WATER QUALITY ANALYZER

A project report submitted in partial fulfillment of the Requirements for the award of credits of Programming with Microcontroller a skill-oriented course of

Bachelor of Technology

In

CSE (IoT, CYBERSECURITY

INCLUDING BLOCKCHAIN TECHNOLOGY)

By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(IoT, CYBERSECURITY INCLUDING BLOCKCHAIN TECHNOLOGY)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

(Approved by AICTE and permanently affiliated to JUTUK)

Accredited by NBA and NAAC with 'A' Grade

NAMBUR(V), PEDAKAKANI(M), GUNTUR-522508, JUNE 2022

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(IoT, CYBERSECURITY INCLUDING BLOCKCHAIN TECHNOLOGY)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

CERTIFICATE

This is to certify that the project titled "**WATER QUALITY ANALYZER USING ARDUINO"** is a Bonafide record of work done by **Miss. ALURI INDU PRIYA** under the guidance of **Mr. K. Ravi Kumar, Associate professor** in partial fulfillment of the requirement for the award of credits of **Programming with Microcontroller a** skill-oriented course of Bachelor of Technology in Computer Science and Information Technology, JNTUK during the academic year 2023-2024.

Signature of Project Instructor

Mr. K. Ravi Kumar

Signature of HOD

Dr. M. R. N. Tagore

DECLARATION

I, ALURI INDU PRIYA (22BQ1A4702) hereby declare that the project report entitled "**WATER QUALITY ANALYZER using ARDUINO**" done by me under the guidance of Mr. K. RAVI KUMAR, Associate professor, Department of CSE (IOT, Cybersecurity including Blockchain Technology) is submitted for the partial fulfillment of requirements for the award of Degree of Bachelor of Technology in COMPUTER SCIENCE AND INFORMATION TECHNOLOGY.

Date: Signature of the candidate:

Place: VVIT, Nambur.

ACKNOWLEDGEMENT

We express our sincere thanks to the Chairman, Vasireddy Venkatadri Institute of Technology, Sri Vasireddy Vidya Sagar for providing us well equipped infrastructure and environment.

I thank Dr. Y. Mallikarjuna Reddy, Principal, Vasireddy Venkatadri Institute of Technology, Nambur, for providing us the resources for carrying out the Project.

I express my sincere thanks to Dr. K. Giri Babu, Dean of Studies, for providing support and a stimulating environment for developing the project. Our sincere thanks to Dr. M.R.N TAGORE sir, Head of the Department, Department of CIC for his co-operation and guidance which helped me to make my project successful and complete in all aspects.

I also express my sincere thanks and am grateful to our guide Mr. K. Ravi Kumar, Associate professor, Department of Computer science and Information technology for motivating me to make our Project successful and fully complete. I am grateful for his precious guidance and suggestions. I also place my floral gratitude to all other teaching staff and lab technicians for their constant support and advice throughout the project.

Name of the candidate

ALURI INDU PRIYA (22BQ1A4702)

TABLE OF CONTENTS

ABSTRACT

The Water Quality Analyzer is a specialized device designed to monitor and evaluate water quality, focusing specifically on turbidity levels. This project utilizes advanced sensing technology to measure water clarity, displaying the results on an easy-to-read LCD screen. Aimed at providing essential information for ensuring safe and clean water, the analyzer is built to be portable, user-friendly, and straightforward to operate. The system is designed for individuals with no technical background, ensuring that it can be easily installed, configured, operated, and maintained. Its compact and robust design makes it suitable for a wide range of applications, including household use, industrial facilities, and environmental monitoring. The Water Quality Analyzer empowers users by providing immediate, reliable data on water turbidity, supporting efforts to maintain high standards of water quality and safety.

CHAPTER-1

INTRODUCTION TO WATER QUALITY ANALYZER

The 21st century which is the era of fastest period of evolution in the information technology. Every single day the concept behind the scene is getting more and more complex to provide the humanity with the best level of comfort. And whenever the thinking goes to think of the most prominent technology which has completely altered the people way of interaction with the normal World, then in that stage the clear concept of IoT (Internet of Things) pops up in mind.

IoT is one of the emerging technology which has an astonishing impact on the daily life routine, whenever we come across dealing with the objects that are around us. The Internet is one of the major media that is responsible for the World to be connected to a global village, probably more than that. Well if Internet can be responsible for connecting the people together, then what if we carefully use the same technology in a much logical format to connect it to the objects that are around us? Is that logical and possible?

