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AIR PURIFIER USING SOLAR SYSTEM

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ABSTRACT

This research paper focuses on the design and development of a solar-powered air quality monitoring and filtration system aimed at mitigating air pollution. The primary objective is to target and remove harmful particulate matter, which is a significant contributor to air pollution.

Employing a non-conventional approach, the system aims to achieve optimal air purification results through cost-effective and environmentally friendly methods

The proposed system utilizes various sensors to assess air quality parameters. Specifically, the MQ135 sensor measures overall air quality, the MQ6 sensor detects contamination from other gases, and the MQ2 sensor identifies combustible gases. These sensors operate on analog signals, which are then converted to digital data using an Analog-to-Digital Converter (ADC).

The Arduino Uno controller board, equipped with 6 ADC channels, reads analog voltages ranging from 0 to 5 volts and converts them into digital values. With an 8-bit ADC on the Arduino Uno Board, digital values from 0 to 1024 correspond to the voltage range. These digital values are calibrated to reflect the actual percentage of gas present in the air, ranging from 0 to 100%.

The calibrated sensor readings are displayed on an LCD connected to the Arduino board, which has four lines with 20-character spaces each. The system provides real-time readings of sensor data on the LCD display. By setting threshold values for the sensors, the system controls the operation of the filter fan to purify the air.

For example, if the threshold value is set at 40%, the filter fan will be activated to filter out contaminants when the sensor readings exceed this threshold. The fan is controlled via a relay, which is switched by the controller through a transistor

Keywords: Real time air quality detect, Solar charge controller, Air quality monitoring, LCD.

1. INTRODUCTION

In recent years, the escalating issue of air pollution has become a significant concern worldwide. The World Health Organization (WHO) reports that a staggering 91% of the global population resides in areas where air quality exceeds safe levels. Exposure to such pollution is linked to a host of health problems, ranging from respiratory illnesses to cardiovascular issues and even cancer [1].

In response to this pressing environmental challenge, solar-powered air purifiers equipped with air quality monitoring systems have emerged as a promising sustainable solution. These innovative devices harness solar energy through photovoltaic cells to power both the air purification process and the monitoring of air quality. The root causes of air pollution are diverse, stemming from various human activities such as industrial processes, transportation, construction, and more. Urban centers, in particular, bear the brunt of high pollution levels, posing serious health risks to inhabitants [2].

While there are existing air purification options available, many fall short of delivering the desired efficacy, partly due to limited funding allocated by government agencies. This underscores the need for cost-effective alternatives that can effectively tackle air pollution.

To address this gap, we are developing solar-powered air purifiers tailored for affordability and efficiency. However, a challenge lies in ensuring consistent power supply for internal components. To overcome this hurdle, we are designing an energy-independent, robust inner air purifier integrated with air monitoring capabilities, all powered by solar panels.

Our solar air purifier employs a centrifugal suction system to draw in air from the bottom, passing it through a filtration mechanism that effectively removes contaminants and odors, thus enhancing indoor air quality.[3]

2. PROBLEM STATEMENT

1. Integrating health sensors such as body temperature and pulse monitoring devices.

2. Designing, executing, and evaluating a device capable of remotely tracking hand and finger movements. This system utilizes a Smart Glove and multiple E-textile sensors to measure the range of motion (ROM) of fingers, along with a microcontroller.

3. The development of monitoring systems aims to decrease healthcare expenses by minimizing visits to physician offices, hospitalizations, and diagnostic procedures. The utilization of GSM technology enables the server to continuously update patient data on a website platform.

3. ADVANTAGED AND APPLICATIONS

3.1Applications:

1. Indoor and Outdoor Air Quality Monitoring.
2. Can be used near populated areas like Hospital areas, Laboratory, Class rooms etc.
3. This air purifier can also use as air conditioner by placing wet filters.
4. The Solar power generated can be used for lighting and charging purpose.

3.2 Advantages:

1. Sensors used in this project are easily available.
2. Sensors have long life time & less cost.
3. External supply is not required as we use solar panel for the power supply.
4. Detecting a wide range of dust and gases, including PM2.5, alcohol, benzene, smoke, CO_2, NH_3 and NOx.
5. The sensor Operating voltage will be 5-12 volt.
6. Outdoor air quality with temperature and humidity can be measured using sensor.

