

Air Quality Monitoring and Preservation for Home and Office

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ABSTRACT

The work aims to design an air quality monitoring and preservation system. As the statistics show poor air quality is a major concern all over the world. Poor air quality has effect on human health, agriculture and economics. The proposed work will help reduce indoor air pollution using triple layer filtering process. The system can be operated remotely using of Bluetooth interface provided with it, which could be incorporated into smart system. The system will work in two phases monitoring and preservation. In the monitoring part pm2.5 sensor will monitor the air quality along with temperature and humidity sensors. In the preservation stage HEPA filter and Activated Carbon Layer filter and UV light will play crucial role in purifying the air and preserving the quality of air for human beings.

Keywords: *Air Purification, HEPA*

I. INTRODUCTION

Increase in the health problems of people triggered by exposure to various indoor air contaminants have social concerns all over the world because contemporary people spend most of the day in confined indoor spaces. Dust, pollen, pet dander, mold spores, and dust mite feces can act as allergens, triggering allergies in sensitive people. Smoke particles and volatile organic compounds (VOCs) can pose a risk to health. Exposure to various components such as VOCs increases the likelihood of experiencing symptoms of sick building syndrome. The airborne particulate matter consists of solid and liquid, organic and inorganic substances and is usually grouped into coarse particles and fine particles. Fine particles sometimes refer to particles with aerodynamic diameters of and less than 2.5 μm , or simply PM_{2.5}. The particulate matter if inhaled can cause serious respiratory problems, the exposure to these particulate matter may trigger asthma. These fine air particulates may reduce the functioning of lungs, cause heart diseases, respiratory diseases. The system is capable of capturing a greater number of bacterial, virus, and DNA damaging particulates. Some 88% of those premature deaths occurred in low- and middle-income countries, and the greatest number in the WHO Western Pacific and South-East Asia regions. According to WHO,

more than 80% of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed the World Health Organization (WHO) limits. While all regions of the world are affected, populations in low-income cities are the most impacted. According to the latest urban air quality database, 98% of cities in low- and middle income countries with more than 100 000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 56%.

