International Conference on Advances in Materials, Computing and Communication Technologies
In Association withInternational Journal of Scientific Research in Science and Technology
Volume 9 | Issue 1 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

Air and Water Quality Monitoring System

Daniel Gold Sam C[1], Mohamedabdulazeez M[1], Mithinesh S[1], Jeyanthi S[2]
[1]Students, Ramco Institute of Technology, Rajapalayam, Tamil Nadu, India
[2]Assistant Professor, Ramco Institute of Technology, Rajapalayam, Tamil Nadu, India

ABSTRACT

Pollution has reached the environment's carrying capacity in recent years. Despite the implementation of several pollution-control programmes, there has been little improvement. Despite our government's best efforts to protect natural resources, it is sometimes exploited by inevitable waste discharges. Textiles, leather, sugar, and paper, for example, are water-intensive and polluting industries that have changed in recent decades by extracting large quantities of water and discharging effluents without adequate treatment. Improved pollution-linked databases and ecosystem-balancing technologies are required to resolve this. In the literature, there are a number of technologies for tracking pollution, but they all rely on conventional databases. With the implementation of IoT-based technologies in the industrial waste and air management sectors for Online Monitoring solutions of polluting parameter values such as temperature, humidity, and carbon monoxide gas concentration and updates into the database, polluting parameter values such as temperature, humidity, and carbon monoxide gas concentration and updates into the database. The ESP 32 system is designed for monitoring and managing IoT devices in a website and hosted environment.

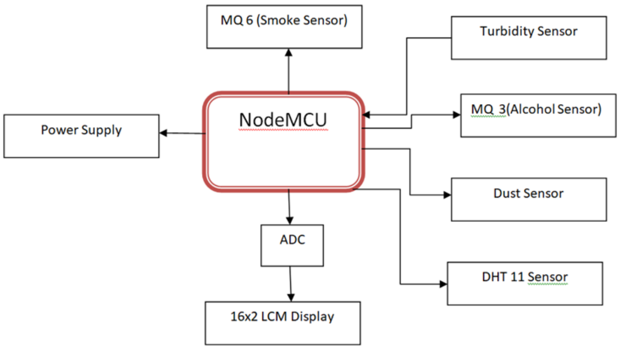
I. INTRODUCTION

Pollution has reached the environment's carrying capacity in recent years. Despite the implementation of various pollution-control laws, no progress has been made. Furthermore, amid our government's best efforts to safeguard the atmosphere, uncontrolled waste discharges do happen from time to time due to unexpected circumstances. Textiles, leather, sugar, and paper, for example, are polluting and water-intensive industries that have changed significantly in recent decades, consuming vast amounts of water and discharging effluents without proper care. Efficient pollution-related databases and ecosystem-balancing solutions should be strengthened to counteract this. With the use of IoT-based technology for polluting parameter Online Monitoring solutions in the industrial waste water and air treatment market, along with sensors that capture parameter values such as pH, temperature, turbidity, and carbon monoxide gas concentration, among others, and update them into an online database.

II. METHADOLOGY

All analogue sensors will be connected to the NodeMCU in this device. The temperature sensor DHT11 has a resistance range of 55 to 1500 ohms and works between 0 and 5 volts. The turbidity sensor is powered by a 12V supply and has a range of 0 to

100%. (3-5V). The MQ-6 and MQ-3 gas sensors detect flammable gases such as LPG, Propane, Hydrogen, and Methane with high sensitivity. The input voltage for all analogue sensors is set to be between 0 and 5 volts, and the Vcc pin of the analogue sensors is connected to the digital pins Vin and GND of the NodeMCU.



III. NODEMCU INTEGRATION

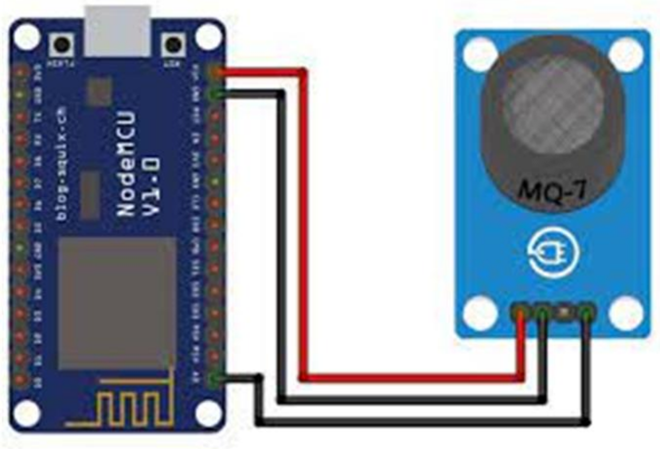
Antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters, and power control modules are all built into the ESP32. With minimal Printed Circuit Board (PCB) specifications, ESP32 adds priceless flexibility and versatility to your applications.

