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Portable Air Purifier Monitoring And Controlling System

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Abstract: The proposed project presents the model of portable air monitoring and purification system which is Bluetooth operated for small rooms, cars, and low-space areas. This system is controlled by Arduino Nano. The system consists of a set of sensors like air quality sensors and temperature sensors to determine the quality of air, whenever the air quality crosses the threshold value it will display toxic or bad air quality on the LCD screen. we can On and Off the fan simply using our mobile phone. The body of the model is made of an acrylic sheet. The purifier includes a two-layer of filter pre-filter and a fine filter for best purification, it absorbed solid and dust pollutant and give dust-free good quality air. It is a portable and handheld system.

Key Words: **Arduino Nano, LCD screen, air quality sensor, temperature sensor, pre & fine filter (keywords)**

1. INTRODUCTION

The Presence of dirt in offices, homes and alternative human environments isn't sensible. In fact, per the Environmental Agency, indoor air quality is two to five times a lot of impure than doors air quality. Air pollution can adversely affect human health and its individual impact varies from one to another. Not only the cities are facing the problem of air pollution but the indoor air quality of rural and urban areas is also getting polluted. The health of millions of people is affected by the bad indoor air quality. I might prefer to enhance the sensors' benefits and build a Smarter air apparatus. rather than the standard method that turning on the air apparatus the entire day. To survive against such indoor air pollution it is necessary to use an smart air purifier. Our project is "Portable Air Monitoring and Purifying System which has two layers of filters and a Bluetooth-operated fan that cools and makes the fresh air out without using any harmful coolant. This device does not cause ozone depletion.

1.1 LITERATURE REVIEW

Previous work done in this field is to observe indoor air quality [1-2]. In which various types of sensors are used to get the data on the different types of gases present in the environment. In addition to that, it can control the working of any filter. The author of the paper followed the process of monitoring the air quality as well as temperature and humidity using temperature and humidity sensors.

Similarly, the work is finished in different forms. In [2] used their observation system to work out the air quality by using various like MQ135, and DHT-11. when analyzing the air quality it permits the user to work his completely different family equipment to modify them on or off and changes.[3].

But there are some problems with this Process. Users need to operate Filter or household equipment manually after the monitoring system notify them about the bad air quality. But there are some scenarios where the user would not be able to operate or afford the equipment or filter. Like while they are sleeping and there is some gas leakage, they just would not be able to turn the filter or equipment on or off. Similarly, if we tend to attach an associate filter with the monitoring system it prices an excessive amount of filter gifts within the market area unit as too costly. [4-7]

N. Rakesh: This paper presents Smart Air Purifier with Air Quality Monitoring System for monitoring and purifying the air at the same time. The principal work of the Smart Air Purifier with Air Quality Monitoring System is to detect the harmful gases present in the air and display toxic or bad air quality on the LCD screen at the same time by using filters the air purifier filters the air and gives fresh air.[8-10]

Mursil Mahmud: IoT-Based Air Pollution Detection Monitoring System using Arduino is a device that detects the pollution in the surrounding air and when it crosses the air

quality index, it is displayed on the LCD screen. This device is used for only monitoring purposes. [11]

The use of ARM with the memory card and gas sensor helps for monitoring and storing data for predictive analysis[12]. The combination of GPS and GSM makes tracking location[13].

