-male, male-to-female and female-to-female.	15
5.	Bread board	----------	1
6.	Exhaust fan	Voltage: 12V(Customizable) Power Consumption: 4.8W Air Flow: 86 CFM Speed: 2500 RPM	1

CIRCUIT DIAGRAM:

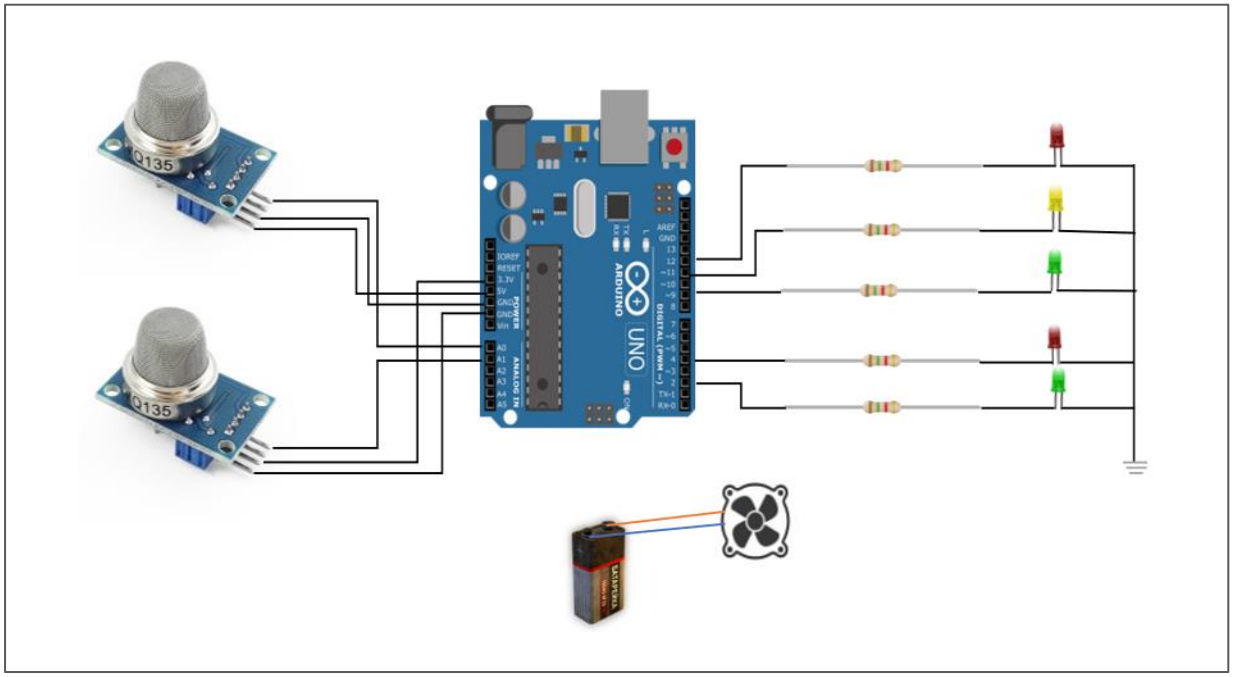


Fig. 1: Circuit diagram of "Arduino based air quality monitoring system with pleated air filter"

WORKING PRINCIPLE:

Our system has three section such as inlet section, filter section and the outlet section. In the inlet section we have used one MQ135 gas sensor which will help to determine the surrounding air quality in PPM (Parts per million) [7] [8]. The data was collected by combination of sensors kept in and around the college for a few days. The MQ135 sensor unit has a sensor layer made of tin dioxide (SnO_2), an inorganic compound which has lower conductivity in clean air than when polluting gases are present. The data fetched from that MQ135 sensor is sent to Arduino platform securely. Arduino provides a common platform to dumb the data in a common language and analysis it. And the corresponding output is displayed by the LEDs. When the surrounding air enter into the system with the help of exhaust fan and after that the contaminated air passed through from the air filter. The air filter helps to filter out all the dust particle and some harmful gases from the air and then again in the outlet section another MQ135 sensor is being used to check whether the filter is able to filter out the air or not basically it checks the status of the air filter. The data that is fetched by the MQ135 of the outlet section is sent to Arduino, after the analysis of the data the corresponding output is displayed with help of LEDs. In our system we have total five LEDs among those three are being used for checking the air quality in inlet section and other two are being used for checking the air quality in the outlet section.

