Impact Factor (SJIF): 6.126 E-ISSN: 2583-1615

International Journal of Research in Academic World

Received: 17/March/2025 IJRAW: 2025; 4(4):203-205 Accepted: 23/April/2025

# Real-Time Water Turbidity Detection and Monitoring System

**[*1]Vedant Kishor Patle, [2]Om Prakash Zape and [3(a, b, c)]Dr. Lenina SVB**

[*1, 2]Student, Department of Electronics & Telecommunication Engineering, SGGS Institute of Engineering & Technology, Nanded, Maharashtra, India.

[3(a)]Assistant Professor & Coordinator, Centre of Excellence in Signal and Image Processing, Department of Electronics & Telecommunication Engineering, SGGS Institute of Engineering & Technology, Nanded, Maharashtra, India.

[(b)]Fellow Women Scientist-C, WOSC-07, TIFAC, DST, India & Registered Indian Patent Agent INPA 2625.

[(c)]Founder and Director of DR. LSVBS PATTSOL Multiservices, (Indian Registered Startup: DIPP24849).

**Abstract**

This project builds a water turbidity meter with an Arduino UNO board and a turbidity sensor to check how clear water is. The system establishes a connection of the turbidity sensor to an LCD display by means of an I2C module that presents real-time current turbidity in the water. Arduino UNO plays the role of the focal person that computes information from the sensor and translates it into readable forms of turbidity levels. The use of I2C interfacing makes sensor, Arduino, and LCD talk to each other easily so the data can quickly be presented properly. This system provides a low-cost convenient to transport method of water quality monitoring in various locations. It is suitable for teaching, environmental monitoring fieldwork, water treatment, and research. The project demonstrates the utilization of open-source hardware for environmental monitoring based on simplifying it to be accurate and user friendly.

**Keywords:** Component, turbidity sensor, Arduino UNO, insert.

## 1. Introduction

Water ranks as a super important natural resource. Making sure it stays high-quality matters for folks' health taking care of the environment, and managing resources. You know, the stuff to check water's all good includes its temperature how clear it is, its pH, and if it's got enough oxygen dissolved in it [1]. Out of these how clear the water is, or turbidity shows if the water's dirty because it tells you about particles floating around that could be nasty for fish and people drinking it. The goal of this research is to craft a system to keep an eye on water using the Arduino UNO microcontroller [Figure 1]. It'll be hooked up to a murkiness detector like turbidity sensor and an I2Cbased LCD screen plus some jumper wires to check water cleanliness on the fly. The Arduino UNO's a big deal in the DIY scene for all sorts of sensing and robot stuff cause it doesn't cost an arm and a leg, it can do a bunch of different things, and it's not a headache to use. Hooking up the LCD with the I2C method is a breeze, it makes the wires less of a tangled mess and ensures the data doesn't get wonky when it sends we're aiming to build a budget-friendly easy-to-carry, and simple-to-use water checking gadget [2]. This device will give useful information regarding water purity, and it's becomes be super convenient for people studying or working in environmental science and water resource management.

## 2. Methodology

The hardware configuration involves connecting turbidity sensor to Arduino, and then getting the LCD display to communicate with it using I2C communication. So, you connect the turbidity sensor an analog input pin on the Arduino, such as A0 or whatever. Then, the I2C thingy of the LCD gets connected to the SDA and SCL pins of the Arduino. Blow's what the standard wiring chart is like for all of this stuff.

### A) System Design and Components

#### i). Turbidity Sensor [Figure 2]

- Connect VCC to 5V.
- Connect GND to the Ground.
- Connect Output to Analog Pin A0.

#### ii). LCD 16×2 with I2C Module Connections [Figure 3]

- Connect VCC to 5V.
- Connect GND to the Ground.
- Connect Output to Analog Pin A0.

SDA to SDA (use Arduino pin A4 for Arduino UNO). SCL to SCL (use Arduino pin A5 for Arduino UNO). The sensor needs calibration to give precise turbidity measurements. This

***Corresponding Author:** Vedant Kishor Patle

means you gotta match the sensor's readings with clear turbidity standards, like NTU (that stands for Nephelometric Turbidity Units, by the way).
Here's how it goes: Take a bunch of water samples that you already know the turbidity for, check what the sensor says for each, and jot that down. With those notes, you make a curve for calibrating stuff. Then, the Arduino takes the sensor's basic analog numbers and figures out the actual turbidity levels using your curve.

