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Smart Air Quality and Temperature Monitoring Based on IOT

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ABSTRACT: With an increasing air pollution, we developed an Advanced Air Quality Monitoring System using Node MCU. The system involves monitoring the air quality by considering parameters like Suspended particulate matter(SPM), Carbon dioxide, Ozone, Carbon monoxide, Smoke, temperature and humidity. Particulate matter being a very important parameter gives a clear indication of pollution in that particular time in the area. These pollutant data are extracted using sensors like MQ7, MQ135, MQ9, DHT11, etc. Most of these sensors produce analog output so an Analog to Digital converter is required before supplying the data to the Node MCU microcontroller. Using software and coding of the Node MCU, the data are analyzed and a graph to show the changes in the locality and time in which the experiment is plotted. The results obtained were verified. The experiment is conducted in a locality at Rajarhat, New Town, Kolkata and the results were compared with that from a local environment control authority. This system would help to take real-time decisions and very effective in today's situation of high air pollution in most of the Indian cities.

KEY WORDS: AirQuality, NodeMCU, GasSensores, Airpollution Monitoring, Temperature monitoring

I. INTRODUCTION

Air is one of the important component of our biosphere. The quality of air is changing day by day. All the industrialization affects the air quality so the components of air, such as nitrogen, carbon dioxide, carbon monoxide, Sulphur dioxide etc. are changing. These changes for gases are affecting the ecosystem. To get an idea of this changing of quality and the quantity of pollutants over time our project is used. This change in quality of the air is affecting humans as well as other animals and plant health. Due to this high industrialization, large amount of toxins is being introduced in the air, which are foreign.

Most of these sensors produce analog output so an Analog to Digital converter is required before supplying the data to the Node MCU microcontroller. Using software and coding of the Node MCU, the data are analyzed and a graph to show the changes in the locality and time in which the experiment is plotted. The results obtained were verified. The experiment is conducted in a locality at Rajarhat, New Town, Kolkata and the results were compared with that from a local environment control authority.

II. EXISTING SYSTEM

In [1], graph lab is used for monitoring the air quality in an indoor environment. In [2], the concept of IOT [8] is used to monitor the air pollution through Node mcu and takes into account the parameters of PM, CO, CO2, Temperature, Humidity and air pressure. However, pollutants like Nitrogen Dioxide, Sulphur Dioxide, and Ozone are not taken in it. This may produce faulty results, as the concentrations of these pollutants may be high in some areas. [3] Shows the use of web socket and Node mcu to monitor pollution but the challenges faced are security of data and Storage Management. In [4], the author explains the controller interfaced monitoring process. Most of the previous works lack sensors of all kind of pollutants. In addition, data security and management needs to be taken into account. Movable objects help in better extraction of pollutant data.

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III. PROPOSED SYSTEM

The sensors mentioned above were already used in various previous models in this field. However, none of the models used the ozone sensor along with other sensors to measure the ozone level of a particular area. Here, in our project, we have implemented an ozone sensor to make the measuring system more concrete and trustworthy since ozone sensing has become an important area in pollution monitoring. We have used MQ131 sensor to measure the ozone level. As a whole, this system is a more complete and advantageous than any previous model, which had been made to measure the air quality of a certain area. The proposed system provides low cost, low power, compact in nature and highly accurate system for monitoring the various parameters of the environment.