- Memory: 448 KB ROM, 520 KB SRAM • CPU: Xtensa® single/dual core 32 bit LX6 microprocessor
- Clocks include an internal 8 MHz oscillator, an internal RC oscillator, and an external 2 MHz to 60 MHz crystal oscillator, among others.
- Timers : Two sets of timers, one RTC timer, and one RTC watchdog
- Peripheral interfaces: 34 GPIOs, 4 SPIs, 2 I2S, 2 I2C, 3 UART, CAN 2.0, 1 host (SD/eMMC/SDIO), 1 slave (SDIO/SPI), 34 GPIOs, 4 SPIs, 2 I2S, 2 I2C, 3 UART, CAN 2.0, 1 host (SD/eMMC/SDIO), 1 slave (SDIO/SPI).
- ADC: Up to 18 channels, 12 bit SAR ADC.
- Digital-to-analog converter (DAC): 2 x 8-bit DAC
- Sensors: ten touch sensors and a Hall sensor
- IR (Tx/Rx): Infrared (Tx/Rx)
- PWM: up to 16 channels of motor and LED PWM
- Customer security: 1024-bit OTP up to 768-bit

3.1 NodeMCU interfacing with MQ-06 and MQ-03

The MQ-06 and MQ-03 gas sensors can detect a variety of gases, including H2, alcohol, LPG, CH4, and smoke. When it senses smoke, it responds rapidly. As gas reaches the coil field, it generates voltage. The output voltage is proportional to the gas concentration, so the higher the gas concentration, the higher the output voltage. This voltage is read by a microcontroller or MCU based on an ESP32 board. According to the programming, necessary action is taken based on voltage calculation.

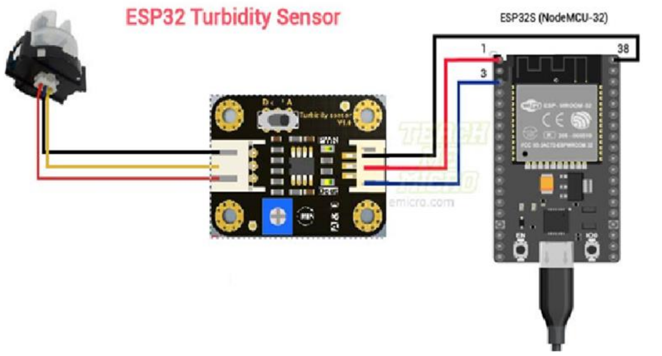
This is an easy-to-use liquefied petroleum gas (LPG) sensor that detects LPG levels in the air (mostly propane and butane). The MQ-6 can detect gas concentrations ranging from 200 to 10,000 parts per million (ppm).



3.2 NodeMCU interfacing with turbidity sensor

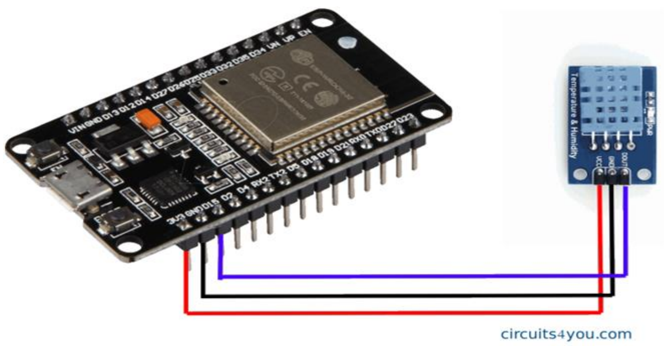
DFRobot's turbidity sensor consists of two components: a submerged sensor and a controller surface.

The controller board has a switch that allows you to switch between digital and analogue modes. The sensor outputs a low voltage in digital mode when the water has too much mud. The controller's sensitivity, which can be adjusted using the blue potentiometer, is used to measure "muddy" in this situation. The controller board has a switch that allows you to switch between digital and analogue modes. The sensor outputs a low voltage in digital mode when the water is muddy. The controller's sensitivity, which can be adjusted using the blue potentiometer, is used to measure "muddy" in this situation. In this project, the turbidity sensor is used in analogue mode because it provides more possible values. As a result, the output pin of the controller is attached to an analogue pin (to which the ESP32 has a lot of, btw).



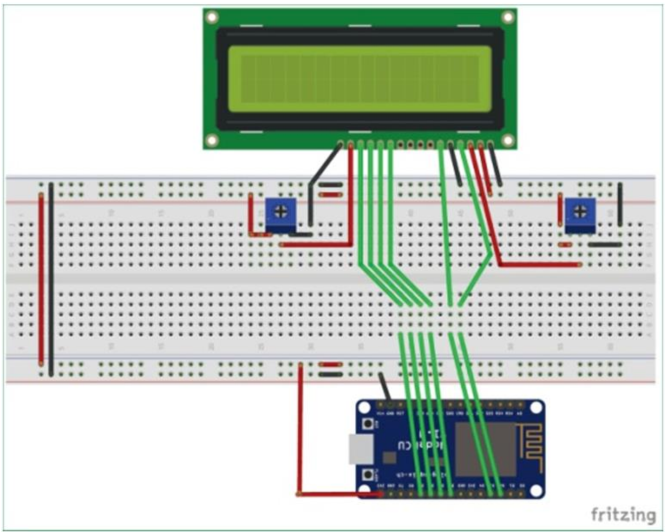
3.3 Interfacing Temperature and Humidity sensor with NodeMCU

