ARDUINO BASED DIY TDS METER

PROJECT REPORT

OF PROJECT-1(EC-603)

BACHELOR OF TECHNOLOGY

SUBMITTED BY-

ADITIYA (21010104006)

AKHIL KUMAR (21010104011)

AMIT (21010104013)

ANANY GUPTA (21010104014)

ANCHAL SHARMA (21010104016)

JASPREET KAUR (21010104036)

SUPERVISOR

ER. AKSHAY KANWAR

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, JNGEC, SUNDERNAGAR (H.P)-175018

ACKNOWLEDGEMENT

It is our proud privilege and duty to acknowledge the kind of help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form without their valuable help, cooperation and guidance.

We express the sincere gratitude to our principal Dr. S.P. GULERIA and HOD-ECE ER. NITASHA BISHT for their administration towards our academic growth. We record it as my privilege to deeply thank for providing us the efficient faculty and facilities to make our ideas into reality.

We express our sincere thanks to our project supervisor AP-ECE ER. AKSHAY KANWAR for his novel association of ideas, encouragement, appreciation and intellectual zeal which motivated us to venture this project successfully. We are pleased to acknowledge the indebtedness to our lab technicians all those who devoted themselves directly or indirectly to make this project report success.

Last but not the least we express our deep gratitude and affection to our parents who stood behind us in all our endeavours . Their personal sacrifice in providing this opportunity to learn engineering is gratefully acknowledged.

ADITIYA (21010104006)

AKHIL KUMAR (21010104011)

AMIT (21010104013)

ANANY GUPTA (21010104014)

ANCHAL SHARMA (21010104016)

JASPREET KAUR (21010104036)

ABSTRACT

The liquid is a vital nutrient that is essential for human life. Water is the second most crucial factor in human survival, behind oxygen. A human can go for several weeks without eating, but only a day without water. Every living thing on Earth is encroached upon by sources.

To evaluate the quality of water saved, a rigorous monitoring strategy is required as it may harm aquatic life and human health by causing cholera, amoebiasis, lead poisoning, etc., hence water quality monitoring is crucial.

Real-time monitoring and management trigger prompt warning, providing timely reaction to pollution in conserving, maintaining aquatic habitat, boosting agricultural productivity by managing irrigated water quality, saving human health, and so on.

Laboratories and research institutions require almost clean or distilled water to conduct conclusive studies. Water with a low pH and no pollution is thus necessary for obtaining precise and trustworthy findings. Chemicals and other toxic substances are frequently discharged into rivers by production and manufacturing enterprises, endangering aquatic life. Water quality monitoring is now done in traditional labs, which is time intensive and prone to mistakes.

As a result, this work aims to look at the viability of developing an Arduino-based sensor system for monitoring the quality of water and other liquids.

TABLE OF CONTENT

CHAPTER – 1
INTRODUCTION

Water is crucial for a variety of reasons, ranging from recreation to agricultural irrigation. Additionally, plants and animals rely on clean water. Water covers more than 70% of the Earth's surface and accounts for 50–80% of all living things.

Fresh, clean, drinking water accounts for barely one-half of one percent of all water on the planet. As a result, we all bear responsibility for managing and maintaining our water resources, and one method to do so is through water quality monitoring.

Human population increase has expedited contamination and exacerbated water resource issues. Water contamination status could be determined using biological, chemical, and physical indicators. Plankton, bacteria, and other biological parameters are examples of biological parameters. pH, dissolved oxygen, nitrate, nitrite, phosphate, and ammonia are all chemical parameters. Temperature, turbidity, color, and odor are examples of physical parameters. Humans want clean water for a variety of reasons, including everyday necessities, industrial purposes, farms, agriculture, and so on.

When these parameters are monitored, it is expected that a consistent set of data would be obtained. As a result, a continuous series of abnormal data would signal the possible entry of a water contaminant, and the user would be warned of this behavior using technology. The locations were limited to industrial zones, sewage waste openings, and city limits where human involvement had a significant impact. The data logging method would result in an approved format application. The third step was to choose an acceptable, competent, and accurate method of analysis. The system has been tested so that these sensor nodes can make judgments and generate warnings when anomalies are identified

CHAPTER – 2

AIM AND SCOPE

2.1 AIM

The main idea of this research work is to provide an efficient liquid quality monitoring system. In this project, we propose to determine the quality of the liquid in its natural state and assess the nature and extent of pollution control needed in different water bodies and the impact of human activities on quality and suitability. This project has numerous sections where this can be employed, such as laboratories, aquaculture, cooling towers, sewage treatment plants, and so on. As a result, we created a low-cost yet quantitative and qualitative monitoring system that is combined with TDS and temperature sensors to measure its nature.

