iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 11 **Issue:** V **Month of publication:** May 2023

**DOI:** https://doi.org/10.22214/ijraset.2023.51826

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 11 Issue V May 2023- Available at www.ijraset.com*

# Environmental Monitoring System

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***Abstract:*** ***In recent times especially in India, people have become increasingly aware of the importance of the environment they reside in. This has led to a growing demand for a dependable environmental monitoring system. Apart from its industrial application, an environment friendly system to monitor the air quality is too essential for ensuring the safety of workers in chemical, mining, and food industries etc., where there are chances of air getting contaminated by baleful impurities. Large-scale sensor deployment for such purposes raises concerns over gathering of the data, handling, connectivity, utilization of power and the potential of the system. Internet of Things (IoT) technology is ideally suited to address these challenges. This paper takes IOT as base and designed the whole system using sensors, micro controllers, and IoT-based technology to effectively monitor changes in the environment. The proposed module enables users to monitor the certain parameters of environment such as humidity, moisture, temperature and expose the present contaminants in the atmosphere. So, the paper also describes the development of a web application that provides vital information to users and allows them to set up notifications for the certain vital changes in data provided by sensor. Compared to other such parallel systems, this system which we have come up with is very cost effective, precise, friendly, and very simple to monitor and visualize the data provided. This proposed system has been checked at different stages The system has been evaluated in various stages and has demonstrated an intense perfection under different conditions.***

***Keywords: Sensors, Arduino Uno, WIFI, Internet of things (IOT)***

## I. INTRODUCTION

This system is designed to monitor the surrounding parameters in the environment with the help of less powered wireless sensors which are linked to internet. The data collected by sensors are then transferred to the server, which can be accessed through other devices which are connected to internet. With IoT technology, current system has the potential to connect to a vast number of devices over the internet, making communication and interaction easy. By logging data from various lo cations around the world, the system can provide accurate and reliable information about environmental parameters. It addresses the challenge of integrating systems and promoting compatibility, providing a straightforward structure which simplifies the transmission of data from sensors with different capabilities. The idea behind this system is to provide remote monitoring of environmental parameters using the Internet.

## II. METHODS

### *A. Tools and Technology*

#### *1) Air Quality and Gas Sensors*

Fig 1: - MQ135 Gas sensor [7]

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Fig 2: -MQ6 Gas sensor [8]

These sensors are generally used to find the polluted gases and contaminants in the air. The general used in the industry to monitor the gas detection.

*2) Soil Moisture Sensor*

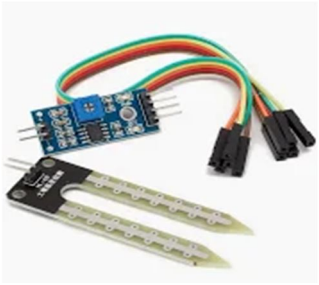

Fig 3: - soil moisture sensor (SMS) [9]

This sensor is well known for scaling the water content in the soil. Perfect use of this sensor is in the field of agriculture.

*3) Temperature Sensor*

Fig 4: - Temperature sensor (LM-35)

It measures the hotness and coolness in the atmosphere in a temperature range of -55°C to 150°C.

*4) PH Sensor*

Fig 5: - PH sensor [11]

This sensor is used to quantify the acidity and alkalinity of the water within range of 0-14. When the PH value falls below seven then the water begins to become more acidic.

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*5) Arduino Uno*

Fig 6: - Arduino Uno [12]

It is a microcontroller board that is open source, and this board is programmable and can be used in various electronics projects. This board can be integrated with different kind of electronic boards, sensors, motors etc.

*6) 16*2 LCD Display*

Fig 7: - 16*2 LCD Display [13]

It is module for electronic displays that is used in variety of circuits and devices. As the name tells us that it has 16 rows and 2 columns used to display the data and the message.

*7) Bluetooth Module*

Fig 8: - Bluetooth Module (HC-05) [14]

It is designed for the wireless communication between any two devices and establishes a protocol between the devices to communicate or share the data.

*B. Functioning and Features*

*1)* Lately climatic change and the observation on the environment and management has become more active presently. In this paper, three distinct IOT solutions utilizing wireless sensors for environmental and ambient monitoring are presented.