II. BLOCK DIAGRAM

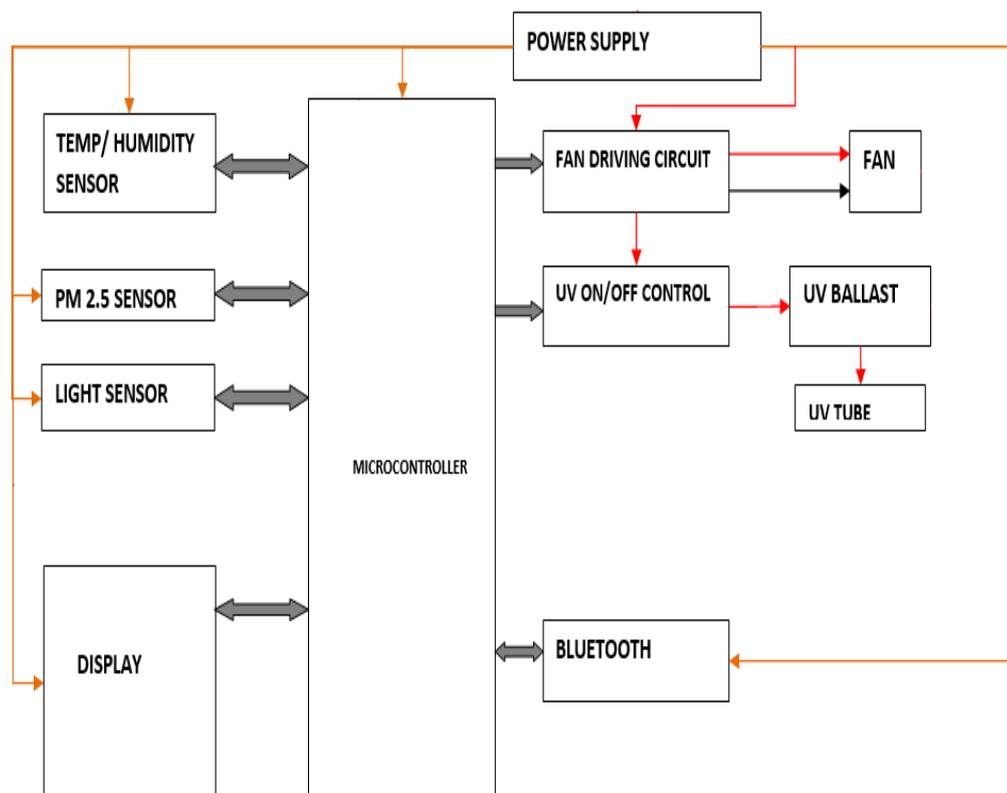


Fig 1. Block Diagram

III CIRCUIT DIAGRAM

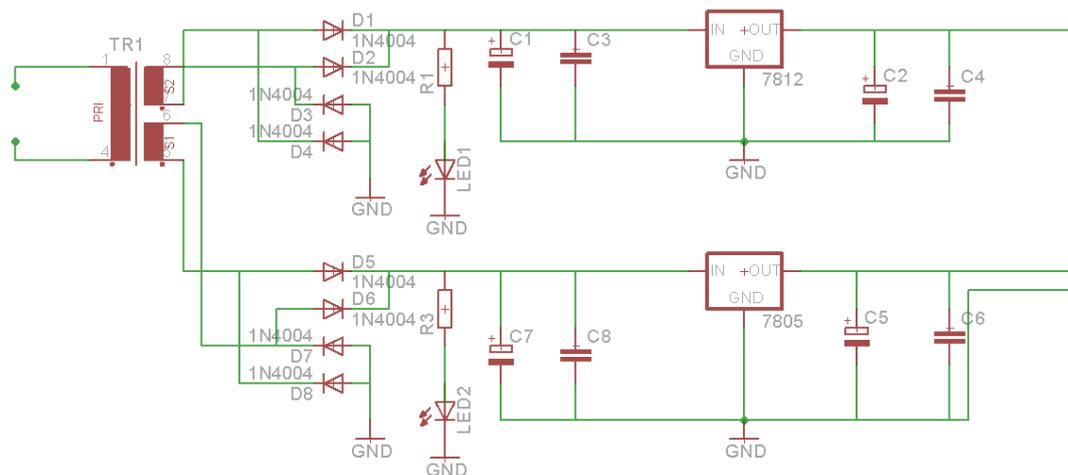


Fig. 2. Power Diagram

A regulated power supply is very much essential for several electronic devices due to the semiconductor material employed in them have a fixed rate of current as well as voltage. The device may get damaged if there is any deviation from the fixed rate. The AC power supply gets converted into constant DC by this circuit. By the help of a voltage regulator DC, unregulated output will be fixed to a constant voltage. The circuit is made up of linear voltage regulator 7805 along with capacitors and resistors with bridge rectifier made up from diodes. From giving an unchanging voltage supply to building confident that output reaches uninterrupted to the appliance, the diodes along with capacitors handle elevated efficient signal conveyable. Power supply is a device that mechanized on DC voltages and also it can uphold its output accurately at a fixed voltage all the time although if there is a significant alteration in the DC input voltage. ICs regulator is mainly used in the circuit to maintain the exact voltage which is followed by the power supply. A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator. For the checking of gigantic alterations in the input as well as in the output filter, capacitors are used. While the bypass capacitors are used to check the small period spikes on the input and output level. Bypass capacitors are mainly of small values that are used to bypass the small period pulses straightly into the Earth.