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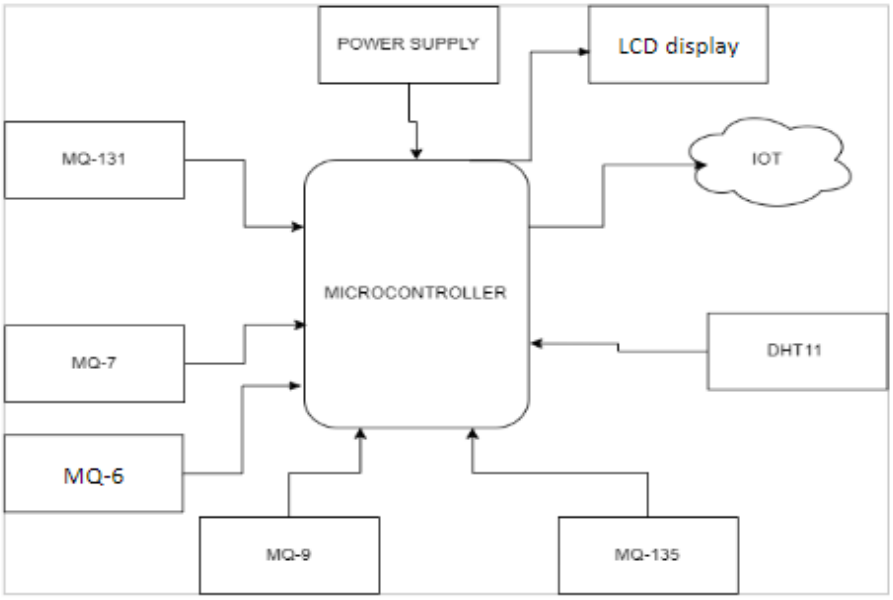
IV. BLOCK DIAGRAM



V. COMPONENTS

- MQ-131 ,
- MQ-7,
- MQ-9 ,
- MQ-135,
- DHT-11,
- NODE MCU,
- LI-ION BATTERY,
- POWER SUPPLY UNIT,
- CONVERTER UNIT,
- I2C MODUAL,
- 8 SEGMENT LCD DISPLAY,
- JUMPER WIRES,

5.1.ESP 32

General-purpose input/output (GPIO) is a pin on an IC (Integrated Circuit). It can be either input pin or output pin, whose behaviour can be controlled at the run time.

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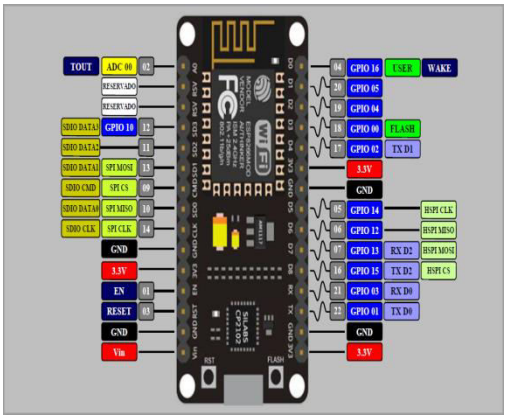
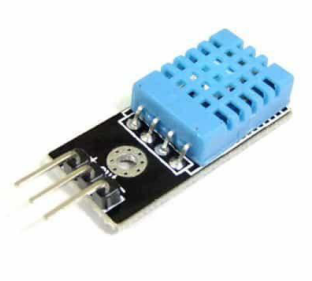


5.2. DHT-11

- Ultra-low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacin
-



5.3. GAS SENSORS

- Operating Voltage is +5V
- Can be used to Measure or detect CO
- Analog output voltage: 0V to 5V
- Digital Output Voltage: 0V or 5V
- Stable, Long life and Low Cost
- Fast Response time
- Heater consumption about 350mW
- The Sensitivity of Digital Output pin can be varied using the potentiometer

5.4. Li-ion battery :

They offer the highest energy density of any other battery cell, meaning they store more energy than other batteries, such as alkaline. Lithium batteries are only sold in AA, AAA, and 9V sizes; however, their mAh ratings exceed every

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other non-rechargeable battery

VI. HARDWARE

VII. RESULTS & CONCLUSIONS

In our system, we have used Node MCU micro-controller along with different real time sensors to analyze the environmental parameters and then take appropriate action based on the generated results.

This model can be also implemented in domestic air conditioning devices so that it can monitor the condition of air inside a home. If the amount of dust particle is higher than the adequate level then it can take appropriate action to measure the dust particles and reduce the level as much as possible. Automatic air purification device can also be implemented by using this prototype model.

