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IoT-Based Microplastic Detection and Water Quality Monitoring System

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Abstract: Presence of microplastic in drinking water is becoming an increasingly alarming environmental and health concern, the challenge with RO/UV based purification system is, they do not provide real time detection of microplastics. In this work, a low-cost sensor-based monitoring system is presented for estimating microplastic level using turbidity and TDS sensors. The combined sensor values produce a cumulative threshold value, which is utilized by the microcontroller to evaluate quality of water. The result is shown instantaneously on an LCD screen as Normal Water or Contaminated Water. Further, when contamination occurs, water is re-circulated and purified with a motor pump under relay control. The system is portable and power-efficient, can thereby become part of household installations at low cost with great potential for practical use towards real-time microplastic awareness, water quality monitoring. This system further runs continuously so that the water quality parameters can be monitored constantly. This algorithm can make decisions on the basis of threshold to enhance the detection reliability between different state water mobilities. Can be Connected to Household Plumbing with relative ease: Basic household plumbing, Simple Set Up (no major changes to home). Its compact design allows for additional sensors to be added in the future as need. Generally, the system increases user education and encourages safely producing drinking water.
Keywords: Microplastic Detection, Water Quality Monitoring, Turbidity Sensor, pH Sensor, IoT System, Real-Time Water Assessment.

I. INTRODUCTION

Microplastic pollution has emerged as a significant global environmental concern in recent years, attracting attention from researchers, policymakers, and public health authorities. Microplastics are plastic particles smaller than 5 mm, originating from the degradation of larger plastic waste or from micro-sized materials used in industrial and consumer products. These particles have been detected in oceans, rivers, groundwater, and even bottled drinking water [1]. Continuous ingestion of microplastics through drinking water poses potential health risks, as they can act as carriers of toxic chemicals, heavy metals, and harmful microorganisms.Despite increasing awareness, most households remain unaware of microplastic contamination due to the lack of affordable and real-time detection methods. Conventional water purification techniques such as Reverse Osmosis (RO), Ultraviolet (UV) treatment, and activated carbon filtration primarily focus on removing dissolved salts, microorganisms, and organic impurities. However, these systems do not provide any direct indication of microplastic presence in water. As a result, users often assume that water is safe without understanding the level of particulate contamination. Therefore, there is a growing need for intelligent and cost-effective monitoring systems suitable for household use [2].Recent advancements in sensor technology and embedded systems have enabled the development of smart water monitoring solutions capable of continuous data acquisition. Sensors such as turbidity and Total Dissolved Solids (TDS) are widely used to measure water quality parameters. Turbidity indicates the presence of suspended particles, including possible microplastics, while TDS reflects dissolved and fine particulate matter in water. Although these sensors do not directly detect microplastics, their combined analysis can indicate abnormal particle behavior associated with contamination. By integrating these sensors with microcontrollers and data processing algorithms, it is possible to design a cost-effective system for continuous monitoring without relying on expensive laboratory techniques such as spectroscopy or microscopy.However, most existing methods for microplastic detection are laboratory-based, expensive, and not suitable for real-time household applications. In addition, current water purification systems lack the capability for continuous monitoring and automatic response to contamination. This creates a research gap in developing a low-cost, real-time, and automated system for indirect microplastic detection.To address this gap, this work proposes a low-cost microplastic monitoring system based on turbidity and TDS sensors integrated with a microcontroller. The system uses a cumulative threshold-based algorithm to evaluate water quality and classify it as safe or contaminated. The results are displayed on an LCD, and a relay-controlled motor pump is automatically activated when contamination is detected to enable water recirculation.

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The proposed system is compact, energy-efficient, and suitable for household applications. By combining sensing, processing, and automated control, the system improves user awareness and supports safer drinking water management.

II. LITERATURE SURVEY

Microplastic contamination in drinking water has emerged as a critical environmental and public health concern due to its widespread presence and potential long-term health impacts.[1] Hong Heng See et al. presented a rapid and precise analytical method for the detection of microplastics in Malaysian bottled drinking water. Their study highlighted the presence of microplastic particles in commercially available bottled water and emphasized the need for reliable detection techniques to ensure drinking water safety.[2] S. Jeyaram et al. investigated the identification and occurrence of microplastics in drinking water bottles and milk packaging consumed daily by humans. The study revealed significant levels of microplastic contamination and raised concerns about continuous human exposure through everyday consumption.[3] Yueya Chang et al. analyzed the occurrence, characteristics, and risk assessment of microplastics in tap water and bottled water in China. Their work provided detailed insights into particle size, shape, and polymer type, along with an evaluation of potential health risks.