1.2 Proposed Methodology

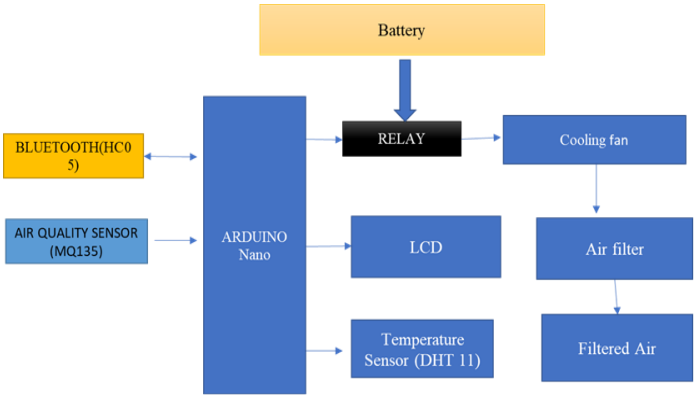

Fig.1. Block Diagram of Air quality and Monitoring System

- In this project we are using Arduino nano which is an open-source microcontroller based on At mega 328P.
- Bluetooth module HC-05 and LCD are used which is connected to Arduino nano.
- For monitoring purposes sets of sensors are used which are an Air quality sensor(MQ135) & Temperature sensor(DHT11) connected to an LCD screen by means of Arduino Nano. For purifying purposes, we are using a cooling fan that is covered with pre & dust filters connected to the Arduino by means of a relay that is powered by an external battery.
- As the system senses the inconvenience in surrounding air it will display on an LCD screen like(bad & toxic air quality).
- So we can easily switch on our purifying system using our mobile phone by means of a Bluetooth module(HC-05) which is connected with Arduino nano.
- After the air quality index reaches normal as it shows (good air quality) on the LCD screen so in we can switch off our purifying system using the same mobile phone.

1.3 Filtering System

Filtering Part

- Air is sucked through the opening in the front panel of the Air purifier and is guided to the first filter.
- The first filter is the "Pre-filter" & its main function is to remove the big particles present in the air.
- It removes particles of 3 to 10-micron size. The second filter is "Dust-filter" and its main function is to absorb the air contaminants such as hairs and other matter which is not visible to the naked eye.

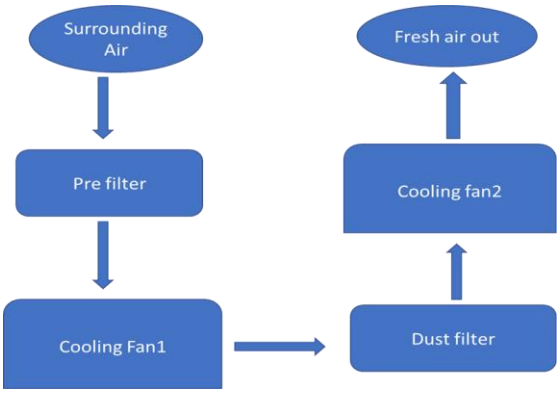

Fig .2. Flow chart

- When we switch on the cooling fan the air is sucked through the opening and it passes through the pre-filter which removes the big particles present in the air.
- then the air has to pass through the dust filter which filters the air and absorbs the air contaminant such as hairs and other matter which is not visible to the naked eye.
- Hence we get the fresh air out by using our portable air filter.

Fig.3. Pre-Filter

Fig 4. Dust Filter

1.4 Tools and Components

Table. no.1

Temperature Sensor (DTH 11)	1 Nos
Arduino nano	1 Nos
Filter Cloth	1 Nos
Battery(12V,2A)	1 Nos
acrylic Sheet	1 Nos
Air Quality Sensors (MQ-135)	1 Nos
Cooling fan	2 Nos
Relay	1 Nos

1.5.Components

- **MQ-135Air quality**: sensor used for detecting a wide range of gases, including NH3, NOx, alcohol, benzene, smoke, and CO2. Ideal for use in office homes and Schools. Air quality sensors square measure used for sleuthing a large variety of gases, as well as NH3, NOx, alcohol, benzene, smoke, and CO2. It ideal to be used in workplaces homes and factories.

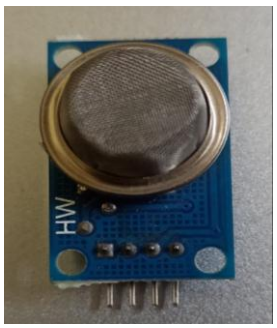

Fig. 4. MQ135

- **Temperature & humidity sensor(DHT-11):** This is a type of electric device whose resistance varies with temperature modification we tend to square measure exploitation DHT 11 for Observance Space. Temperature DHT-11 uses an electric phenomenon.