2.2 EXISTING SYSTEM

It is a semi-automated or manually managed method that requires human intervention. There is a requirement for human interaction in taking various water parameter values. These samples are tested at state-of-the-art laboratories. Samples are taken to these laboratories for analysis, which can be done by evaporating the liquid and collecting the remnants. The amount of unknown content in the known volume of liquid is then determined using an analytical balance and weighing the residual. The problem with this approach is that water is not continuously monitored and constantly requires human intervention.

2.3 PROPOSED SYSTEM

As the system's fundamental controller, we propose using a constructed Arduino Uno R3. According to the coding, the system operates automatically and autonomously. TDS is an important water factor that may be detected by this system, as well as the probes of the sensors placed inside the water. All sensors read the water quality parameters and relay the information to the Arduino via electrical signals. The Arduino is configured to examine the outcome which is converted into digital values and compare it to the specified standard ranges in the code. If any water parameter exceeds the standard limit that means the water is unsafe to consume.

2.4 SCOPE

To examine water quality data, a variety of statistical approaches or methodologies are available. Because water shortage is developing due to a lack of rainfall in many locations, future study scope includes determining the water quality for recycled water, research linked to changing hard water into soft water, and so on. Creating a single prototype that is integrated with sensors for detecting organic and inorganic matter, ORP, BOD, dissolved oxygen, algae growth, bacterial growth, and other parameters. As a result, there will be no need to use various devices to measure different parameters .

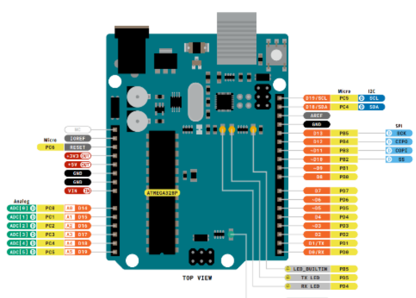
CHAPTER – 3

MATERIALS AND METHOD

3.1 MATERIALS

3.1.1 ARDUINO UNO R3

Arduino UNO R3 is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button .It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.



3.1.2 TDS SENSOR

The TDS value of water is measured with the DFROBOT Gravity Analog TDS Sensor. It can be used to examine the quality of home water, hydroponics, and other liquids. This product accepts 3.3 - 5.5V broad voltage input and outputs 0 - 2.3V analog voltage, making it suitable with 5V or 3.3V control systems or boards. The excitation source is an AC signal, which may effectively prevent the probe from polarization and extend the probe's life while also helping to strengthen the output signal's stability. The TDS probe is waterproof and can be immersed in water for an extended period.

3.1.3 OLED DISPLAY 0.96 INCH 128x64

128×64 Mono 0.96” OLED Display is a single-chip CMOS OLED/PLED driver with a controller for organic / polymer light emitting diode dot-matrix graphic display system. It consists of 128 segments and 64 commons. This IC is designed for a Common Cathode type OLED panel.

The SSD1306 embeds with contrast control, display RAM, and oscillator, which reduces the number of external components and power consumption. It has 256-step brightness control. Data/Commands are sent from general MCU through the hardware selectable 6800/8000 series compatible Parallel Interface, I2C interface, or Serial Peripheral Interface. It is suitable for many compact portable applications, such as mobile phone sub-display, MP3 player and calculator, etc.

3.1.4 ARDUINO IDE

The Arduino IDE is free and open-source software for writing and uploading code to Arduino boards. The IDE generates a Hex file when a user writes code and compiles it. The data is subsequently transferred to the board through a USB wire.

3.2 APPENDIX –

```
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64

// Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)
#define OLED_RESET -1
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire,
OLED_RESET);
// Define the analog pin connected to the TDS sensor
const int sensorPin = A0;
// Variables to store the raw analog reading and the TDS value
int sensorValue;
float tdsValue;

void setup() {
  // Start serial communication at 9600 baud rate
  Serial.begin(9600);
  // Initialize OLED display with I2C address 0x3C
  if(!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {
    Serial.println(F("SSD1306 allocation failed"));
    for(;;);
  }
```

