# TURBIDITY MEASURING SYSTEM

**A MINI-PROJECT REPORT**

***Submitted by***


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## BONAFIDE CERTIFICATE

Certified that this project **“TURBIDITY MEASURING SYSTEM**” is the bonafide work of “**M.RAJA SEKAR (210701512) and V.VENKATESH (210701520)”** who carried out the project work under my supervision.

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**INTERNAL EXAMINER** **EXTERNAL EXAMINER**

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# LIST OF ABBREVIATION

| ABBREVIATION | ACCRONYM |
|---|---|
| **TURBIDITY- Sensor** | Turbidity Sensor |
| **LED** | Light Emitting Diode |
| **NTU** | Nephelometric Turbidity Units |
| **RFID** | Radio Frequency Identification |

# ABSTRACT

This abstract introduces an IoT-based turbidity measuring system designed for real-time water quality monitoring. Traditional methods for assessing turbidity are often time-consuming and lack immediacy. In response, this system integrates turbidity sensors with IoT technology, enabling continuous data collection and transmission to a centralized platform. Utilizing wireless connectivity, the system facilitates remote monitoring and control, allowing stakeholders to respond promptly to changes in water quality. The cloud-based platform offers advanced analytics for trend analysis and anomaly detection. Users access data through a user-friendly interface, receiving real-time alerts for proactive intervention. This system enhances efficiency, reduces costs, and promotes environmental sustainability by enabling informed decision-making and resource management. Overall, the IoT-based turbidity measuring system represents a promising advancement in water quality monitoring, offering real-time insights and actionable data for improved environmental stewardship.

# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

The project “TURBIDITY MEASURING SYSTEM” presents a solution for the Water quality monitoring is a fundamental aspect of ensuring environmental sustainability and public health. Turbidity, a measure of the clarity of water, is a crucial parameter in assessing water quality as it indicates the presence of suspended particles and pollutants. Timely and accurate measurement of turbidity is essential for various applications including drinking water treatment, industrial processes, and ecosystem health assessment.

## 1.2 SCOPE OF THE WORK

The IoT-based turbidity measuring system offers a comprehensive solution for real-time water quality monitoring. By integrating turbidity sensors with IoT technology, it enables continuous data collection and transmission, overcoming the limitations of traditional methods. This system utilizes wireless connectivity to facilitate remote monitoring, providing stakeholders with timely insights into turbidity levels.

## 1.3 PROBLEM STATEMENT

Traditional turbidity measurement methods lack real-time monitoring capabilities, relying on manual sampling and delayed analysis. This hampers timely responses to changes in water quality, posing risks to environmental sustainability and public health. Industries, particularly water treatment plants, require continuous monitoring to ensure quality compliance. Thus, there's a critical need for an IoT-based turbidity measuring system. Such a system would enable automated, real-time monitoring, wireless data transmission, and advanced analytics. By addressing these challenges, it can enhance water quality management, facilitating proactive interventions and promoting environmental sustainability.

## 1.4 AIM AND OBJECTIVES OF THE PROJECT

The aim of this project is to develop an IoT-based turbidity measuring system for efficient water quality monitoring. The objectives include designing a robust sensor network integrated with IoT technology to enable real-time turbidity measurement and data transmission. Additionally, the project aims to implement advanced analytics algorithms for trend analysis and anomaly detection. The system will provide stakeholders with timely insights into water quality, facilitating proactive management strategies. By achieving these objectives, the project seeks to enhance the efficiency, accuracy, and sustainability of water quality monitoring efforts, ultimately contributing to environmental conservation and public health.

# CHAPTER 2

## LITERATURE SURVEY

This paper [1] This study delves into the application of polymer optical fiber sensors for measuring water turbidity, employing infrared LED, polymer optical fiber, and a photodetector. Two types of turbidity sensors are explored: those with and without cladding, varying in length and configuration. The sensors are immersed in turbid water samples, and measurements are taken in terms of turbidity concentration. Results reveal that turbidity concentration, sensor length, cladding presence, and sensor curvature impact output voltage. Sensors with cladding demonstrate superior sensitivity and resolution. The optimal configuration features a sensor length of 2 cm, exhibiting an output power range of 0.931 μW, sensitivity of 0.046 μW/NTU, and resolution of 0.022 NTU. This research underscores the efficacy of polymer optical fiber sensors in turbidity measurement, promising advancements in water quality assessment.