DEFINING ARDUINO:

An Arduino is a microcontroller-based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its opensource hardware feature. It is used in communications and in controlling or operating many devices.

- Digital pins: 14 (These pins have only 2 states i.e., high, or low or in simple words either 5 V or 0 V no in between values.)
- Analog pins: 6 (A0 to A5 and they produce a resolution of 10 bits and they provide flexibility of connecting any external device via these pins.)

1.1 DESIGNING OF ARDUINO BOARD USING MICROCONTOLLERS ANDMICROPROCESSORS

•Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

• The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and effortless way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

DIFFERENT TYPES OF ARDUINO BOARDS

- Arduino Uno
- Arduino Due
- Arduino Mega(R3)
- Arduino Leonarde

FEATURES OF ARDUNIO BOARDS

Arduino Board	**Processor**	**Memory**	**Digital I/O**	**Analogue I/O**
Arduino Uno	16Mhz A Tmega328	2KB SRAM, 32KB flash	14	6 Input, 0 output
Arduino Due	84MHz AT91SAM3X 8E	96KB SRAM, 512KB flash	54	12 inputs, 2 outputs
Arduino Mega	16MHz A Tmega2560	8KB SRAM, 256KB flash	54	16 inputs, 0 output
Arduino Leonardo	16MHz A Tmega32U4	2.5KB SRAM, 32KB flash	20	12 inputs, 0 output

CHAPTER 2

PRINCIPLE

A Water Quality Analyzer is an integrated system designed to monitor and assess the clarity of water using turbidity measurements. The device relies on a network of hardware and electronic interfaces to provide accurate, real-time data on water quality. At its core, the analyzer consists of sensors, a controller, and an actuator.

- **Sensors**: The primary sensor in the Water Quality Analyzer is a turbidity sensor, which measures the cloudiness or haziness of water caused by suspended particles. This sensor is critical for detecting changes in water quality, ensuring that users can monitor and respond to variations promptly.

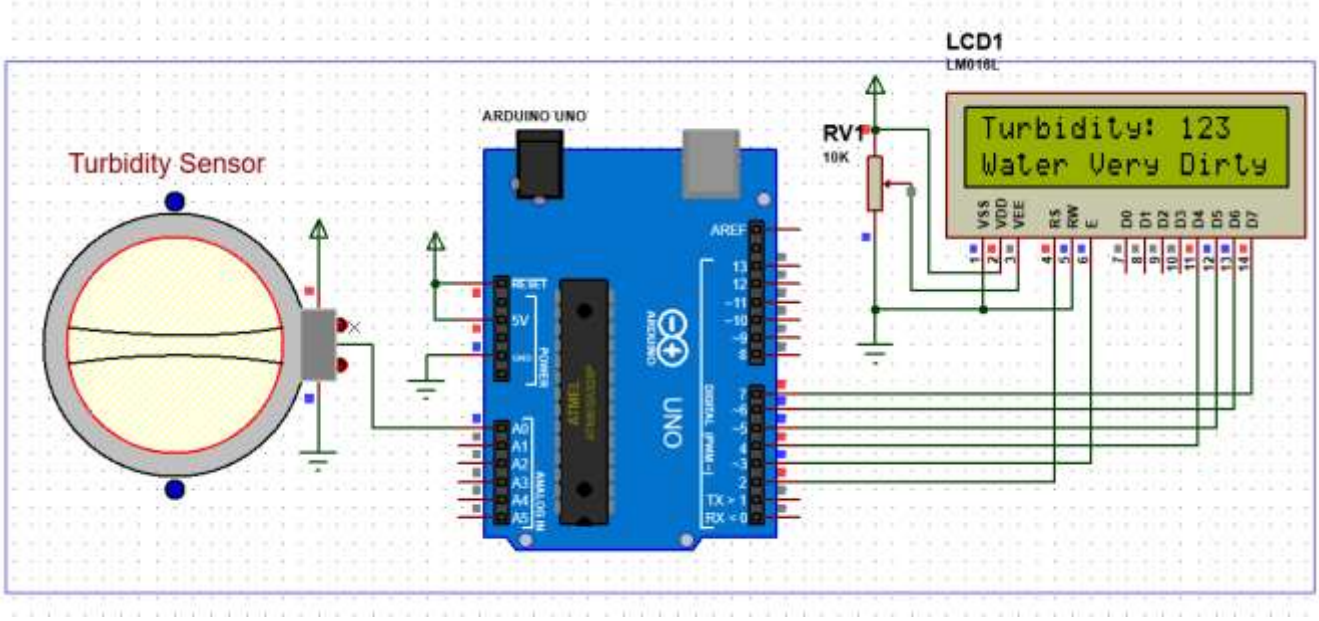
- **Controller**: The controller is typically a microcontroller or a small computing device that processes the data from the turbidity sensor. It interprets the sensor readings and translates them into meaningful information, which is then displayed on an LCD screen. This allows users to easily understand and evaluate the water quality status.