*2)* The soil, water and air samples are collected, and a connection is established between the controller and the sensors. By keeping in mind some parameters like pH value of water, moisture of the soil, temperature, turbidity, nutrients, air pollutants in the atmosphere have been read and recorded according to the sensors.

*3)* The obtained results are then uploaded on the cloud and displayed the same on LCD screen. If the sensor readings are not in the normal threshold range, then an alert message is sent to the concerned board about the uneven measurements of the element via a GSM module. If all the values are confined in the range, then the readings are uploaded on the cloud and stored.

*4)* Accessing the mobile communication network broad coverage is essential for measuring atmospheric environmental information without limitations on location and passing on it to server.

*C. Figures of the designed model*

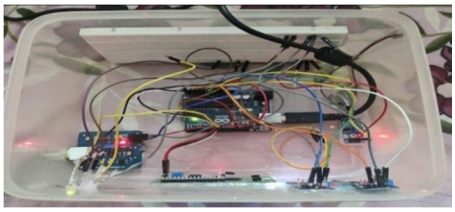

Fig 8: - Shows the whole circuit.

Fig 9: - Shows the mounting of PH sensor and soil moisture sensor.

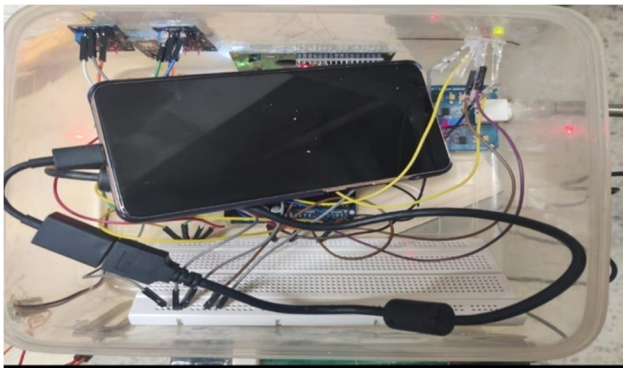

Fig 10: - Shows the device connected to the circuit.

Fig 11: - LCD screen displays the name of the project.

Above figures shows the construction and the placement of the sensors in shapable box, where fig 8 shows the whole monitoring system, fig 9 shows the PH and soil moisture sensor which are being placed on the longer side of the box, fig 10 shows an external device connected to the circuit for checking the parameters and finally fig 11 shows the LCD screen and two gas sensors which measure the various oxide content in atmosphere and displays it on LCD screen.

## III. APPLICATIONS

1) The food industry and transportation sectors are particularly susceptible to adverse temperature and humidity conditions, which can have a direct impact on the quality of food during production and transit. Maintaining the necessary temperature and humidity levels is crucial for preserving the quality of the food during transportation. Therefore, the implementation of IOT applications can be proved to be beneficial for food industries in preventing losses caused by environmental factors.
2) Presently air and water safety monitoring technologies rely heavily on manual labour in conjunction with proper equipment and laboratory analysis. The technology of IOT enhances its capabilities by decreasing the reliance on human labour, enabling more frequent and extensive monitoring and sampling, facilitating advanced and incorporating on the spot testing and connecting feedback measures with detection system. This enables us to avert significant instances of contamination and prevent any related disasters.

## IV. RESULTS

1) Our device can measure PM2.5, humidity, temperature, CO2, O2 and VOC. The values are processed by the Arduino micro controller and the results are displayed on the screen for quick viewing. Since this project is combinations of different-different sensors it gives us a single platform to measure all three necessary parameters of the nature.

## V. CONCLUSION

1) This project mainly focuses on checking the quality of soil, water, and air so that each of those entities are used effectively and maintain their health. This is relatively a modern research field and is expected to expand soon. There is a lot to be improved in this area. The sensor technology will help the user in making better decisions and acts as a preventive measure at the right time.
2) The installation location or space for the development system is unrestricted, and it can monitor atmospheric environmental factors in a comparable manner. However, it may be challenging to draw direct comparisons between the observation results of the two systems due to variations in measurement site locations.