This research [2] The study investigates how changes in land use and climate change may affect sediment flows and soil erosion in stream ecosystems. depending on the properties of the stream, the way land is used, and the kind of soil. The necessity for uniformity across monitoring programs is highlighted by methodological differences in monitoring methodologies.

This project paper[3] When sediments are present, higher reflectance in the green spectrum is detected by empirical procedures, which are crucial in identifying turbid marine environments from satellite ocean color data. This method modifies turbidity detection thresholds based on observational conditions, taking into account the correlation between scattering coefficient and chlorophyll concentration in oceanic case-1 waters. Coastal regions, however, present difficulties because of their high concentrations of chlorophyll and mineral deposits, which cause them to appear red in photography.

This research [4] For many uses, turbidity monitoring is crucial, especially in aquaculture where a variety of turbidity causes can affect fish health and productivity. A specific turbidity sensor that uses four LEDs with varying wavelengths and is based on the Beer-Lambert law has been developed to address this. Infrared and visible wavelength-sensitive photodiodes and photoresistors are mounted 180 degrees from the light sources in the sensor's design.

This study [5] brand-new technique using a turbidity sensor has been created to look into how dairy powders rehydrate. Using this procedure, the powder is dispersed under controlled conditions in a stirred tank that has a turbidity sensor. Particle wetting, swelling as water seeps into the powder, and slow particle dispersion are all visible phases in the turbidity changes that occur during powder rehydration.

# CHAPTER 3

## SYSTEM SPECIFICATIONS

### 3.1 HARDWARE SPECIFICATIONS FOR APPLICATION

| | | |
|---|---|---|
| Processor | : | Pentium IV Or Higher |
| Memory Size | : | 256 GB (Minimum) |
| HDD | : | 40 GB (Minimum) |

### 3.2 SOFTWARE SPECIFICATIONS

| | | |
|---|---|---|
| Operating System | : | WINDOWS 10 AND PLUS |
| Application | : | ARDUINO IDE |

### 3.3 HARDWARE COMPONENTS FOR PROTOTYPE

| | | |
|---|---|---|
| Sensor | : | Turbidity-Sensor |
| Board | : | Arduino Uno |
| Actuator | : | Micro Servo Motor 9g |
| Screen | : | 16x2 LCD Display & I2C Module |

# CHAPTER 4

## MODULES DESCRIPTION

**Arduino Uno**

This is microcontroller setup for the car parking system which acts as the CPU of the whole system. This takes inputs from the Sensors and triggers the actuators.

**TURMIDITY - Sensor**

A turbidity meter is a device that measures the degree to which a liquid is cloudy or opaque. It can be used to measure the concentration of suspended particles in a liquid.

**LED Module**

This module is used to notify about the percentage of water purity.

# CHAPTER 5

## SYSTEM DESIGN

### 5.1 FLOW CHART

A flowchart is a type of diagram that represents an algorithm, workflow or process. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem.