- **Actuator**: In the context of a Water Quality Analyzer, the actuator might be an alert system, such as a buzzer or LED indicator, that activates when turbidity levels exceed predetermined thresholds. This feature ensures that users are immediately notified of significant changes in water quality that may require attention.

CHAPTER-3

ARCHITECTURE

The following image shows the circuit diagram of the Arduino based Water Quality Analyzer using Turbidity Sensor. For the circuit design follow the following procedure.



1: Connect LCD Monitor to Arduino:

Connect Arduino to LCD Monitor using the pins of Arduino. Simply connect the pins from the LCD to Arduino along with a potentiometer.

2: Connect Turbidity Sensor to Arduino:

Simply connect the inputs of the isensor to the Arduino. Detailed connections of the sensor, resitor are shown in circuit diagram

CHAPTER – 4
COMPONENTS

- 10k Variable Resistor – 10k Potentiometer
- Turbidity Sensor Module
- 16×2 LCD Display(Liquid Crystal)
- Arduino UNO R3 DIP Board with USB Cable (ATmega328P)
- MB102 Solderless Breadboard
- 5 PC 100R / 100 Ohm Resistance (x5)
- 9V Battery Module

1:Arduino UNO

The Arduino Uno is a popular microcontroller board based on the ATmega328P microcontroller. It features 14 digital input/output pins, 6 of which can be used as PWM outputs, and 6 analog input pins. The board includes a USB connection for programming and power, a power jack for external power sources, and a reset button. Designed for simplicity and ease of use, the Arduino Uno is ideal for demonstration and prototyping purposes.

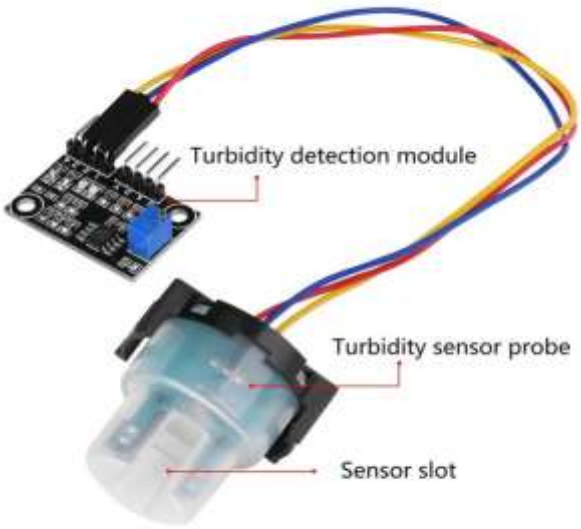
The ATmega328P microcontroller on the Arduino Uno includes a CPU with ample RAM and ROM, as well as other essential components for efficient operation. The board can be powered via an AC-to-DC adapter, a battery, or through the USB connection to a computer.

2: Turbidity Sensor:

A turbidity sensor is an essential device used to measure the cloudiness or haziness of a fluid, typically water, caused by suspended particles. It operates by emitting a light beam through the water and detecting the amount of light scattered by the particles. This measurement is then converted into a turbidity value, usually expressed in Nephelometric Turbidity Units (NTU).

The turbidity sensor consists of several key components:

- **Light Source**: Typically an LED that emits a light beam into the water sample.
- **Detector**: A photodiode or phototransistor positioned at a 90-degree angle to the light source to measure the scattered light.
- **Microcontroller Interface**: This converts the analog signal from the detector into a digital value that can be read and processed by a microcontroller, such as an Arduino.



CHAPTER-5
WORKING

After making circuit design and connecting Turbidity Sensor, Arduino and LCD then turnon power supply to the circuit. Take some dirty water, clean water, and some what dirty water in different cups. Now dip the sensor into the fluids.