REF	Author & Year	Method	Merits	Demerits
[1]	Hong Heng See et al., 2025	Spectroscopy	High precision, fast analysis	Requires lab infrastructure
[2]	S. Jeyaram et al., 2025	Sample analysis	Identifies daily exposure risk	Time-consuming analysis
[3]	Yueya Chang et al., 2024	Risk assessment	Covers tap and bottled water	No real-time detection
[4]	Marthinus Brits et al., 2025	Pyrolysis-GC-MS	Highly accurate quantification	Expensive instrumentation
[5]	Imran Aslam et al., 2025	Fluorescence imaging	Scalable and automated	Requires image processing expertise
[6]	Eleonora Brancaleone et al., 2023	Pilot study	Confirms treated water contamination	Limited sample size
[7]	P. J. Sarlin et al., 2024	Characterization study	Regional contamination insights	Limited detection sensitivity
[8]	Huan Li et al., 2023	Experimental study	Large-scale bottled water study	High operational cost
[9]	M. B. Hossain et al., 2023	Characterization study	First evidence in developing country	Manual analysis
[10]	N. I. S. Ariffin et al., 2022	Exposure analysis	Human exposure estimation	No automation
[11]	Yolanda Picó et al., 2022	Review study	Comprehensive method comparison	Lacks implementation
[12]	X. Zhou et al., 2020	Experimental analysis	Early identification of pollution	Conventional techniques only

TABLE 1 SHOWS THE SUMMARY OF RELATED WORK.

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[4] Marthinus Brits et al. performed a quantitative analysis of microplastics in drinking water from source to tap using pyrolysis–gas chromatography–mass spectrometry. This method enabled highly accurate measurement of microplastic concentrations across different stages of water treatment.[5] Imran Aslam et al. proposed an efficient and scalable detection approach using fluorescence high-content imaging for identifying microplastics in drinking water. The method demonstrated improved automation and scalability compared to conventional microscopic techniques.[6] Eleonora Brancaleone et al. conducted a pilot study to assess the presence of microplastics in drinking water. The findings confirmed that microplastic particles are present even in treated water, indicating limitations in current purification processes.[7] Pathissery John Sarlin et al. examined the occurrence and characterization of microplastics in bottled drinking water. Their study identified different polymer types and highlighted contamination introduced during bottling and packaging processes.[8] Huan Li et al. studied the occurrence of microplastics in commercially sold bottled water and reported widespread contamination across multiple brands. The research emphasized the global nature of the microplastic pollution problem.[9] M. Belal Hossain et al. provided the first evidence of microplastics in bottled drinking water from a developing country. Their characterization study revealed various shapes and polymer compositions, emphasizing the need for regulatory standards.[10] Nur Izzati Shamsul Ariffin et al. analyzed microplastics in Malaysian bottled water brands and evaluated potential human exposure levels. The study highlighted significant variation in contamination among different brands.[11] Yolanda Picó et al. reviewed analytical methods used to detect microplastics in water treatment processes and drinking water. The study also discussed potential health effects, stressing the importance of developing efficient monitoring techniques.[12] Xue-jun Zhou et al. investigated microplastic pollution in bottled water in China and reported early evidence of contamination. Their findings contributed to understanding the distribution and concentration of microplastics in packaged drinking water.