**Define the Hardware Comes with Some Key Components**

i). The Arduino UNO Microcontroller acts as the boss of the system handling the info from the murkiness detector and displaying it on the screen for you to see shown in Figure 1.


**Fig 1:** Arduino UNO

ii). Let's talk about this Turbidity Sensor, like the TSD-10. Its job is to figure out how murky the water is by checking out the suspended bits floating around in it [3]. This cool device shoots some light into the water and then checks how much of that light the little bits bounce back. It then tells you what's up with the water's cloudiness in units called NTU stands for (Nephelometric Turbidity Unit,) shown in figure 2.

**Fig 2:** Turbidity sensor with module

iii). The 16x2 LCD screen taps into an I2C module to give you the dirtiness level of the water as it happens. This I2C buddy cuts down on how many wires you got to hook up from your Arduino to the screen, which makes everything run smoother and easier to set up shown in figure 3.


**Fig 3:** LCD 16×2 with I2C Module

iv). You need a breadboard and some jumper cables to get all your parts talking to each other. They're super handly for when you're trying to figure things out and building a prototype shows in figure 4 and figure shows Hardware setup & block diagram shown in [Figure 5].

**A Hardware Setup**

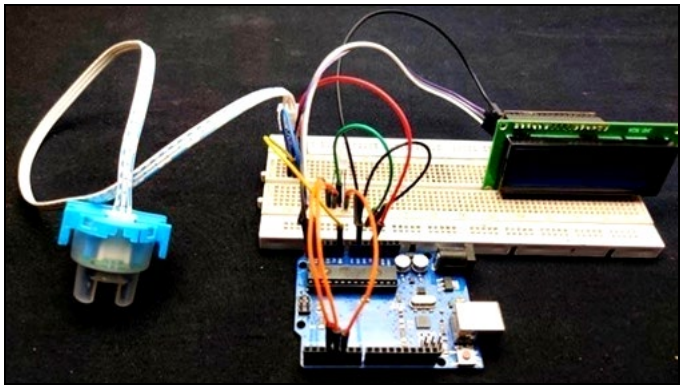

**Fig 4:** Jumper wire connected with all of the above Components

**A) Code** [4]

```
#include

<LiquidCrystal_I2C.h> LiquidCrystal_I2C lcd(0x27, 2, 16);
int sensorPin = A0;
void setup()
{
Serial.begin(9600);
//initialize LCD lcd.init();
//turn on LCD
backlight lcd.backlight(
);
}
void loop() {
int sensorValue = analogRead(sensorPin);

Serial.println(sensorValue);
int turbidity = map(sensorValue, 0, 520,
100, 0);
delay(100); lcd.setCursor(0, 0);
lcd.print("Turbidity
:"
); lcd.print(" "); lcd.setCursor(10, 0);
lcd.print(turbidity)
```

; delay(100); if (turbidity < 20)
{ lcd.setCursor(0, 1); lcd.print(" its CLEAR
"); Serial.print(" its CLEAR ");

if (turbidity > 50)
{ lcd.setCursor(0, 1); lcd.print(" its DIRTY "); Serial.print("
its DIRTY ");