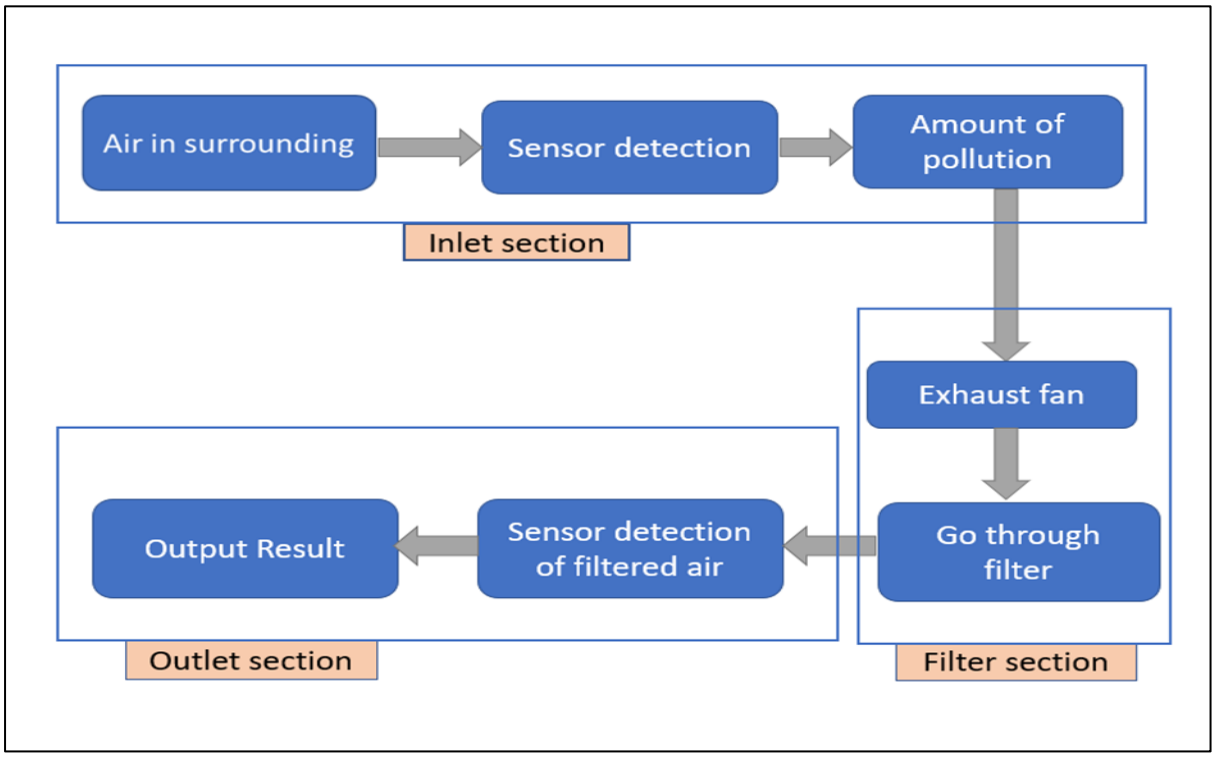