## VI. ACKNOWLEDGMENTS

I am immensely grateful to our college (VIT PUNE) for their unwavering support and encouragement that have aided me in successfully completing the project. I would like to extend my thanks to our group members and guardian for their invaluable contributions throughout this endeavor.

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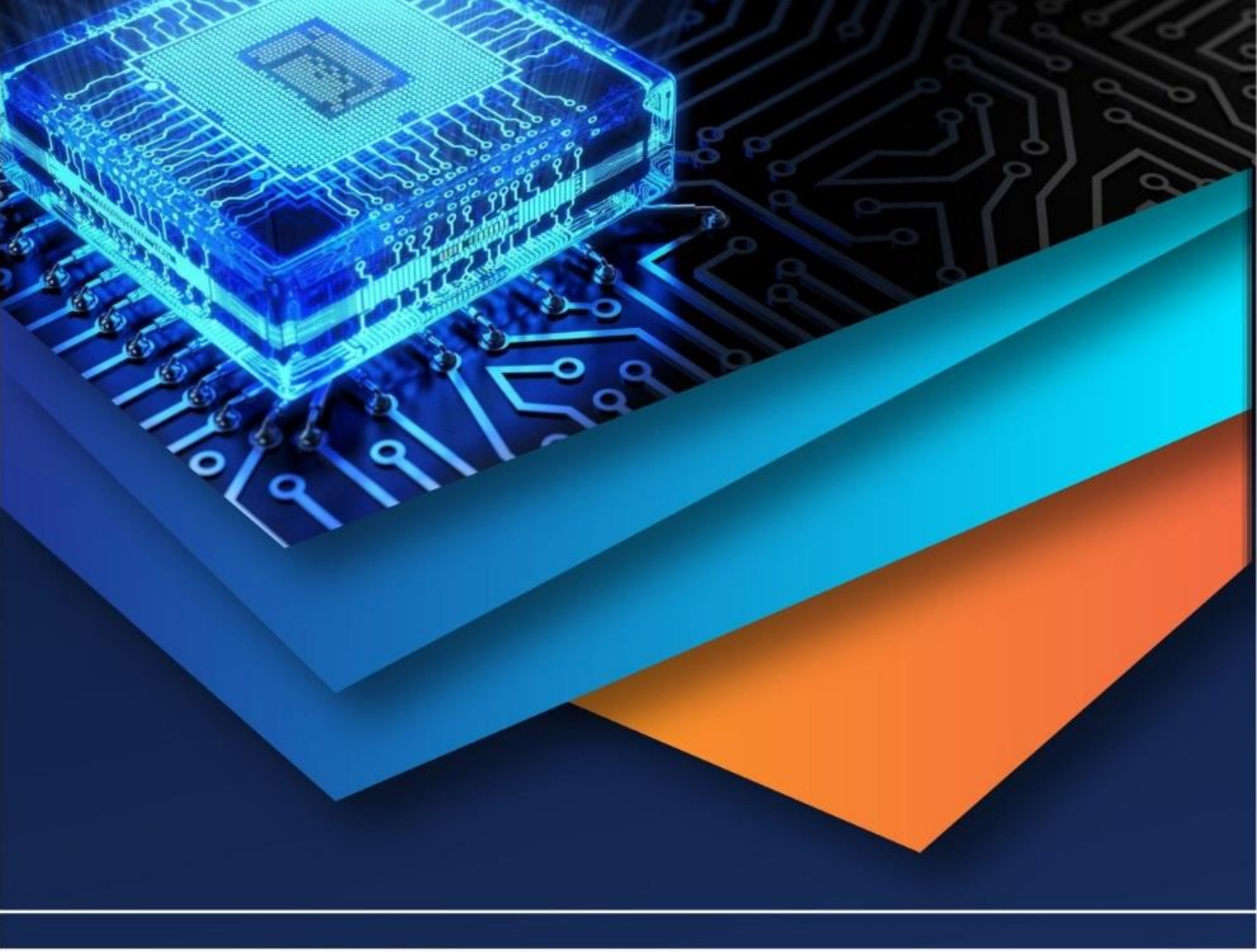

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