The four pins on the DHT1 sensors are VCC, GND, data, and a not attached pin with no use. A pull-up resistor of 5K to 10K Ohms is needed to keep the data line high and enable communication between the sensor and the Arduino Board. All of these sensors come with three-pin breakout boards that have a built-in pull-up resistor.
Vcc (Voltage Regulated Current) 3.5 to 5.5 volts. Temperature and humidity are both outputs from the data. Humidity as measured by serial data. Linked to the earth's surface a framework



3.4 Interfacing 16x4 LCD display with NodeMCU

LCD displays are a low-cost and fast way to view basic data. This tutorial will show you how to connect an ESP8266 NodeMCU development kit to a 16x2 LCD monitor using I2C.
The LCD uses I2C to communicate with the NodeMCU. I2C is easy because it only needs two wires for communication.
The LCD display can be conveniently linked to the NodeMCU development kit. Connect one of the NodeMCU's GND pins to the LCD display's GND pin. Connect the VCC pin on the LCD monitor to the Vin pin on the NodeMCU. The VIN pin on the NodeMCU is wired to the incoming USB port's 5V pin. Link the LCD display's SDA pin to the NodeMCU's D2 pin. Link the LCD display's SDL pin to the NodeMCU's D1 pin.



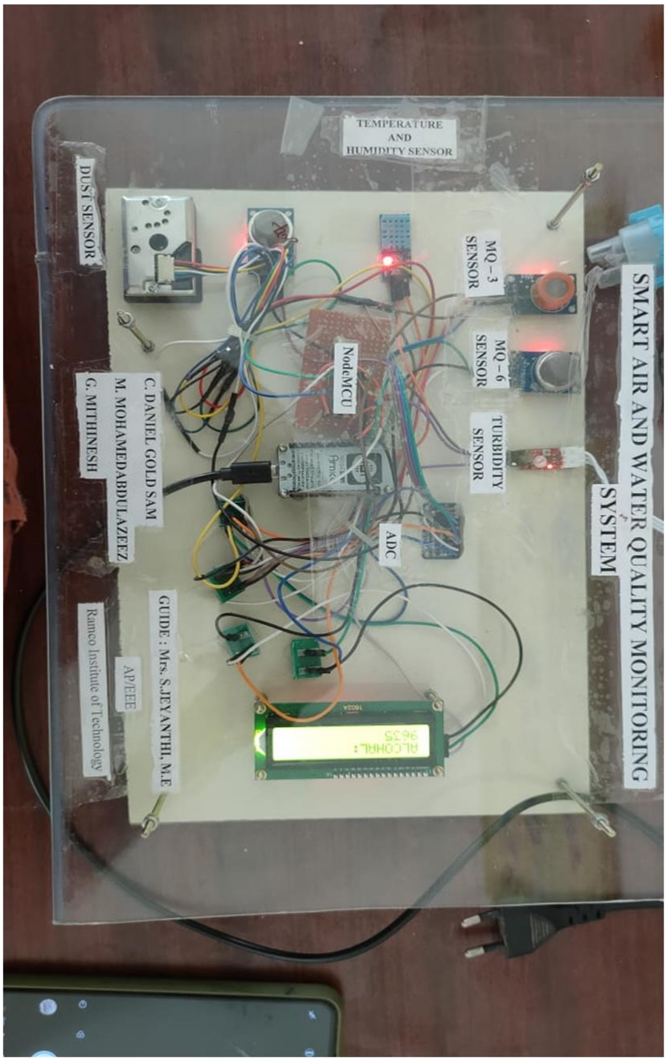
IV. WORKING

The main goal is to use IoT to create a smart monitoring system to track air and water pollution. To easily track a wide range of dusts, gases, and other substances,
NodeMCU, MQ-03,06 sensors, dust sensors, turbidity sensors, DHT11 sensors, humidity and turbidity sensors are used in this system. As previously mentioned, we are integrating all of these components.

The data collected by the NodeMCU device is saved in the blink mobile app. After that, the data is dynamically modified and processed in the cloud.

V. RESULTS AND DISCUSSION

For example, in terms of air quality, the following qualities are monitored: smoke, alcohol, temperature, humidity, and dust sensor. The turbidity of water is measured. These values will be tracked and sent to a mobile app via IoT. Since turbidity cannot be determined, the value is shown in an LCDdisplay.



VI. FINAL REMARKS

As a result of industrial effluents, water in rivers and wetlands is becoming highly polluted, resulting in an increase in turbidity and a decline in air quality. It is suggested that IoT be used to monitor multisensor-based air and water quality. According to the literature, manual data computation using laboratory methods takes a long time. In terms of delivering accurate results, systems are inefficient, and they do not allow for long-distance communication. This method has been proposed. It regulates the consistency of air and water in terms of ppm and temperature. Thanks to Bluetooth, it can be used even though the internet is inaccessible. In the field of air and water quality survey and control, the project has a wide range of applications.

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