**Block Diagram**

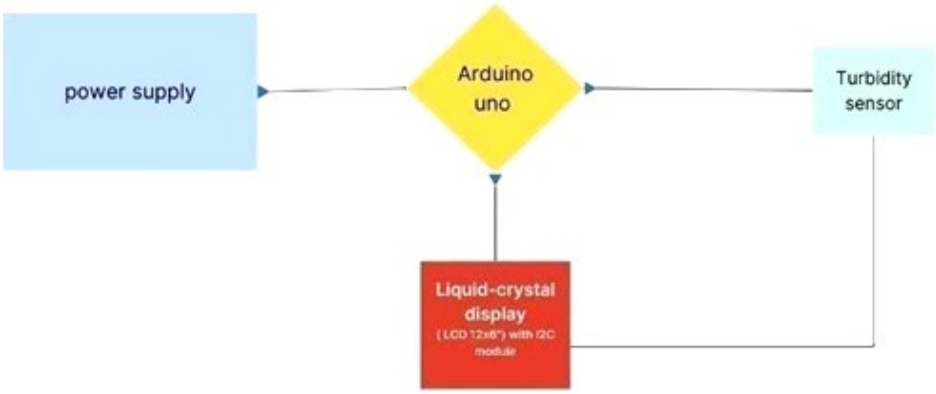


**Fig 5:** Block diagram

## 3. Result and Discussion

We ran the turbidity monitor on a single water sample we spiked with some dirt. It was a way to prepare for real-life scenarios where water can get all murky. This experiment was to see if our gear could detect and display how murky the water got with dirt floating in it.

Here's what went down:

We used tap water and mixed in a little garden dirt—not more than what you'd scoop with a tablespoon into a 200 ml water glass.

- The sensor's analog readout hit 810.
- That translates to a voltage of 3.97V.
- Look at it, the water was super murky kind of brownish.

And the LCD showed something like "Turbidity: High." If it's set up for numbers, it would show those instead.

**Discussion**

The gadget managed to track a huge jump in haziness from the dirt bits floating in the H2O. A solid 810 showed up on the analog scale hitting almost the top of what the sensor can handle – that meant the murkiness was pretty high. And yep, these digits popped right up on the display updating without missing a beat. Our tests confirmed that this 'turbidity sensor' when hooked Up to the Arduino UNO gets how clear the water is [5] the screen made it a breeze to get the gist of water quality just by throwing a quick look. The test on a single sample showed that the system works well for easy checks of muddiness. While it was a straightforward test, it showed us the setup notices when stuff is dirty to a level that you can see. That's good for use at home or when looking out for the environment.

**Limitations**

Since we tested this with one sample, we can't say for sure it's right on the dot for all muddiness levels. To get that lab-quality accuracy you'd need a bunch of tests and to adjust the thing using those official NTU solutions

## 4. Acknowledgement

The authors wish to express their sincere gratitude to the SGGSIET AICTE IDEA Lab Coordinator and the Centre of Excellence Coordinator for their continuous support, encouragement, and valuable insights throughout the course of this work. We are also thankful to the Librarian for facilitating access to the DrillBit technical reports, which significantly enriched our research

Our heartfelt appreciation goes to the Director, SGGSIET, and the Head, Department of Electronics and Telecommunication Engineering, for their constant encouragement, infrastructural support, and for fostering a research-friendly environment that made this publication possible.

**References**

1. Binti Rosle NA and Bin Alias MY. “Low-Cost Internet of Things System for Turbidity Water Clarity Measurement,” in *2024 Multimedia University Engineering Conference (MECON)*, Cyberjaya, Malaysia: IEEE, 2024, 1–6. doi: 10.1109/MECON62796.2024.10776398.
2. Yi Wang, Yong-peng Xu, Jun Nan, and Gui-bai Li, “Treatment of low temperature and low turbidity water enhanced by reusing ultrafiltration membrane washing water,” in *2011 International Symposium on Water Resource and Environmental Protection*, Xi’an: IEEE, 2011, 1522–1525. doi: 10.1109/ISWREP.2011.5893316.
3. Yunita Arsyad, Benediktus Yoseph Bhae, and Kristianus Jago Tute, “Sistem Monitoring Kekeruhan Air Berbasis IoT (Studi Kasus : Perumda Ende),” *SATESI J. Sains Teknol. Dan Sist. Inf.*. 2(2):33–139, Oct. 2022, doi: 10.54259/satesi.v2i2.1137.
4. Ibrahim SN, Asnawi AL, Malik NA, Mohd Azmin NF, Jusoh AZ and Mohd Isa FN. “Web based Water Turbidity Monitoring and Automated Filtration System: IoT Application in Water Management,” *Int. J. Electr. Comput. Eng. IJECE*. 2018; 8(4):2503, doi: 10.11591/ijece.v8i4.pp2503-2511.
5. Xie N, Chen W, Zhang Z and Yuan Y. “Analysis of Turbidity Measurement Based on Ratio Method:,” presented at the International Conference on Electronics, Mechanics, Culture and Medicine, Shenyang, China, 2016. doi: 10.2991/emcm-15.2016.77