

**TOUCHLESS CHEAPEST AND WATER DISPENSER****Mrs. K. Snehalatha**

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**ABSTRACT**

Access to safe and hygienic drinking water is essential for public health, yet many conventional water dispensing systems still rely on physical contact, increasing the risk of contamination, especially in shared environments. This study focuses on the design and development of a touchless, low-cost water dispenser that addresses both hygiene and affordability concerns. The proposed system uses a simple sensor-based mechanism, such as an infrared or ultrasonic sensor, to detect the presence of a user's hand and automatically dispense water without the need for manual operation. By eliminating direct contact with taps or buttons, the system helps reduce the spread of germs and promotes safer usage in public and community settings.

A key objective of this work is to ensure that the solution remains economical and accessible, particularly for low-resource environments. The design incorporates readily available and inexpensive components, including a microcontroller, relay module, and a small water pump or solenoid valve. This not only reduces the overall cost but also makes the system easy to assemble, maintain, and repair. The simplicity of the design ensures that it can be adopted in a wide range of locations such as schools, rural healthcare centers, offices, and public facilities without requiring specialized technical expertise.

The system was developed through a structured methodology involving component selection, circuit design, integration, and testing. During operation, the sensor detects hand movement within a predefined range and signals the control unit to activate the water flow. Once the hand is removed, the flow stops automatically, preventing unnecessary water usage. Experimental testing demonstrated that the system provides a quick and reliable response, ensuring smooth and consistent performance. The touchless operation not only enhances user convenience but also contributes to improved hygiene standards.

In addition to hygiene benefits, the system supports water conservation by controlling the duration and flow of water. This feature is particularly valuable in areas facing water scarcity, where efficient usage is critical. The dispenser also consumes minimal power, making it suitable for use in regions with limited electricity availability and allowing potential integration with alternative energy sources such as battery or solar power.

Despite its advantages, certain limitations were observed, including sensitivity of the sensor to environmental conditions such as strong light or reflective surfaces. However, these challenges can be minimized through proper calibration and installation. Overall, the results indicate that the proposed system achieves a good balance between cost, functionality, and usability.

In conclusion, this study demonstrates that a practical and effective touchless water dispensing solution can be achieved using simple and affordable technology. The proposed system has the potential to improve hygiene, reduce water wastage, and enhance accessibility, particularly in underserved communities. It highlights how low-cost innovations can play a significant role in addressing everyday challenges and promoting sustainable public health practices.

**INTRODUCTION**

Access to clean drinking water is a fundamental human need, yet the way water is dispensed in many public and shared environments still poses hygiene and accessibility challenges. Traditional water dispensers often require physical contact—pressing buttons, turning knobs, or handling taps—which can become vectors for the transmission of pathogens. This concern has become even more pronounced in the wake of global public health crises, where minimizing contact with shared surfaces is essential. At the same time, high-end touchless dispensing systems remain financially out of reach for many communities, especially in low-resource settings. This creates a gap between safety and affordability that demands practical innovation.

The concept of a touchless, low-cost water dispenser emerges as a response to this gap. By integrating simple sensing mechanisms—such as infrared or ultrasonic sensors—with basic control systems, it is possible to automate water dispensing without the need for physical contact. The primary goal is not to compete with

expensive commercial solutions, but to design a system that is economical, easy to build, and reliable in everyday use. Such a device can be particularly valuable in schools, rural health centers, public transportation hubs, and small businesses where budget constraints often limit access to advanced technologies.

Human-centered design plays a crucial role in the development of this system. Beyond functionality, the dispenser must be intuitive and inclusive, allowing users of all ages and abilities to operate it effortlessly. A simple hand gesture should trigger water flow, and the system should respond consistently under varying environmental conditions. Equally important is the use of locally available materials and components, ensuring that the device can be assembled, maintained, and repaired without specialized expertise. This approach not only reduces costs but also encourages community-level adoption and sustainability.

Another key consideration is water conservation. A well-designed touchless dispenser can help regulate water flow more precisely than manual taps, reducing wastage. By incorporating features such as timed dispensing or flow control, the system can promote responsible water usage while still meeting user needs. In regions where water scarcity is a pressing issue, even small improvements in efficiency can have meaningful impact.

This work aims to present the design, development, and evaluation of a touchless water dispenser that balances cost, performance, and usability. By focusing on simplicity and practicality, the proposed solution seeks to make hygienic water access more widely achievable. Ultimately, the broader vision is to demonstrate how thoughtful, low-cost engineering can address real-world problems and improve everyday life, particularly in underserved communities where such innovations are needed most.

### OBJECTIVES

The primary objective of this work is to design and develop a touchless water dispenser that is both affordable and practical for everyday use. The intention is to create a solution that does not rely on expensive components or complex technology, making it accessible to communities with limited resources while still maintaining reliability and efficiency.