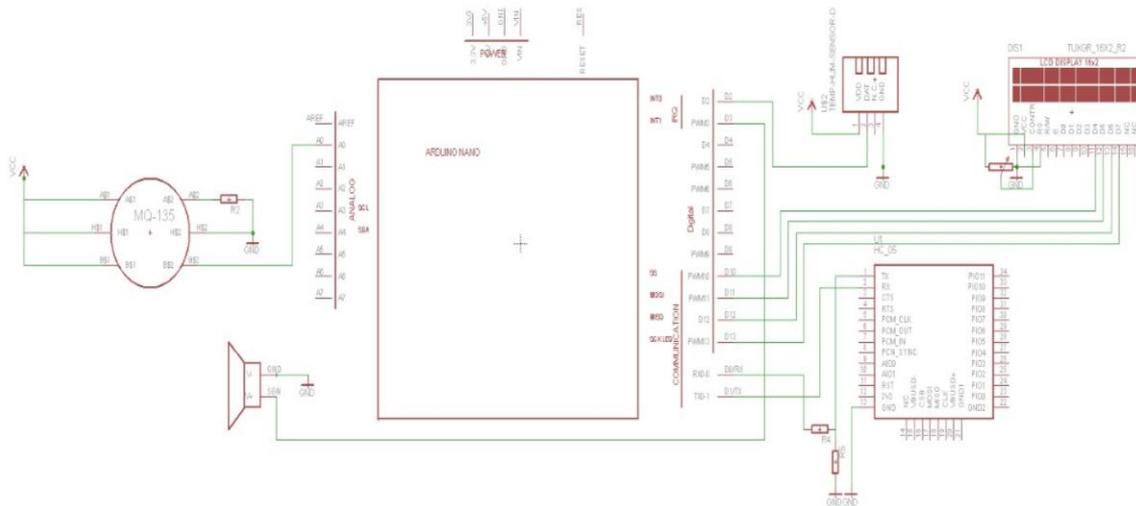


Fig. 3. Microcontroller Interfacing

IV. WORKING

The microcontroller is the main part of the system, it acts as the brain for the whole system all the peripherals are connected to or through the microcontroller as shown in the Fig. Controller Interface. The system is divided in two parts monitoring and preservation, for the purpose of monitoring there are two sensors used in the system. The first sensor is the DHT11 which will be used to monitor temperature and humidity, the sensor is connected to microcontroller through pin number 2. Also the sensor is given 5V VCC and GND connection from the power supply unit. Similarly the second sensor is MQ135 the sensor is used to detect the harmful gases in the surrounding area. The MQ135 is a six pin sensor. Three pins on the left are given 5V supply two pins are grounded and one pin is connected to the analog input pin of the microcontroller as input. It is connected to the A0 analog input pin. The buzzer is connected to pin D3 of the microcontroller, it will be used to alert the user for any harmful gases of p.m. levels are high in the area and also to alert of any faults with the system. The second part of the system is preservations part, in this part the main aim is to filter the air through multiple levels of filter which will lead to cleaner air in the surrounding area. A UV light is connected to the 12V power supply, the function of this light is to kill the bacteria present in the air. The UV light connected through a ballast circuit which basically acts as the driver circuit for the light. The Fan is the most important part of the system as it is solely responsible for the air flow coming in and out of the system, the fan is operated through a

driver circuit which acts as speed controller for the fan as well. The supply line for the fan and the UV light is different as both these require high voltage and current.

The other peripherals connected to the system are Bluetooth module, the module is given 5V VCC and GND signals and two pins Receiver and Transmitter are connected vice-versa to the microcontroller. The Bluetooth module provides the connection between user and the system. The LCD is interfaced with microcontroller through 4 bit mode, the four data lines D4, D5, D6 & D7 are connected to pins 10, 11, 12 & 13 respectively. The RS and Enable pins are interfaced with the controller. The LCD is given 5V VCC and GND signals. The same signals are also given to the anode and cathode pins of the LCD. The LCD is used to display the Temperature, Humidity and the P.M level in the surrounding.

V. CONCLUSION

The report discusses an open platform of an indoor air quality monitoring and preservation system. The details of the hardware and the software design are presented and demonstrated in real world environment. The current work focuses on the control of the particulate matter PM2.5 concentration which is harmful for a human being in many ways. The system also monitors temperature and humidity. The whole system can be accessed remotely from a smartphone making use of system easy for the user.

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