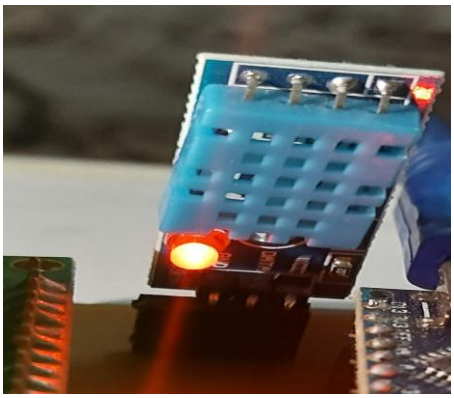

Fig. 8 DHT-11

- **LCD (16x2):** A liquid-crystal show (LCD) may be a flat-panel show or another electronically modulated device that uses the light-modulating properties of liquid crystal. Liquid crystals don't emit lightweight directly, instead of employing a backlight or reflector to supply pictures in color or monochrome. LCDs are on the market to show discretionary pictures (as in an exceedingly general pc display) or mounted pictures with low data content, which may be displayed or hidden.

Fig. 6. LCD (16X2)

- **Cooling Fan**: we are using the cooling fan for suction of impure air and after filtering it sends back the fresh quality air.

Fig .7. Cooling fan

- **Arduino Nano**: We are using here Arduino Nano which is an open-source microcontroller. The ATmega328P provides UART TTL serial communication and is provided with set of digital and analog I/O pins which used to interface with multiple elements. The Arduino Nano may be a little, complete, and the breadboard-friendly board supported the ATmega328 (Arduino Nano 3. x).

Fig .8. Arduino Nano

- **Bluetooth module*(HC-05)*:** wireless communication is swiftly substituted by the Wired associate once it involves physics and communication sometimes we are here using Bluetooth for controlling the cooling fan via relay.

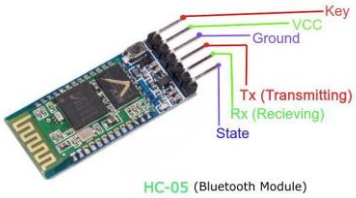

Fig .9. HC-05

- **Battery**: We are using here 12v,2A battery to run the cooling fan, for cooling purposes.

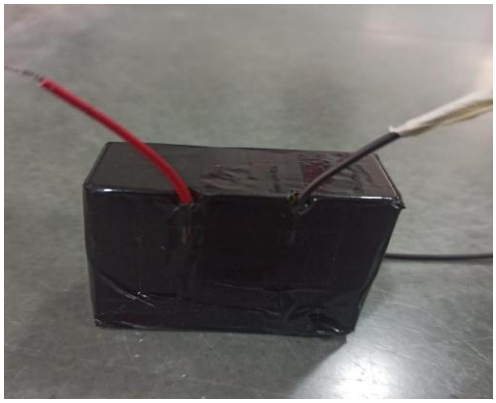

Fig .10. Battery

VII. RESULTS

Fig. 11 (a)

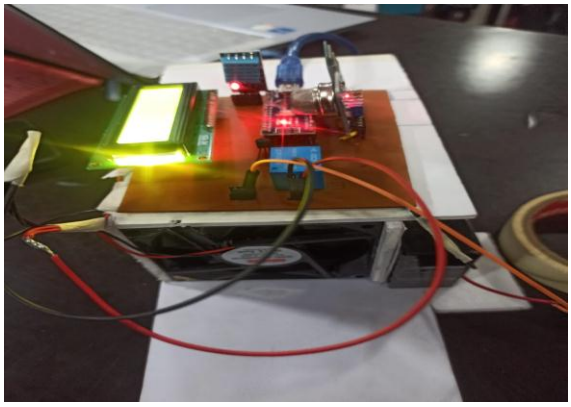

Fig .11. (a) & (b) Working Model of Monitoring and Purifying System

1.6 Conclusion

A low-cost portable prototype model for air monitoring and purifying is presented which Is efficient, convenient to use, and budget-friendly. The contribution of this product is to survive against such indoor air pollution which continuously affects human health. We made it user-friendly. It should also be noted that affordable sensor and air filter plays an important role in air quality observation and purification.

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