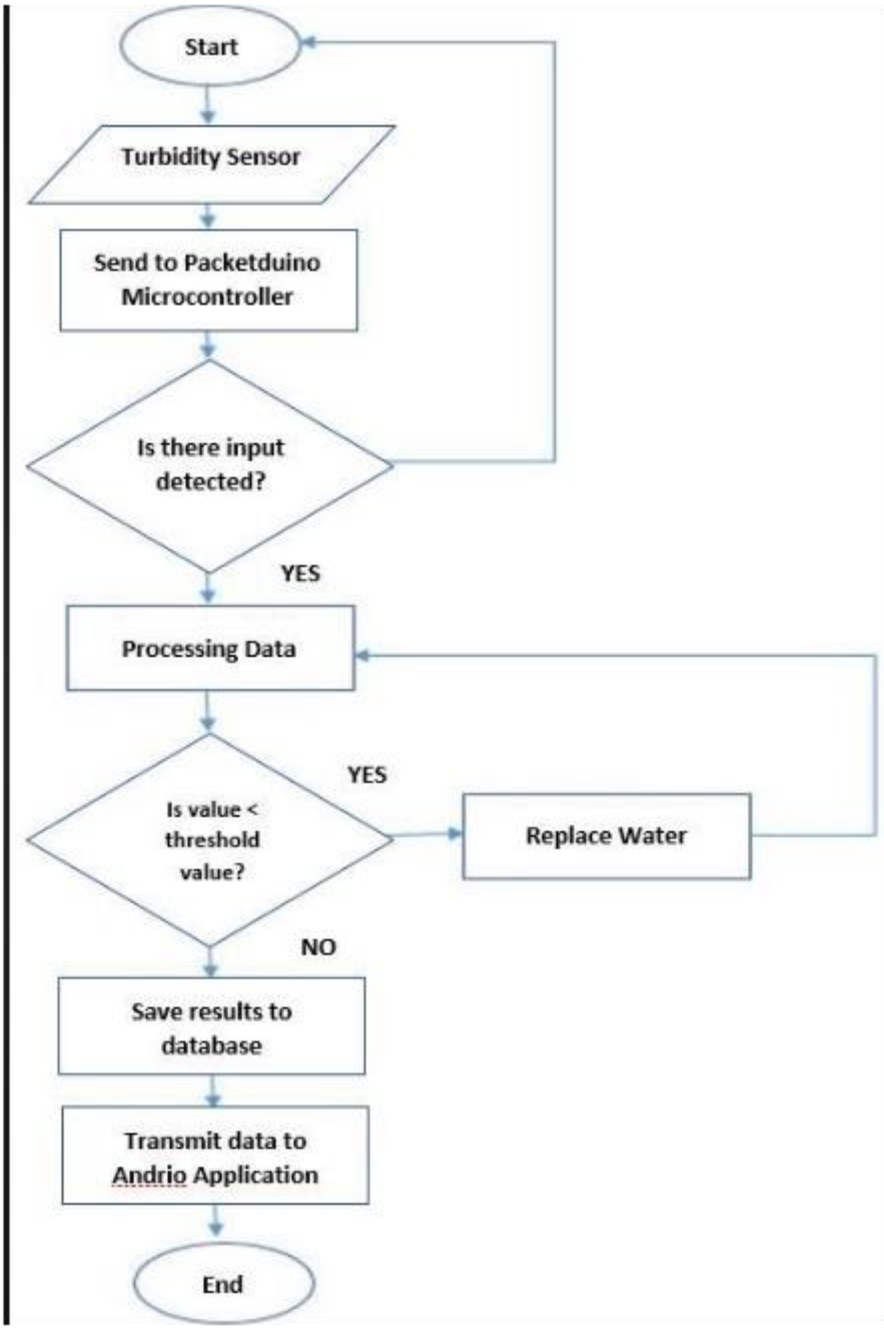


Figure 5.1 Flow Chart

## 5.2 CIRCUIT DIAGRAM

The circuit diagram explains the connections made with the hardware components and the board. The Arduino uno is connected with the breadboard as the VCC and GND are connected with the rails. The Sensors, LED and S is given connection with the rails and the other input/output pins are connected to digital as per the requirements.