III. PROPOSED WORK

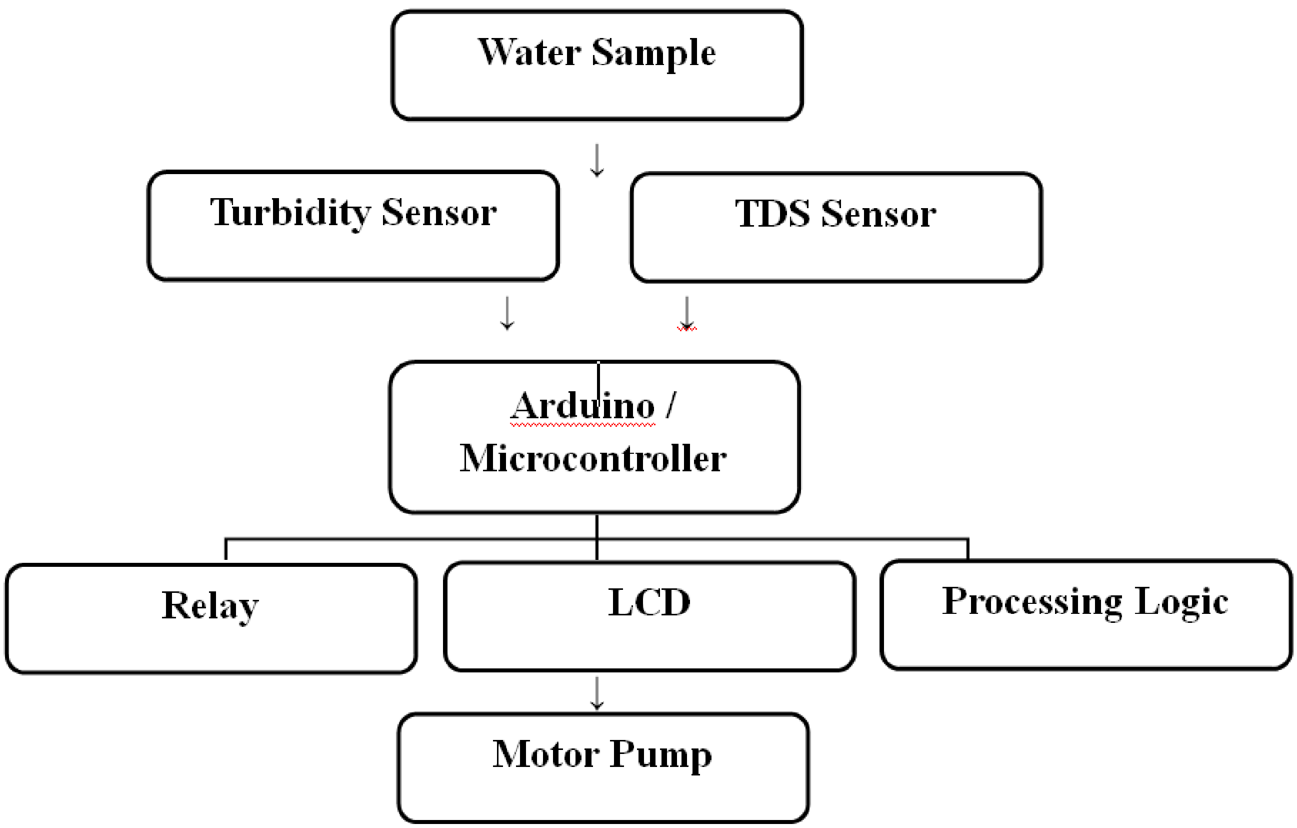

FIGURE 1 SHOWS THE SYSTEM ARCHITECTURE OF PROPOSED MODEL

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Figure 1 shows the system architecture of the proposed microplastic monitoring system. The system consists of turbidity and TDS sensors that collect water quality data and transmit it to a microcontroller. The microcontroller processes the data using a threshold-based algorithm to determine water quality. The results are displayed on an LCD, and when contamination is detected, a relay activates a motor pump for water recirculation.The proposed system is designed as a cost-effective water quality monitoring solution based on a microcontroller architecture. It addresses the limitations of conventional water purification systems such as Reverse Osmosis (RO) and Ultraviolet (UV), which do not provide information about microplastic contamination. By integrating sensors, automated control, and real-time visualization, the system provides a practical solution for household applications.The system is organized into multiple functional modules:

Water Quality Sensing Module

This module includes turbidity and TDS sensors for monitoring water quality. The turbidity sensor (e.g., SEN0189) operates in the range of 0–1000 NTU and detects suspended particles, including possible microplastic fragments. The TDS sensor (e.g., Gravity Analog TDS Sensor) operates in the range of 0–1000 ppm and measures dissolved solids and fine particles in water. These parameters serve as indirect indicators of microplastic contamination.Before deployment, the sensors are calibrated using standard reference samples. The turbidity sensor is calibrated using clear water as a baseline to ensure accurate low-range measurements. The TDS sensor is calibrated using standard solutions with known concentrations. This calibration process reduces measurement error and improves system reliability.

Data Processing Module

The data processing module consists of an Arduino-based microcontroller. It receives analog signals from the sensors and converts them into digital values using an analog-to-digital converter (ADC). A cumulative threshold-based algorithm is applied to process the sensor data. A Water Quality Index (WQI) is calculated by combining turbidity and TDS values, representing the level of contamination. Based on this value, the system classifies the water as either normal or contaminated.

A. Microplastic Estimation Module

This module evaluates the calculated WQI to estimate the presence of microplastic contamination. If the WQI exceeds a predefined threshold, the water is classified as contaminated; otherwise, it is considered safe. Although the system does not directly detect microplastic particles, it provides a reliable estimation using indirect parameters.

B. Display and Indication Module

The LCD display provides real-time information about water quality. It shows turbidity and TDS values along with the final classification as “Normal Water” or “Contaminated Water.” This allows users to easily understand water conditions without requiring technical expertise.

C. Pump Control Module

The pump control module automates the purification process. A relay-controlled motor pump is activated when contaminated water is detected, enabling recirculation for further filtration. Once the water quality returns to normal, the pump is automatically turned off, ensuring energy efficiency and reducing manual intervention.Overall, the proposed system is compact, portable, energy-efficient, and cost-effective. It eliminates the need for expensive laboratory equipment and complex analytical techniques, making it suitable for regular household use.

D. IoT Extension

Although the current system focuses on local monitoring, it can be extended to include IoT functionality. By integrating a Wi-Fi module such as ESP8266 or NodeMCU, sensor data can be transmitted to cloud platforms such as ThingSpeak or Firebase. This enables remote monitoring, data logging, and access through mobile or web applications. Such enhancements support long-term analysis of water quality trends.

IV. SYSTEM DESIGN AND ALGORITHM:

A. Algorithm

The proposed system will execute a prescribed algorithm for monitoring water quality and will indirectly estimate the levels of microplastic contamination through turbidity and total dissolved solids (TDS) parameters.