4. BLOCK DIAGRAM

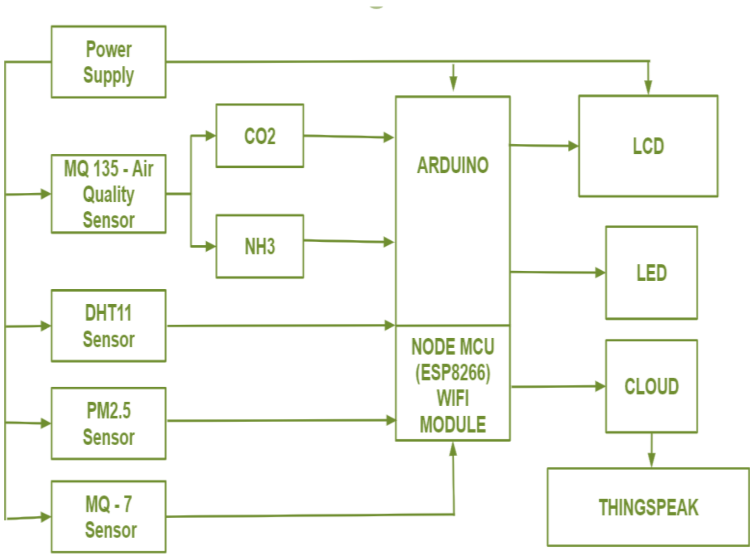

FIG 1 Air Purifier Using Solar System

ALGORITHM

- Step1: Start
- Step 2: Establish connection between device and network.
- Step 3: Sensor measures the pollutant concentration
- Step 4: Read the sensor values/Input.
- Step 5: Comparing them with reset value & Enter the thing speak channel Id:1310999.\
- Step 6: Sensor value > Threshold value & Enter the key=JBB2TB1KKRF29QBT.
- Step 7: LCD display air quality condition & LED alert the user.
- Step 8: Read the data from different fields of created things speak channel via Internet.
- Step 9: Visualize data obtained via internet.
- Step 10: Stop.

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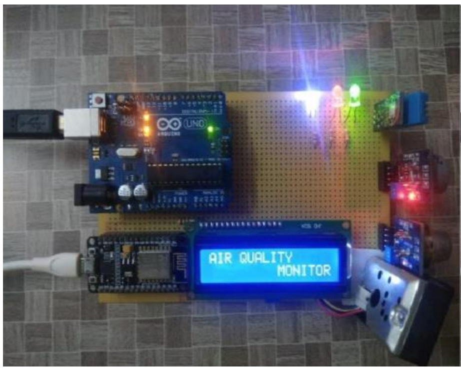
5. RESULTS



OBSERVATION

DAY	TEMPERATURE	HUMIDITY	PM 2.5	CO	CO2	NH3
1	33	65	83.96	3.19	395.133	0.29
2	34	62	82.77	3.16	392.01	0.21
3	34	65	83.59	3.14	400.1	0.33
4	34	64	84.13	3.19	410.96	0.26
5	33	65	85.49	4.16	370.96	0.26
6	33	60	79.37	3.19	395.15	0.29
7	34	64	84.64	3.26	326.23	0.25
8	35	65	78.52	3.85	370.28	1.20

6. CONCLUSION

In this, we have developed a solar-powered air purification system coupled with an integrated air quality monitoring system, presenting a sustainable and effective means to enhance indoor air quality. This innovative system merges the advantages of renewable solar energy with advanced air purification technology and real-time air quality assessment capabilities. By harnessing solar energy through photovoltaic panels, our solar-powered air purifier eliminates reliance on grid electricity, thereby reducing carbon emissions and offering a cost-efficient and environmentally friendly solution, particularly in regions abundant with sunlight. To further optimize the system's functionality, we have integrated an air quality monitoring system. This component continuously measures vital air quality parameters, including particulate matter (PM2.5 and PM10), carbon dioxide (CO_2) levels, volatile organic compounds (VOCs), as well as temperature and humidity. The real-time monitoring data is displayed on an intuitive interface, enabling users to effortlessly monitor and evaluate the air quality in their surroundings.Furthermore, the air quality monitoring system integrates advanced functionalities including customizable fan speeds and automated alert systems. In response to air quality dropping below predefined thresholds, the system dynamically adjusts fan speed to enhance air circulation and triggers alerts to notify users. This ensures the air purifier operates efficiently and effectively, adapting to fluctuating air quality conditions in real-time.

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