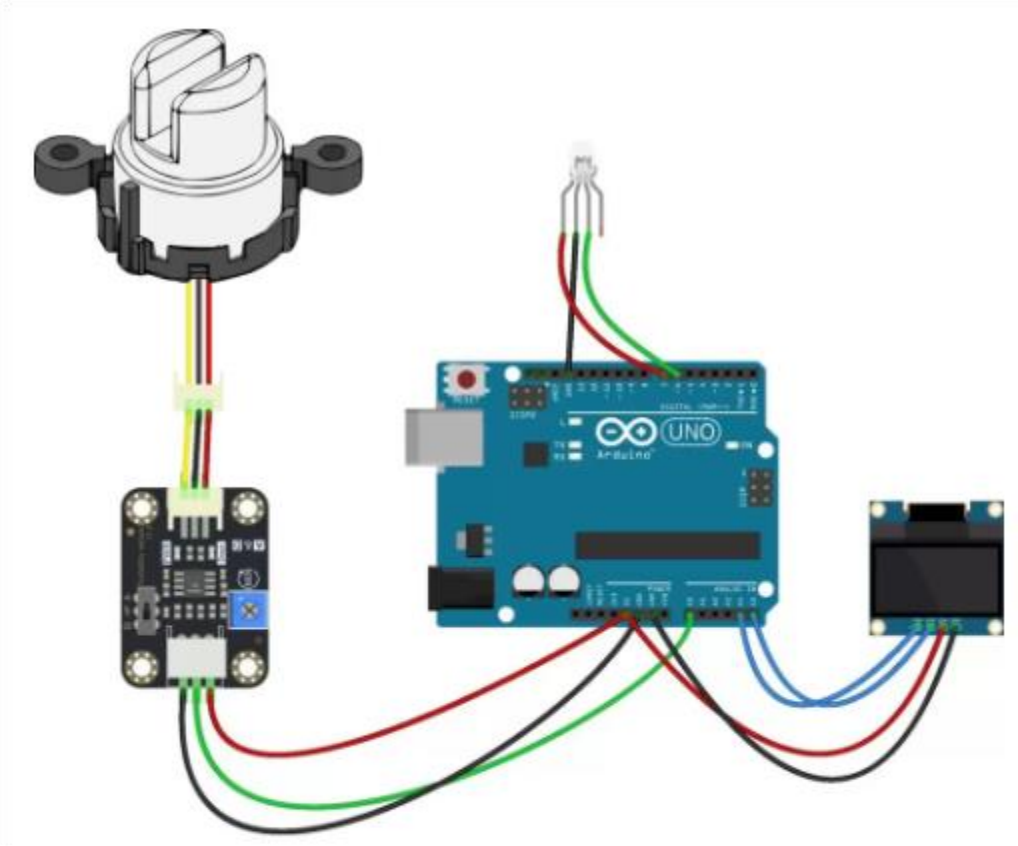


Figure 5.2 Circuit diagram

From the above figure 5.2, the connections are made

# CHAPTER 6

## CODING

1. **Setup**

```
#include <Wire.h>

#include <Arduino.h>

#include <U8g2lib.h>

#ifdef U8X8_HAVE_HW_SPI

#include <SPI.h>

#endif

#ifdef U8X8_HAVE_HW_I2C

#include <Wire.h>

#endif

int redled =6;

int greenled=7;

U8G2_SSD1306_128X64_NONAME_F_HW_I2C u8g2(U8G2_R0, /*

reset=*/ U8X8_PIN_NONE);

void setup(void) {

  u8g2.begin();

  pinMode(redled,OUTPUT);

  pinMode(greenled,OUTPUT);

}
```

**2. Loop**

```
void loop(){

void loop(void) {

 int sensorValue = analogRead(A0);
  // print out the value you read:
  int turbidity =map(sensorValue,0,700,100,0);

  u8g2.clearBuffer();                                         // clear the internal memory

  u8g2.setFont(u8g2_font_ncenB08_tr);      // choose a suitable font

  u8g2.drawStr(0,10,"TURBIDITY:");        // write something to the internal
memory

  u8g2.setFont(u8g2_font_7Segments_26x42_mn);        // choose a suitable
font

  u8g2.setCursor(0, 60);

  u8g2.print(turbidity);

   u8g2.setFont(u8g2_font_fub14_t_symbol);        // choose a suitable font

  u8g2.setCursor(70, 60);

  u8g2.print("%");

  if (turbidity<50)
  {
    digitalWrite(redled,HIGH);
    digitalWrite(greenled,LOW);
  }  else {
   {
    digitalWrite(greenled,HIGH);
    digitalWrite(redled,LOW);
  }
  }
  u8g2.sendBuffer();                                          // transfer internal memory
to the display
  delay(1000);

}
```