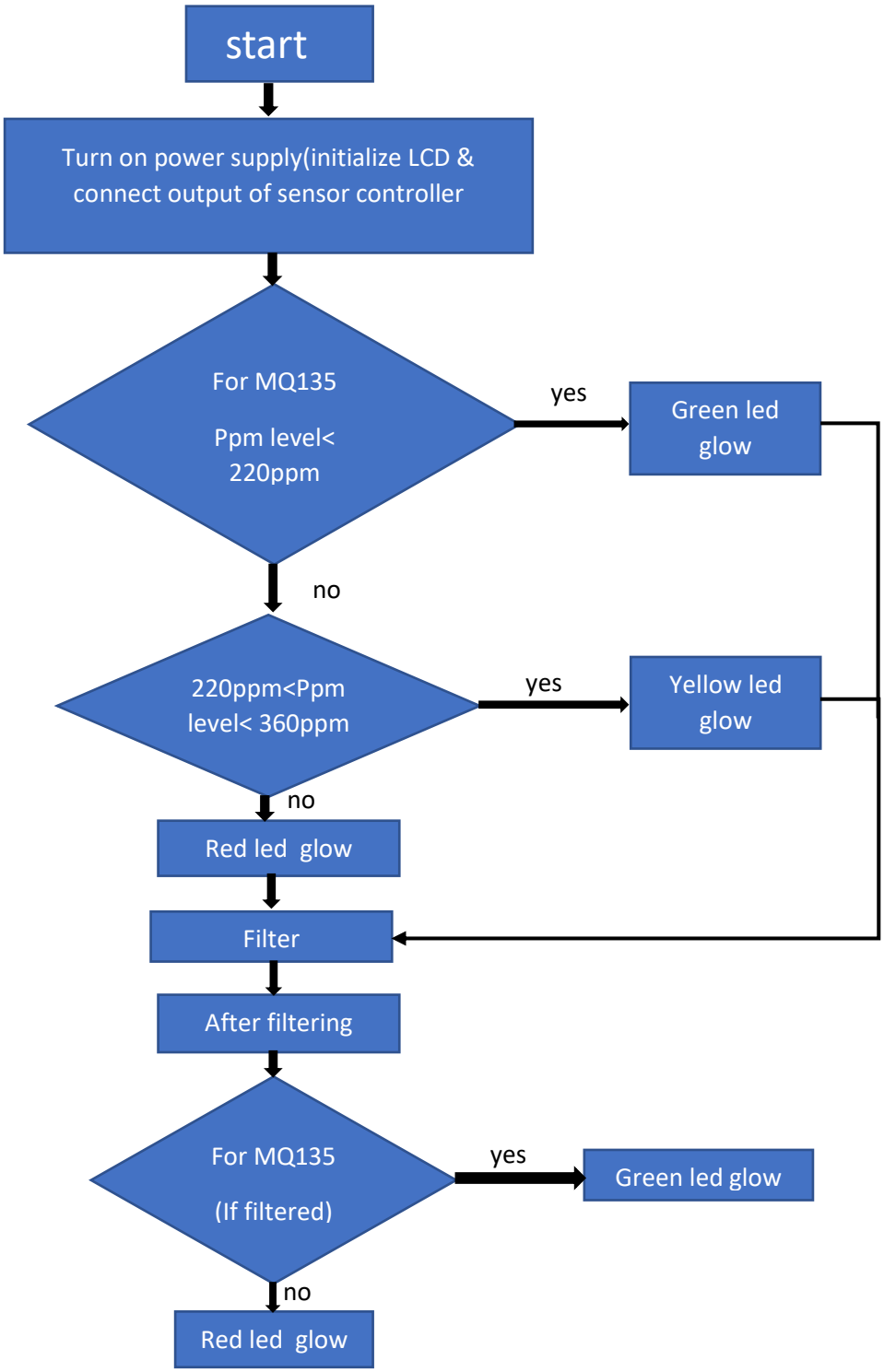