The prescribed algorithm will function autonomously and continuously using a microcontroller architecture. The system will first initiate all hardware components, including turbidity, TDS, LCD display, relay module, and motor pump. Once all components are initialized, the microcontroller will establish predetermined threshold levels of both turbidity and TDS from standard safe drinking water quality criteria. These thresholds will allow for determining whether a given sample of drinking water meets acceptable quality levels or not. Subsequent to this, both turbidity and total dissolved solids (TDS) sensors will supply continuous real time data to the system. A turbidity sensor will measure the amount of particulate matter suspended in the water causing a cloudiness in the water sample, whereas TDS sensors will indicate the dissolved solids (solutes), including very fine particulate matter present in the water sample. The output signals from the TDS and turbidity sensors will transmit to the microcontroller's integrated analog-to-digital converter (ADC), which converts these outputs into a digital representation**.**

The classification results trigger the microcontroller to display the current sensor data and assess the water quality on the LCD. Whenever there is an occurrence of contaminated water detected, the algorithm will turn on the relay module to switch on the motor pump to recirculate the contaminated water for further filtering/refining processes in order to improve the water quality. Once the sensor data returns to normal operating levels, the algorithm will automatically turn off the motor pump to save energy use. The entire process described above is done in real-time and requires no operator intervention, allowing for constant monitoring without the need for a human being to perform a manual check. The algorithm increases the reliability of the results by performing a series of cumulative analyses to eliminate false alarms as opposed to using a single measurement. Consequently, it provides an economical, straightforward, and time-efficient solution that will facilitate the monitoring of household water quality, as well as indirectly monitor for microplastics.

B. Cumulative Value Formula:

$$WQI = T + TDS$$

Where:

- T= Turbidity (NTU)
- TDS= Total Dissolved Solids (ppm)
- WQI= Water Quality Index

Decision Rule:

$$\text{If } WQI > \theta \Rightarrow \text{ContaminatedElse } \Rightarrow \text{Normal}$$

Where:

θ= Threshold value

Threshold Justification:

The threshold value is selected based on standard drinking water quality limits and experimental observations. Turbidity values below 10 NTU and TDS values below 500 ppm are generally considered safe for drinking water. Based on these limits and calibration experiments, a combined threshold value of 200 is chosen for classification. This threshold ensures reliable differentiation between normal and contaminated water samples under varying conditions.

Algorithm

Step 1: Start the system and initialize all components.

Step 2: Read turbidity sensor value T(in NTU).

Step 3: Read TDS sensor value TDS(in ppm).

Step 4: Convert analog sensor values into digital values using ADC.

Step 5: Calculate the Water Quality Index (WQI) using:

$$WQI = T + TDS$$

Step 6: Compare the WQI value with the predefined threshold θ.

Step 7:

If $WQI \leq \theta$, classify water as Normal

Else, classify water as Contaminated

Step 8: Display turbidity, TDS, and status on LCD.

Step 9:
If water is contaminated → Activate relay and start pump
Else → Keep pump OFF
Step 10: Repeat the process continuously for real-time monitoring.

C. WORKFLOW DIAGRAM:

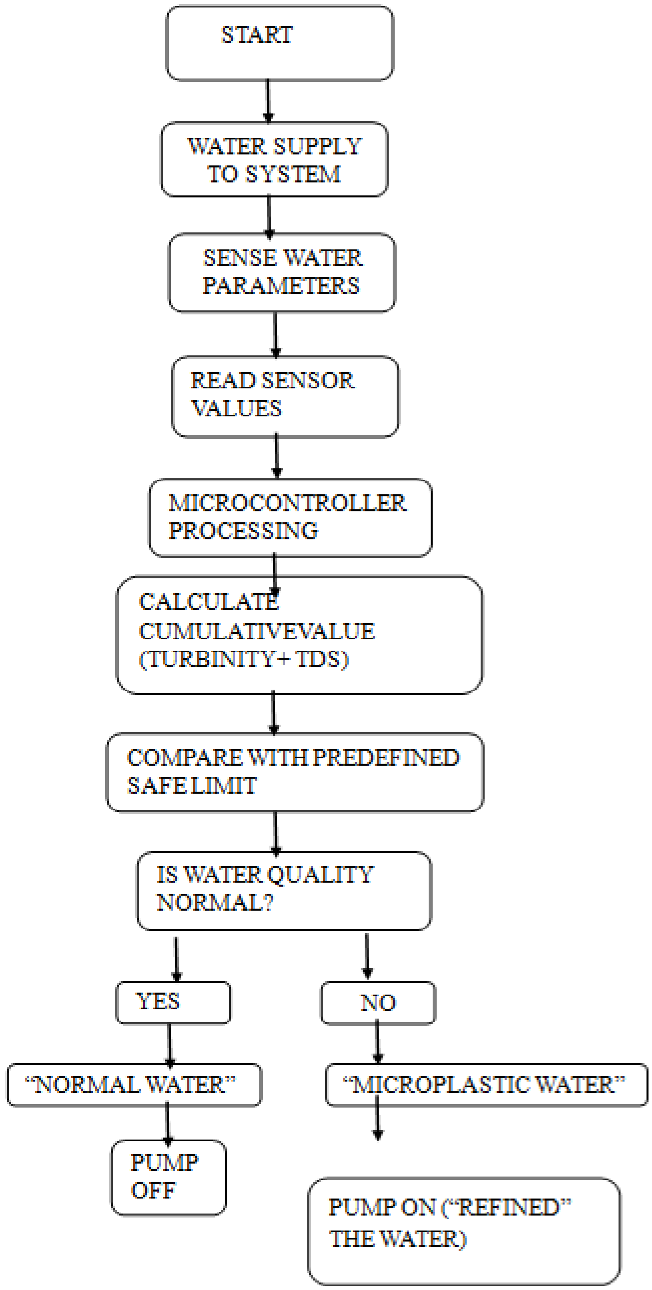

FIGURE 2 SHOWS THEWORKFLOW FOR FINDING MICROPLASTIC

This figure 2 shows that the operation of the micro plastic water quality monitoring system prototype starts with a water sample being taken and the turbidity and TDS sensors being immersed in the water. As soon as the system is powered on, the sensors begin to detect the water. The turbidity sensor measures the suspended particles in the water, while the TDS sensor measures the total dissolved solids.

