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Water Turbidity Detection Device Using Turbidity Sensor Based on Arduino Uno

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Contents

INTRODUCTION

- Water quality is essential for health and the environment, but traditional testing methods are often expensive and time-consuming
- Turbidity is a key indicator of water pollution, caused by suspended particles like soil, organic matter, or bacteria
- High turbidity levels can indicate contamination and must be monitored to ensure water is safe to use.
- This project introduces a simple turbidity detection system using an Arduino Uno, which measures NTU values and provides real-time alerts through an LCD, LED, and buzzer.

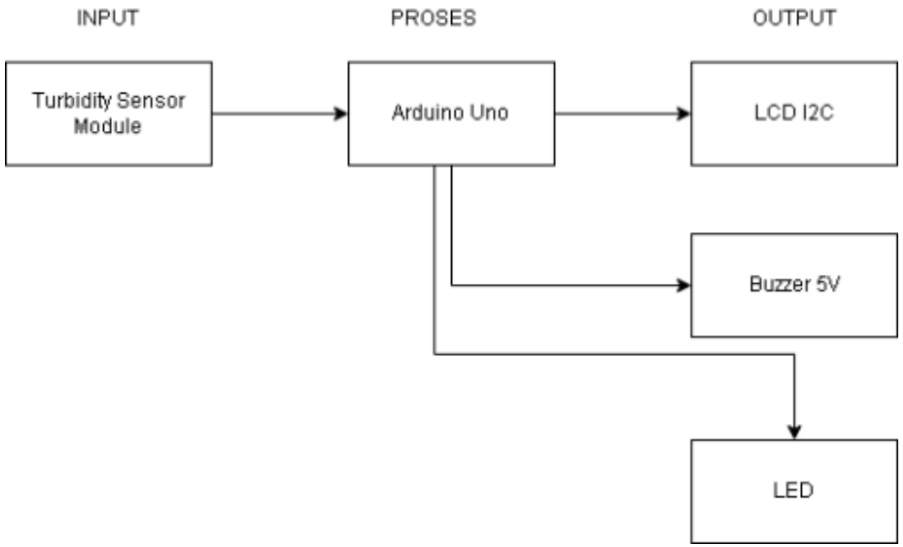
LITERATURE REVIEW

SL	Paper Title	Key Outcome	Author and Year
1	Water Quality Testing Using Arduino and Turbidity Sensor	Real-time, low-cost water quality monitoring using Arduino and turbidity sensor emphasizes sensor calibration.	B. Mounika et al. 2024
2	A Portable and Low-Cost Water Quality Monitoring System Based on Arduino and IoT Technology	Combined IoT with Arduino to build a compact water quality monitor, useful for mobile and field-based water analysis.	Hu et al. 2019
3	Development of Arduino-Based Water Quality Monitoring System for Aquaculture	Used turbidity and pH sensors with Arduino to help check water quality for fish farming.	Jalil Yusof 2019

LITERATURE REVIEW

SL	Paper Title	Key Outcome	Author and Year
4	Water Quality Monitoring Using IoT and Cloud Computing	A smart system using commercial-grade IoT modules and cloud servers are costly and complex.	Shaikh et al. 2018
5	Online Monitoring of Water Quality Using Spectrophotometric Sensors	Uses spectrophotometry for turbidity and pollution detection , but requires bulky instruments and professional handling.	Rieger et al. 2010
6	Turbidity Measurement	Standard turbidity testing with lab nephelometers is accurate but costly and not practical	U.S. Environmental Protection Agency 2009

PROPOSED SYSTEM



PROPOSED SYSTEM

Input Module:

- **Turbidity Sensor:** Detects the turbidity level of the water in NTU (Nephelometric Turbidity Unit).
- Sends analog signal to the Arduino Uno.

Processing Unit:

- **Arduino Uno Microcontroller:**
  - Reads turbidity sensor values.
  - Compares with pre-defined threshold.
  - Controls output components based on turbidity level.

PROPOSED SYSTEM

Output Module:

- **LCD Display:** Shows turbidity level (NTU value).
- **Buzzer:** Sounds an alert if turbidity exceeds threshold.
- **LED:**
  - Green LED indicates clean water.
  - Red LED indicates turbid water.

SURVEY

Aspect	Traditional Methods	Proposed Arduino-Based System
Technology Used	Lab-based nephelometers, spectrophotometers	Arduino Uno, turbidity sensor, LCD, LED, buzzer
Detection Method	Manual water sampling and laboratory testing	Real-time NTU detection using light scattering and voltage mapping
Features Extracted	Turbidity level (NTU) from precise lab tools	NTU values with real-time visual and sound alerts
Cost and Accessibility	Expensive, not suitable for remote or low-resource areas	Low-cost, portable, easy to use in rural or field settings

WORKING

- The system uses a **turbidity sensor** to detect how cloudy (turbidity) the water is, measured in **NTU**.
- The turbidity sensor works by **shining light through the water** and measuring how much light is **scattered by suspended particles**
- Sensor readings are sent to the **Arduino Uno**, which processes the voltage to determine turbidity.
- If turbidity is **below the threshold**, a **green LED** turns on indicating clean water.
- If turbidity **exceeds the threshold**, a **red LED** and **buzzer** activate as a warning.

WORKING

- The exact turbidity value is shown on an **LCD screen** in real time.
- The device is powered by a simple circuit integrating **sensor, Arduino, LCD, LED, and buzzer**.
- The system was tested with different water types (e.g., clean water, tea, milk, etc.).
- This system helps in practical water quality monitoring with low cost, portability, and user-friendly features.

APPLICATIONS

- **Drinking Water Testing:** Helps ensure the safety of water in households, schools, and rural areas.
- **Agricultural Use:** Monitors water quality used for irrigation or livestock.
- **Aquaculture and Fish Farming:** Detects dirty water to prevent harm to aquatic life.
- **Wastewater Monitoring:** Useful in small-scale industries or local treatment plants to check discharge quality.
- **Educational Projects:** Ideal for teaching sensor-based systems and environmental science in labs.

CHALLENGES

- **Sensor Accuracy:** Readings can be affected by temperature, air bubbles, or unstable water flow.
- **Fixed Threshold Limitation:** A single threshold may not suit all water types or turbidity conditions.
- **Environmental Interference:** Light reflection or electrical noise may affect the turbidity sensor's performance.
- **Limited Parameter Detection:** The system only detects turbidity and does not account for pH, TDS, or other water quality indicators.

ADVANTAGES

- **Low Cost:** Made with cheap and easily available parts.
- **Real-Time Results:** Shows turbidity level instantly.
- **Easy to Build:** Simple design using Arduino and basic components.
- **Clear Alerts:** Uses buzzer and lights to warn about dirty water.
- **Portable:** Can be used in rural or remote areas easily.

FUTURE SCOPE

- **Multiple Sensors:** Add pH, TDS, and temperature sensors for complete water testing.
- **Wireless Monitoring:** Use Wi-Fi or Bluetooth to send data to a mobile app or cloud.
- **Automatic Water Treatment:** Connect the system with a purifier that starts when water is dirty.
- **Solar Powered Unit:** Make the system run on solar power for outdoor and remote use.

CONCLUSION

- A simple and low-cost water turbidity detection system was developed using Arduino Uno and a turbidity sensor.
- The system provides real-time turbidity readings and clear alerts using an LCD, LED, and buzzer.
- It is suitable for water quality monitoring in households, agriculture, aquaculture, and educational settings.
- With a success rate of 93.27%, the system is effective, portable, and practical for use in rural and remote areas.

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Thank You