Fig. 2: Flow diagram of “Arduino based air quality monitoring system with pleated air filter”

FLOW CHART:


start
Turn on power supply(initialize LCD & connect output of sensor controller
For MQ135
Ppm level< 220ppm
yes
Green led glow
no
220ppm<Ppm level< 360ppm
yes
Yellow led glow
no
Red led glow
Filter
After filtering
For MQ135
(If filtered)
yes
Green led glow
no
Red led glow

ADVANTAGES:

1. **Availability of Sensors:**
   The key advantages of sensors include improved sensitivity during data capture, almost lossless transmission, and continuous, real-time analysis. Sensors monitor processes and assets accurately, reliably, and continuously and also
   increase productivity and reduce total cost of ownership. Wastage of energy is also comparatively lower. Compatible with multiple types of gas sensors.

2. **Detection of gases:**
   Our model can detect a wide range of gases, including NH3, NOx, alcohol, benzene, smoke and CO2.

3. **Dust particles can be eliminated:**
   As mentioned, increased amount of dust particles in a confined space can cause a lot of harm for human health. This problem can be easily eliminated by our system.

4. **Simple and compact model:**
   Our model is compact, can be handled easily and it is portable, so it can be located anywhere to monitor the indoor and outdoor parameters. It also provides comprehensive air quality measurements by integrating multiple air parameters into one system.

5. **Continuous update of change in percentage of air quality:**
   Our system can update us the continuous change of surrounding air quality.

LIMITATIONS OR DISADVANTAGES:

1. This system has been made by using only one type of sensor that means this system can detect only one type of gas at a time. Hence other gases presence cannot be detected by this system.

2. One of the major drawback of this system is that it cannot be used to accurately measure the contaminating of gases.

3. This system works well and gives the positive result for smaller pollutants but when it comes to deal with the large pollutants like pores and dust it hardly shows any positive result.

4. LED has been used to monitor the quality of air. But as we know air quality is measure in ppm so the quality of air monitoring of this system is not fully trustable.

APPLICATION:

1. The system can be used to monitor the roadside pollution or in industrial places as it will provide the data in real time which will be useful to control the pollution level.

2. It will help to maintain the indoor air quality and also to provide a fresh air which will be better compare to outside air.

3. The system can be used as a ventilator in buildings and for engines as well. This can be done as it has the capability to filter the air.

4. Our aim is to make the data available for every common man so that they can understand what kind of air they are taking and hopefully they do take steps to make pollution under control.

FUTURE SCOPE:

1. As one sensor can detect one specific type of gas so more sensor will be added so that all kinds of gases presence can be detected.

2. A webpage will be there and the system will upload the data on that website along with date and time so, that we can trace back and check the quality of air and can compare it on daily basis. And SD card will be provided too to store the data for better comparison.

3. GPS system will be introduced and it will provide the real time data of every location and that data will be uploaded in website to make people aware of the air quality of their surroundings
.
4. The current filter will be replaced with filters like HEPA, UV. This move will make the system more versatile in its work and hence can be used in different different places.

BUDGET:

Name of the components	Quantity	Price
MQ135	2	120
LED	5	30
PLEATED AIR FILTER	1	60
JUMPER WIRE	15	10
BREAD BOARD	1	93
EXHAUST FAN	1	60
ARDUIN UNO	1	480
TOTAL		**853**

Material cost: ₹ 853

Research and development cost: ₹1300

Labour cost: ₹300

Packaging cost: ₹ 200

Total cost: ₹ 1253

Selling Price: ₹ 2000

BUSINESS ASPECT:

Improving air quality has led to increase demand for air monitors, as the contaminated air contains harmful pollutants responsible for health problems. Air pollution monitoring and control data are important for air pollution assessment, environment pollution policies by national and local authorities, public and private companies and national organizations, hospitals, institution and public sectors. The total cost of our product is twelve hundred and fifty-three. In future, if we plan to make this product available to public or citizen, then our selling price will be two thousand including labour cost and research and development cost of our product.

CONCLUSION:

This research proposed a smart air pollution monitoring system that constantly keeps track of air quality in an area and displays the air quality measured on an LED the system helps to create awareness of the Quality of air that one breathes daily. This monitoring device can deliver real-time Measurements of air quality. The system to monitor the air of environment using Arduino microcontroller proposed to improve quality of air. Here the using of MQ135 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project which controls the entire process and LED is used for the visual Output. The Automatic Air management system is a step forward to contribute a solution.

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