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These two parameters provide clues about the water contamination.

The sensor readings are transmitted to the microcontroller. The microcontroller fetches the sensor data and processes it by converting the analog signals into digital signals. The system then calculates a cumulative value by adding up the turbidity and TDS values. This cumulative value indicates the level of water quality. Then, the cumulative value calculated is compared with a safe threshold value stored in the microcontroller. The system decides if the water quality is normal or if it is contaminated. If the cumulative value is below the safe limit, the water is categorized as Normal Water, and the LCD shows the instruction "Normal Water." The relay-controlled motor pump in this case is still and turned OFF. If the cumulative value is over the threshold limit, the water is categorized as Contaminated Water. The LCD shows the warning message and the relay energizes the motor pump. The pump is useful for the purification or re-circulation of the water for the next determination.

D. DATAFLOW:

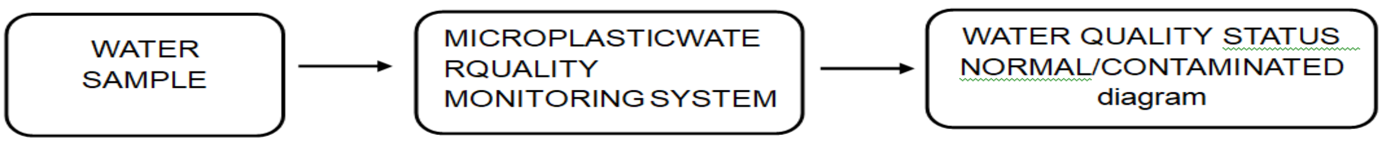

FIGURE 3 SHOWS THEDATAFLOW DIGRAM

This figure 3 shows that presents the steps of water quality monitoring in terms of microplastic pollution. Initially, a water sample is collected from a particular source such a river, lake, or drinking water. Following this, the microplastic water quality monitoring system, which acts as the main analysis unit, is given such a sample. By means of appropriate sensing or analytical methods, the system assesses the water sample to find and measure microplastics' presence. The system determines the condition of the water and generates the ultimate result as the quality level of the water based on the study findings. The water is flagged as normal if the standard deems the microplastic level to be normal; otherwise, it is regarded as contaminated. This procedure facilitates the recognition of polluted water and thus aids the implementation of water safety and treatment in time.