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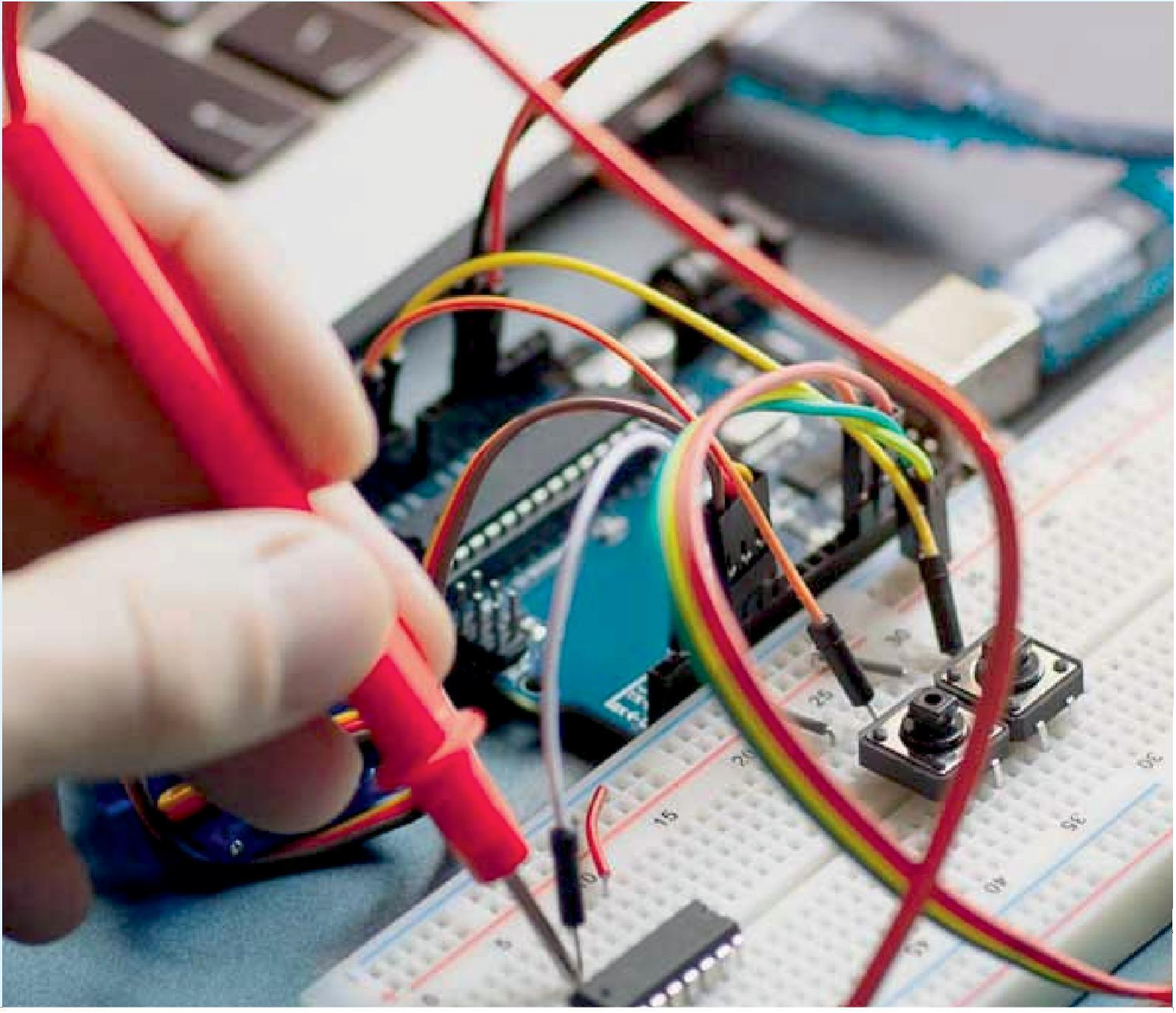

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