Another key objective is to improve hygiene in shared spaces by eliminating the need for physical contact during water dispensing. By introducing a simple, sensor-based mechanism, the system aims to reduce the risk of contamination and promote safer water usage in places such as schools, clinics, and public facilities.

This study also seeks to ensure that the proposed system is user-friendly and inclusive. The dispenser should be easy to operate for individuals of all ages, requiring only a natural hand movement to function. Simplicity in design is emphasized so that users can interact with the system without confusion or the need for prior training.

Cost-effectiveness is a central focus throughout the project. The objective is to use readily available, low-cost materials and components, enabling easy assembly, maintenance, and repair. This approach supports scalability and encourages adoption in both urban and rural settings.

In addition, the study aims to promote efficient water usage. By controlling the flow of water automatically, the system can help minimize wastage, contributing to more responsible consumption practices, especially in areas where water resources are limited.

Finally, this work intends to demonstrate that meaningful technological solutions do not always require high-end resources. By combining simplicity with thoughtful design, the project aspires to offer a practical innovation that addresses real-world challenges in a sustainable and impactful way.

### METHODOLOGY

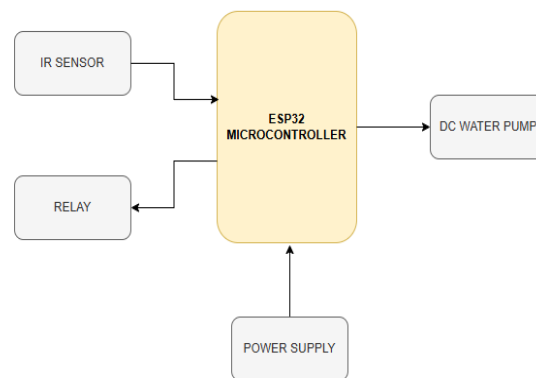
The development of the touchless low-cost water dispenser followed a simple and practical approach, focusing on ease of design, affordability, and real-world usability. The process began with identifying the key problem—reducing physical contact in water dispensing while keeping the system economical and accessible. Based on this, a straightforward system architecture was planned using commonly available electronic components.

The core of the system is a sensor-based mechanism that detects the presence of a user's hand. An infrared or ultrasonic sensor is positioned near the outlet of the dispenser to sense motion or proximity. When a hand is detected within a specific range, the sensor sends a signal to a control unit, typically a microcontroller. This control unit processes the signal and activates a water pump or solenoid valve, allowing water to flow. Once the hand is removed, the system automatically stops the flow, ensuring both hygiene and water conservation.

To keep the design cost-effective, the components were carefully selected based on availability and price without compromising basic performance. The system was assembled using simple circuitry, making it easy to replicate and maintain. Special attention was given to minimizing power consumption so that the device could operate efficiently, even in areas with limited electricity supply.

The prototype was then physically constructed and tested under different conditions to evaluate its responsiveness and reliability. Parameters such as sensing distance, response time, and water flow duration were adjusted to achieve smooth and consistent operation. User interaction was also observed to ensure that the system is intuitive and does not require instructions for basic use.

Finally, the performance of the dispenser was assessed in terms of functionality, cost, ease of use, and water efficiency. Feedback from trial usage helped refine the design, making it more practical for deployment in real-life environments. This step-by-step methodology ensures that the final system is not only technically sound but also aligned with the needs of everyday users.



**Figure 1.1: Block Diagram**

To further strengthen the design process, the methodology also included a phase of requirement analysis, where the needs of potential users and environments were carefully considered. Factors such as frequency of use, availability of power supply, water source compatibility, and environmental conditions (such as dust or humidity) were taken into account. This helped in shaping a design that is not only functional but also adaptable to different real-world settings.

Following this, a detailed component selection and system integration phase was carried out. Each component—sensor, microcontroller, relay module, pump or solenoid valve, and power supply—was tested individually before integration. This step ensured that all parts were compatible and worked efficiently together as a single system. Wiring and connections were kept simple and organized to reduce the chances of failure and to make troubleshooting easier.

The design also considered safety aspects. Proper insulation and secure mounting of electrical components were ensured to prevent hazards such as short circuits or water leakage affecting the electronics. In addition, a stable enclosure was designed to protect the internal components from external damage while maintaining accessibility for maintenance.

A calibration phase was included to fine-tune the sensor's sensitivity and the system's response time. This was important to avoid false triggering due to environmental disturbances such as sudden light changes or unintended movements. By adjusting the sensing range and delay timing, the system achieved a balance between responsiveness and stability. To evaluate performance more thoroughly, repeated testing cycles were conducted. The system was operated multiple times to observe consistency, durability, and user satisfaction. Basic performance metrics such as response accuracy, dispensing time, and water usage per operation were noted. Any issues identified during testing were addressed through iterative improvements.