E. FLOWCHART:

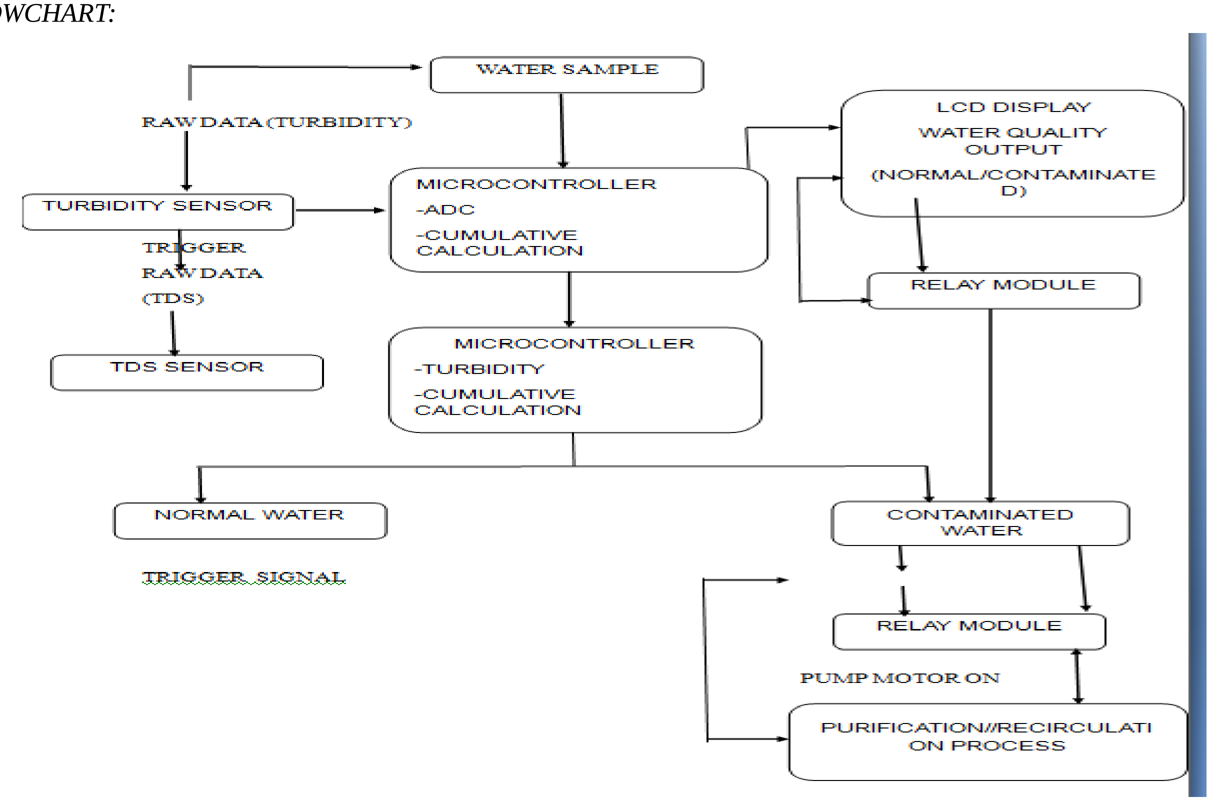

FIGURE 4 SHOWS THE FLOW DIGRAM

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Figure 4 shows that the interaction begins when the water sample is taken and placed onto the sensors. The turbidity sensor measures the turbidity of the water caused by suspended particles, including microplastics. Meanwhile, the TDS sensor measures the total amount of dissolved solids present in the water sample. Each of these sensors produces raw analogue data, which is dependent on the water condition. The Arduino CPU gets these unprocessed sensor readings. There is an Analog-to-Digital Converter (ADC) in the microcontroller that, in the first place, changes incoming sensors' readings from analogue to digital. After this, the data are processed using a cumulative calculating approach. Data from the sensors are combined and processed to obtain control data, which reflects the condition of the water. The processed data is then compared to a predefined threshold value stored in the microcontroller. This process allows the assessment of contaminated water as opposed to water that is not contaminated. Based on the processed decision from the microcontroller, the LCD panel displays the water quality data (Normal/Contaminated). Once the microcontroller detects contaminated water, he sends a trigger signal to the relay module. If the water is erratic, the relay remains off and pump does not run. Therefore, exactly how the sensor data ensures safe monitoring and treatment of water via processing, decision making, display and control automation.

V. EXPERIMENTAL RESULT

The proposed microplastic monitoring system was evaluated using water samples under different conditions, including clear water, moderately contaminated water, and highly polluted water. A total of 50 samples were tested using the system. For each sample, turbidity (NTU) and Total Dissolved Solids (TDS) values (ppm) were measured using the sensors, and the corresponding Water Quality Index (WQI) was calculated by the microcontroller.The dataset includes both normal and contaminated samples, enabling effective evaluation of the system's classification performance. The experimental results demonstrate that the system consistently responds to variations in water quality by accurately classifying samples based on the predefined threshold. This structured dataset ensures reliable validation of the proposed method under different water conditions.

Sample	Turbidity (NTU)	TDS (ppm)	Cumulative Value	Threshold	Output
1	5	150	155	200	Normal
2	20	300	320	200	Contaminated
3	8	120	128	200	Normal
4	25	350	375	200	Contaminated

TABLE 2SHOWS THE SENSOR READINGS AND SYSTEM OUTPUT FOR DIFFERENT WATER SAMPLES.

Table 2 shows the sensor readings and corresponding system output for different water samples. It can be observed that samples with low turbidity and TDS values produce a cumulative value below the threshold, resulting in a "Normal Water" classification. In contrast, samples with higher values exceed the threshold and are classified as "Contaminated Water."The experimental results indicate a clear relationship between sensor values and water quality classification. The threshold value of 200 effectively differentiates between normal and contaminated conditions under different test scenarios.

- The accuracy of the proposed system is calculated based on the number of correctly classified samples. Out of 50 tested samples, 46 samples were correctly classified as either normal or contaminated. The accuracy is calculated using the following formula:

$$\text{Accuracy} = \frac{\text{Number of Correct Predictions}}{\text{Total Number of Samples}} \times 100$$

Substituting the values:

$$\text{Accuracy} = \frac{46}{50} \times 100 = 92\%$$

This result demonstrates that the proposed system provides reliable classification performance for real-time water quality monitoring.

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Method	Cost	Real-Time	Accuracy	complexity	suitability
Spectroscopy [1]	High	No	High	Complex	Laboratory
Pyrolysis-GC-MS [4]	Very High	No	Very High	Very Complex	Laboratory
Imaging Method [5]	High	Limited	High	Complex	Semi-practical
Proposed System	Low	Yes	92%	Simple	Household

TABLE 3 SHOWS COMPARISON WITH EXISTING METHODS.

Table 3 shows the comparison between the proposed system and existing microplastic detection methods. Traditional methods such as spectroscopy and Pyrolysis-GC-MS provide high accuracy but require expensive equipment and laboratory conditions. Imaging-based methods offer partial automation but still involve high complexity. In contrast, the proposed system provides a low-cost, real-time monitoring solution with acceptable accuracy. The system is simple to implement and suitable for household applications, making it a practical alternative to existing approaches.