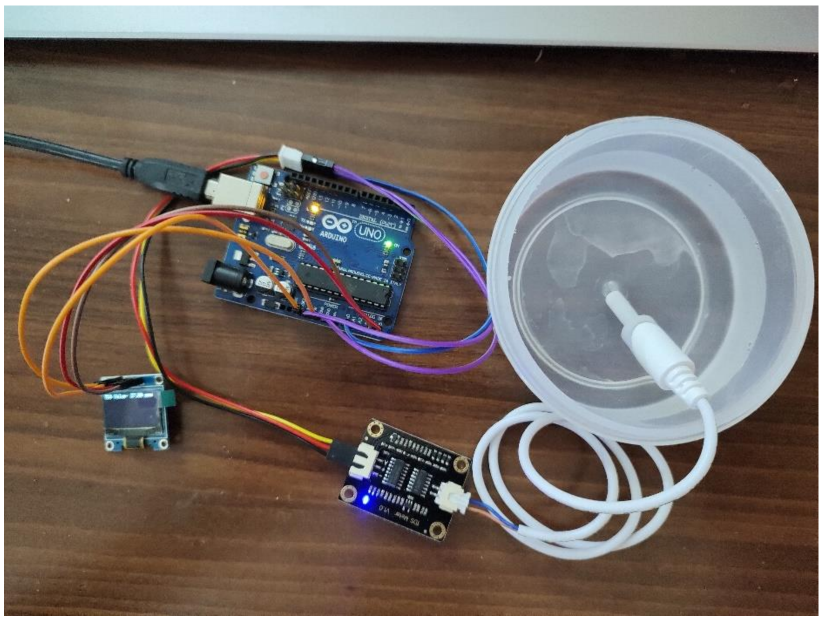
```
 // Clear the display buffer.
  display.clearDisplay();

  // Set text size, color, and print initial message
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(0,0);
  display.println("TDS Meter:");
  display.display();
  // Wait for OLED to initialize
  delay(2000);
}

void loop() {
  // Read the analog value from the TDS sensor
  sensorValue = analogRead(sensorPin);
 // Convert the analog value to TDS value
  tdsValue = analogToTDS(sensorValue);
  // Print the TDS value to the OLED display
  display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(0,0);
  display.print("TDS Value: ");
  display.print(tdsValue);
  display.println(" ppm");
  display.display();
```

```
 // Print the TDS value to the serial monitor
  Serial.print("TDS Value: ");
  Serial.print(tdsValue);
  Serial.println(" ppm");
 // Delay for some time before taking the next reading
  delay(1000);
}

// Function to convert analog value to TDS value

float analogToTDS(int analogValue) {
  // Calibrate your sensor to get the appropriate conversion formula
  // This formula might vary depending on your sensor and calibration
  float tdsValue = analogValue * 0.5; // Adjust this calibration factor accordingly
  return tdsValue;
}
```

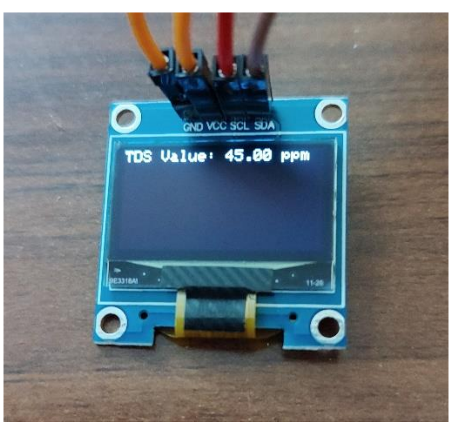
CHAPTER – 4

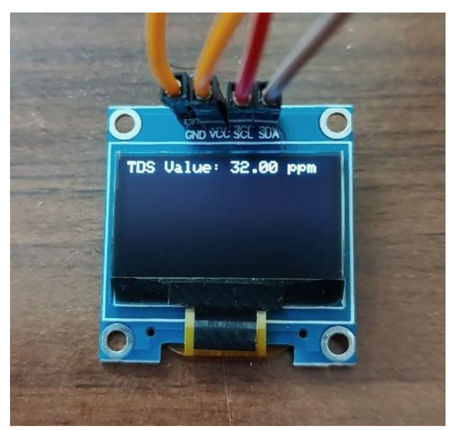
RESULTS

4.1 HARDWARE



4.2 RESULTS





4.3 TDS SENSOR TEST DATA

S NO.	SAMPLE	TDS VALUE
1.	Distilled water	0.2
2.	Water in aquarium	214
3.	Mineral water	766
4.	Drinking water	480
5.	River water	337
6.	Coffee	301
7.	Mirinda	294
8.	Pepsi	588

CHAPTER – 5
CONCLUSION

5.1 CONCLUSION

This work aimed to develop a low-cost, efficient, real-time, adaptable, easily configurable, and, most significantly, a portable system capable of controlling the amount of water-borne diseases caused by dirty water and providing accurate results in laboratories. Some sensors are used for this. The data obtained from all of the sensors are analyzed to provide better solutions. This method is useful for the Pollution Control Department since it allows them to monitor the various industrial water outlets to their neighboring water resources, which reduces human work and improves health. The quality of any sort of liquid can be determined with this approach. As a result, it is a straightforward technique for monitoring the water level system.

5.2 SUMMARY

The current study leads to the following points:

a) The test results from the design of a Arduino - based liquid quality monitoring system reveal good performance, even though the measurement findings were not constant or variable.

b) More study is needed to evaluate measurements with chemical parameters to generate an accurate value