# CHAPTER 7

## SCREEN SHOTS

**1. CONNECTION**

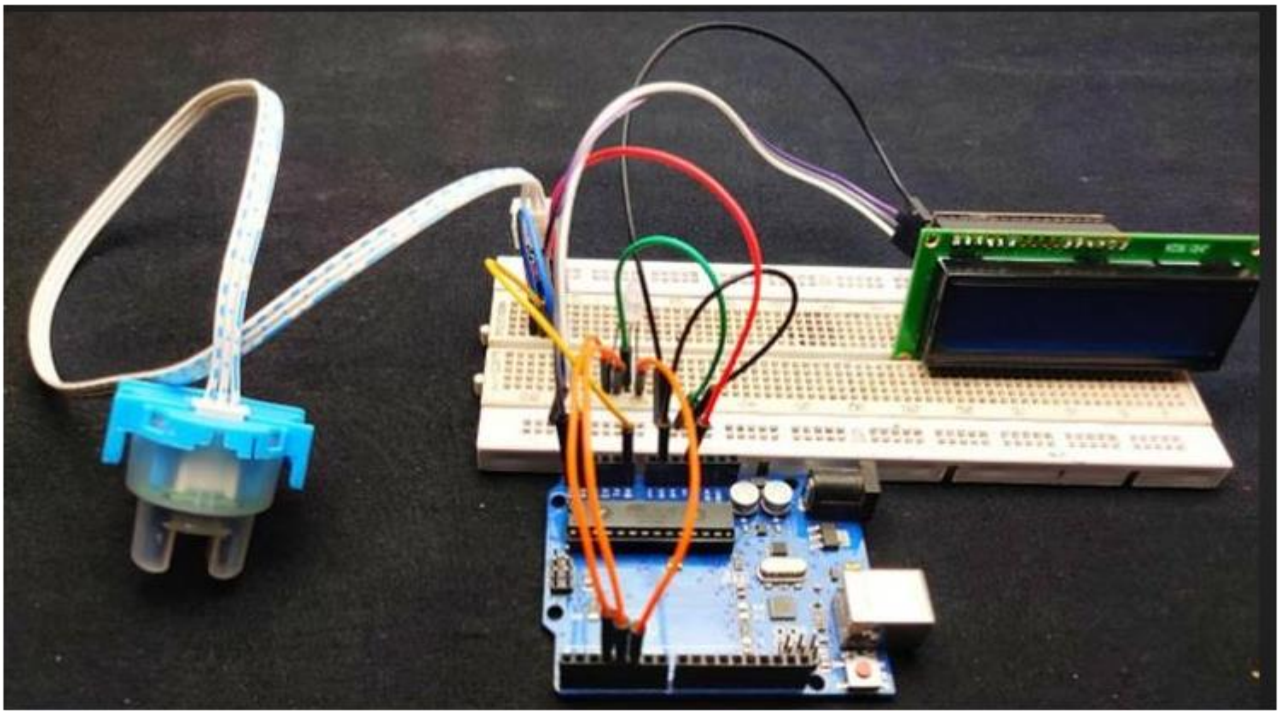

Figure 7.1 Connection Setup

Upon successful connection, light will be light up in the LCD module and turbidity module is a device used to measure a liquid’s turbidity. It typically consists of a light source and a photodetector, which are used to measure the amount of light that is scattered by suspended particles in the liquid. The module may also include a processor and other electronics to convert the analog signal from the photodetector into a digital value that can be used to calculate the turbidity of the liquid. Some turbidity modules may also include a display or other output mechanism to display the measured turbidity value.

# CHAPTER 8

## CONCLUSION AND FUTURE ENHANCEMENT

In conclusion, the development of an IoT-based turbidity measuring system represents a significant advancement in water quality monitoring, offering real-time insights and enabling proactive management strategies. By integrating turbidity sensors with IoT technology, the system facilitates continuous monitoring, wireless data transmission, and advanced analytics, addressing the limitations of traditional methods. The system's user-friendly interface and scalability make it a valuable tool for various applications, from drinking water treatment to environmental research.

Future enhancements may focus on sensor accuracy, expanded parameter measurement, and enhanced analytics. Integration of machine learning for predictive modeling and remote control functionalities can bolster effectiveness. Stakeholder collaboration and ongoing research are pivotal for realizing these advancements, ensuring sustained relevance in water quality management.

## REFERENCES


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