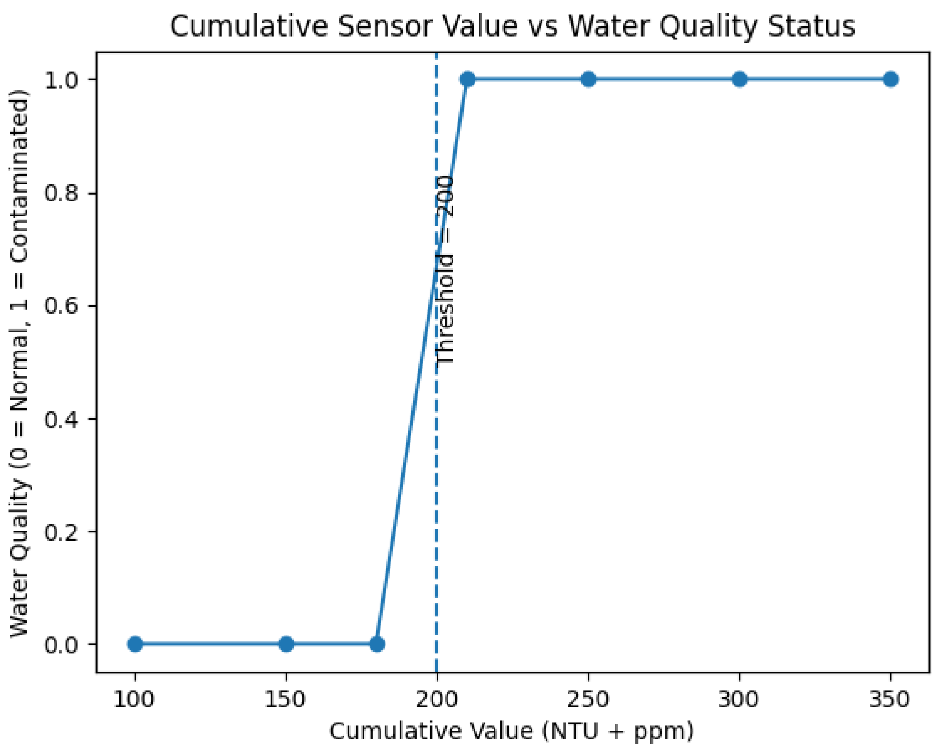


FIGURE 5 SHOWS THE RELATIONSHIP BETWEEN CUMULATIVE SENSOR VALUE AND WATER QUALITY STATUS.

Figure 5 shows the relationship between cumulative sensor values and water quality status. The X-axis represents the cumulative value obtained by combining turbidity (NTU) and TDS (ppm), while the Y-axis represents the system output, where 0 indicates normal water and 1 indicates contaminated water. It can be observed that when the cumulative value exceeds the predefined threshold, the system classifies the water as contaminated. This clearly demonstrates the effectiveness of the threshold-based decision mechanism.