The Sensor reads and gives some values (ntu) based on turbidity. The quality of water is given b the sensor in the LCD monitor.

- ntu >= 200 → Water Very Clean
- ntu >= 150 && ntu < 200 → Water Clean
- ntu >= 100 && ntu < 150 → Water Slightly Dirty
- ntu >= 50 && ntu < 100 → Water Dirty

CHAPTER-6

CODE

```
#include <LiquidCrystal.h>

// Initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

#define sensor_pin A0  // Define the digital pin connected to the sensor
int sensor_value;     // Variable to store the digital value read from the sensor
int ntu;              // Variable to store the calculated NTU value

void setup() {
  pinMode(sensor_pin, INPUT);  // Set the sensor pin as an input

  lcd.begin(16, 2);  // Initialize the LCD with 16 columns and 2 rows
  lcd.setCursor(0, 0);
  lcd.print("   Welcome To   ");
  lcd.setCursor(0, 1);
  lcd.print("Turbidity Sensor");
  delay(3000);  // Display the welcome message for 3 seconds
  lcd.clear();
}

void loop() {
  sensor_value = analogRead(sensor_pin);  // Read the digital value from the
sensor
  if(sensor_value>208)sensor_value=208;

  ntu = map(sensor_value, 0, 208, 300, 0);
  // Interpret the digital signal
  // Assuming HIGH means high turbidity and LOW means low turbidity
  /*if (sensor_value == HIGH) {
    ntu = 100;  // Example value for high turbidity
  } else {
    ntu = 10;   // Example value for low turbidity
  }*/

  // Display the turbidity value on the LCD
```

```
  lcd.setCursor(0, 0);
  lcd.print("Turbidity: ");
  lcd.print(ntu);
  lcd.print("  ");  // Clear any leftover characters from previous prints

  // Display the water quality message
  lcd.setCursor(0, 1);
  if (ntu >= 200) {
    lcd.print("Water Very Clean");
} else if (ntu >= 150 && ntu < 200) {
    lcd.print("Water Clean");
} else if (ntu >= 100 && ntu < 150) {
    lcd.print("Water Slightly Dirty");
} else if (ntu >= 50 && ntu < 100) {
    lcd.print("Water Dirty");
} else {
    lcd.print("Water Very Dirty");
}


  delay(1000);  // Wait for 1 second before the next reading
}
```

CHAPTER-7
ADVANTAGES

- **Ensures Safe Water Quality:** The Water Quality Analyzer helps in continuously monitoring the turbidity levels, ensuring that water quality is safe for consumption and use.

- **User-Friendly Operation:** The system is designed to be easily operated by individuals without technical expertise, making it accessible for a wide range of users, including those in households and small businesses.

- **Immediate Data Access:** With real-time data displayed on an LCD screen, users can instantly access and understand water quality metrics, allowing for quick responses to any changes.

- **Portability and Flexibility:** The compact and robust design of the Water Quality Analyzer makes it portable and suitable for various environments, from homes to industrial sites.

- **Supports Environmental Monitoring:** The device is valuable for environmental monitoring efforts, helping to maintain high standards of water quality in natural bodies of water and supporting conservation efforts.

- **Reliable and Accurate:** Utilizing advanced turbidity sensors, the analyzer provides precise and reliable measurements, ensuring that users can trust the data for making informed decisions.

- **Cost-Effective Solution:** By preventing potential water quality issues, the Water Quality Analyzer can help avoid costly damage and health risks, making it a cost-effective investment for long-term water management.

CHAPTER-8
CONCLUSION

Monitoring water quality with a Water Quality Analyzer represents a significant advancement in environmental management and public health. Utilizing advanced turbidity sensing technology, this system provides a reliable, user-friendly solution for assessing water clarity and safety. Various real-world applications have demonstrated the effectiveness of this technology, highlighting its potential to ensure safe water quality across diverse environments, from households to industrial settings.

The Water Quality Analyzer is designed for ease of use and accessibility, allowing even non-technical individuals to benefit from accurate, real-time water quality data. By integrating this technology into everyday practices, communities can significantly improve their water management efforts, preventing health hazards and promoting environmental conservation. This innovation stands to revolutionize water quality monitoring, making it a critical tool for sustainable living and public safety. If implemented on a larger scale, the Water Quality Analyzer could greatly enhance the quality of life by ensuring the availability of clean, safe water for all.

CHAPTER-9
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