Lastly, the methodology emphasized scalability and reproducibility. The design documentation was prepared in a clear and structured manner so that the system can be easily replicated by others. The overall approach ensures that the final product is not only effective but also practical for widespread implementation, particularly in resource-limited environments where simple and reliable solutions are most valuable.

## RESULTS AND DISCUSSION

The developed touchless water dispenser was successfully designed, assembled, and tested, demonstrating that a simple and low-cost system can effectively provide hygienic water dispensing. During operation, the sensor was able to detect the presence of a user's hand with good accuracy, triggering the water flow almost instantly. The

response time of the system was found to be quick and consistent, allowing smooth interaction without noticeable delays.

The performance tests showed that the dispenser functioned reliably under normal conditions. The sensor maintained stable detection within the calibrated range, and the control unit responded appropriately to start and stop the water flow. This ensured that water was dispensed only when needed, contributing to reduced wastage compared to conventional manual taps. The automatic cut-off feature worked effectively, preventing unnecessary flow when no hand was present.

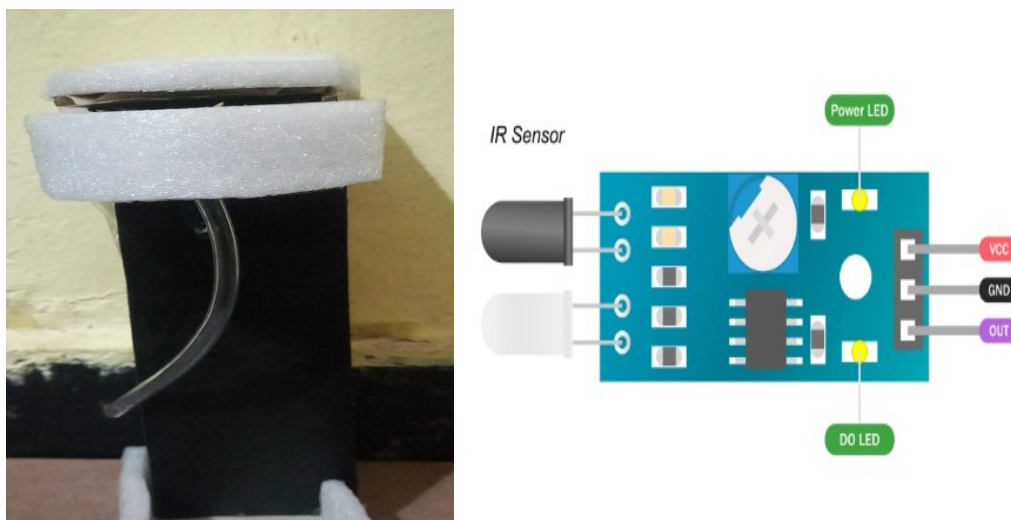
From a usability perspective, users found the system easy to operate, as it required no physical effort or prior instruction. The touchless feature significantly improved hygiene, particularly in shared environments where multiple users interact with the same water source. This makes the system especially suitable for public places such as schools, offices, and healthcare settings.

Cost analysis revealed that the overall system could be built at a significantly lower price compared to commercially available touchless dispensers. The use of readily available components and a simple design contributed to its affordability, making it a practical option for low-resource settings. At the same time, the system maintained satisfactory performance, showing that cost reduction did not severely compromise functionality.

However, some limitations were observed during testing. The sensor performance could be slightly affected by environmental factors such as strong sunlight or reflective surfaces, which occasionally led to minor detection inconsistencies. Additionally, the durability of certain low-cost components may require periodic maintenance or replacement over time.

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**Figure 1.2 Final Output**

Overall, the results indicate that the proposed system achieves a good balance between cost, efficiency, and usability. The discussion highlights that while there is room for improvement, particularly in enhancing sensor robustness and long-term durability, the current design serves as a viable and effective solution for promoting hygienic and contactless water dispensing in everyday environments.

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### CONCLUSION

This study demonstrates that an effective and hygienic water dispensing system can be developed using a simple, low-cost, and touchless approach. The proposed design successfully eliminates the need for physical contact, thereby reducing the risk of contamination in shared environments. Through the integration of basic sensors and control components, the system achieves reliable and responsive operation while remaining affordable and easy to implement.

The results confirm that the dispenser performs efficiently under normal conditions, providing consistent water flow only when required. This not only improves user convenience but also contributes to water conservation. The simplicity of the design ensures that the system can be easily assembled, maintained, and adapted for different settings, making it particularly suitable for schools, public places, and resource-limited areas.

Although minor limitations such as sensitivity to environmental factors and component durability were observed, these do not outweigh the overall benefits of the system. With slight improvements and careful installation, the performance can be further enhanced.

In conclusion, the touchless low-cost water dispenser presents a practical and scalable solution to address both hygiene and accessibility challenges. It highlights how thoughtful engineering and simple technology can create meaningful impact, offering a sustainable way to improve everyday public health and water usage practices.

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