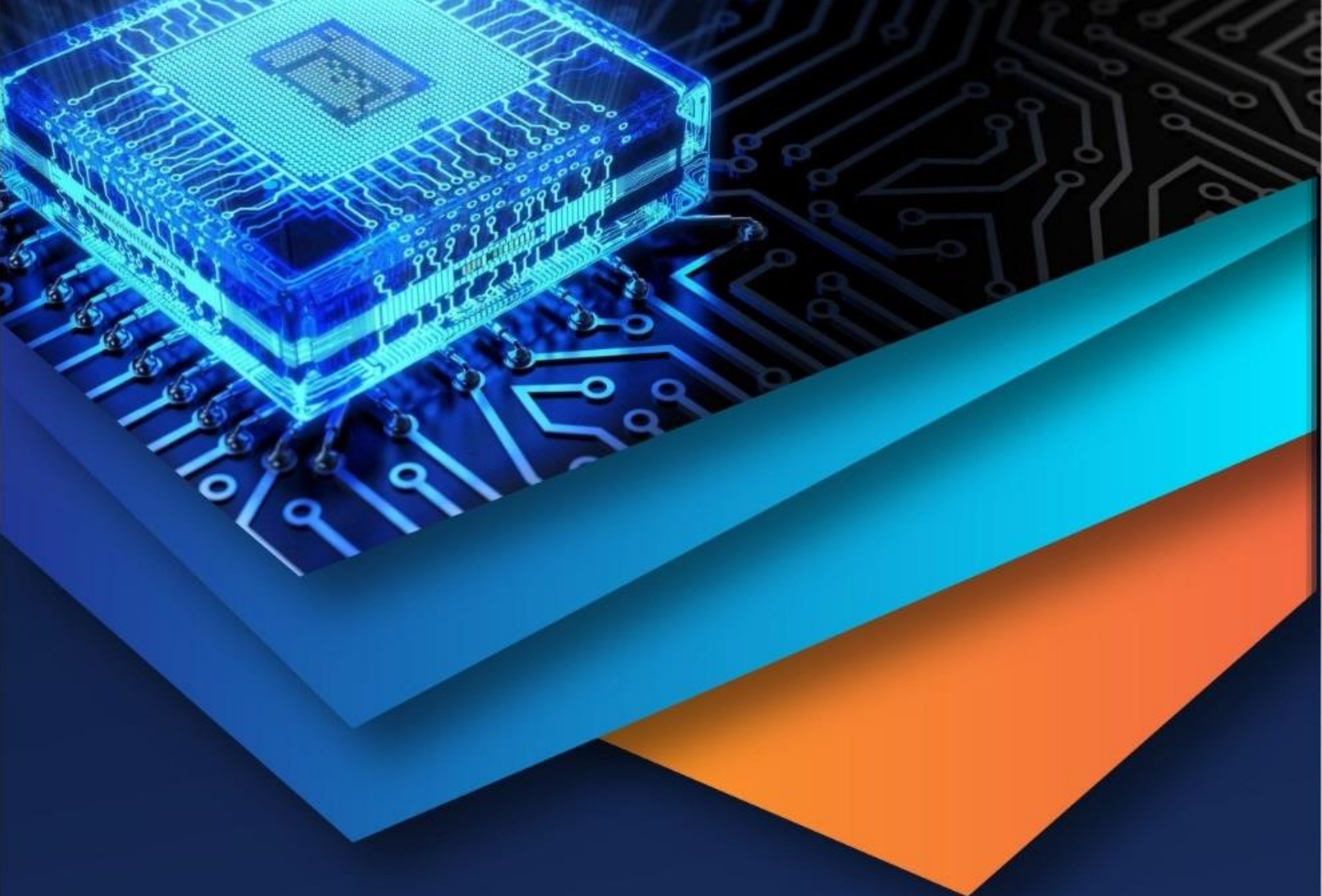
VI. CONCLUSION

The proposed system demonstrates that it is possible to design a cost-effective solution for monitoring microplastic contamination using turbidity and TDS sensors.

By combining sensor measurements into a cumulative threshold value, the system is able to indirectly identify potential microplastic presence in drinking water. The system provides continuous monitoring with real-time display on an LCD, making it suitable for household applications.The integration of a relay-controlled motor pump enhances system functionality by enabling automatic water recirculation when contamination is detected. Experimental results show that the system achieves an accuracy of approximately 92% in classifying water samples as normal or contaminated. The proposed system is practical, energy-efficient, and suitable for real-time water quality monitoring.In future work, the system can be improved by incorporating additional sensors such as pH and temperature for more comprehensive water quality analysis. Furthermore, integration with IoT platforms can enable remote monitoring through mobile or web applications. Advanced filtering techniques and machine learning approaches can also be explored to improve the accuracy of microplastic detection.

REFERENCES

[1] Hong Heng See,En Qi Lim, Woei Jye Lauet al ”Rapid and precise method for microplastic analysis in Malaysian bottled water”Volume 13, Issue 5,DOI:https://www.sciencedirect.com/science/article/pii/S2213343725027757
[2] S. Jeyaram, Natarajan Arumugam, Abdulrahman I. Almansour et al”Identification and occurrence of microplastics in drinking water bottles and milk packaging consumed by humans daily“Volume 197,DOI:https://link.springer.com/article/10.1007/s10661-025-13721-3
[3] Yueya Chang, Jun Yang et al”Occurrence, Characteristics, and Risk Assessment of Microplastics in Tap Water and Bottled Water, China”Volume35, Issue1,DOI:https://onlinelibrary.wiley.com/doi/abs/10.1002/tqem.70143
[4] Marthinus Brits, Martin J. M. van Velzen, Eelco N. Pieke et al”Microplastics in drinking water: quantitative analysis of microplastics from source to tap by pyrolysis–gas chromatographymassspectrometry“Volume 32,DOI:https://link.springer.com/article/10.1007/s11356-025-37130-8
[5] Imran Aslam, Quinten Wouters, Iris Van Den Eede, Wouter Vandezande et al”Efficient and Scalable Detection of Microplastics in Drinking Water Using Fluorescence High-Content Imaging”Volume10, Issue2,DOI:https://onlinelibrary.wiley.com/doi/abs/10.1002/smtd.202500465
[6] Eleonora Brancaleone, Daniela Mattei, et al”Microplastic in Drinking Water: A Pilot Study”Volume3, Issue1,DOI:https://www.mdpi.com/2673-8929/3/1/3
[7] pathissery John Sarlin, Sancia Morris, et al”Occurrence and characterization of microplastics in bottled drinking water”Volume 2,DOI:https://link.springer.com/article/10.1007/s44274-024-00129-y
[8] Huan LI , Long ZHU , Mindong MA et al,”Occurrence of microplastics in commercially sold bottled water”Volume867DOI:https://www.sciencedirect.com/science/article/pii/S0048969723001687
[9] M. Belal Hossain et al,”First evidence of microplastics and their characterization in bottled drinking water from a developing country”Volume 11,DOI:https://www.frontiersin.org/journals/environmentalscience/articles/10.3389/fenvs.2023.1232931/full
[10] Nur Izzati Shamsul Ariffin et al”Microplastics in Malaysian bottled water brands: Occurrence and potential human exposure”Volume 315DOI:https://www.sciencedirect.com/science/article/pii/S0269749122017080
[11] Yolanda Picó,Ifra Manzoor et al”Microplastics in water, from treatment process to drinking water: analytical methods and potential health effects”DOI:https://www.oaepublish.com/articles/wecn.2022.04
[12] Xue-jun Zhou , Jin Wang , Hong-yan Li et al”Microplastic pollution of bottled water in China”Volume 40 DOI:https://www.sciencedirect.com/science/article/pii/S2214714420307613



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