

Automatic Sanitizer Dispenser

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Abstract:- In light of the growing emphasis on hygiene and the prevention of infectious diseases, particularly following the COVID-19 pandemic, the development of a contactless automatic hand sanitizer dispenser has become highly relevant. This project focuses on designing and implementing a low-cost, energy-efficient, and easy-to-use device that dispenses hand sanitizer automatically upon detecting a user's hand.

The system utilizes an infrared (IR) sensor to detect proximity, which then signals a microcontroller to activate a DC pump or motor, dispensing a controlled amount of sanitizer without physical contact. The design aims to minimize the risk of cross-contamination, making it suitable for use in hospitals, offices, schools, and public spaces.

The prototype was successfully built using readily available components such as Arduino, IR sensors, and a mini water pump. The final model was tested for responsiveness, dispensing accuracy, and power efficiency. This project demonstrates a practical, scalable solution for maintaining hygiene in high-traffic environments.

Keywords:- Sanitizer, Pump, Alcohol, Soap, Coronavirus, Ultrasonic Sensor, Relay

II. INTRODUCTION

An **Automatic Sanitizer Dispenser** is a touchless hygiene device designed to promote cleanliness and reduce the transmission of germs. Utilizing infrared (IR) sensor technology, these dispensers can detect the presence of hands beneath them and release a controlled amount of hand sanitizer without any physical contact. This touch-free functionality significantly minimizes the chances of cross-contamination, making it ideal for environments such as hospitals, offices, schools, malls, and other public spaces. In recent times, especially during the COVID-19 pandemic, the importance of maintaining proper hand hygiene has been underscored globally. Automatic sanitizer dispensers have emerged as effective tools in supporting these hygiene practices by offering a quick, efficient, and user-friendly solution for regular hand sanitization.

III LITERATURE SURVEY

The need for improved hygiene and touch-free solutions has significantly increased due to the global outbreak of infectious diseases, especially COVID-19. During the pandemic, hand sanitization emerged as a critical preventive measure to reduce the transmission of viruses. Traditional sanitizer dispensers require physical contact, making them potential carriers for germs. This led to a surge in interest in developing **automatic, contactless sanitizer dispensing systems** that minimize human interaction and enhance safety..

Several research studies and projects have explored various methods for creating contactless dispensing mechanisms. Most systems revolve around the integration of **sensors, microcontrollers, and pumps**, typically designed to detect a user's hand and trigger a sanitizer release. For example, Patil and Jadhav (2020) proposed a system using an **ultrasonic sensor and Arduino Uno** to detect hand proximity and activate a motor pump. Their design focused on low cost and ease of use, laying the foundation for practical real-world deployment.

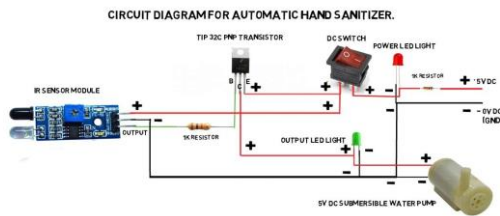
Another study by Sharma et al. (2021) introduced a **solar-powered automatic sanitizer dispenser**, aimed at increasing energy efficiency and supporting deployment in rural areas without reliable electricity. Their model used a **solar panel, IR sensor, and a relay-based control system**, showing the versatility of renewable energy in hygiene technology.

In addition, a team of researchers at the National Institute of Technology (NIT) developed a more advanced dispenser integrating **IoT (Internet of Things)** features for remote monitoring of sanitizer levels. This type of smart system can alert users or facility managers when the sanitizer reservoir is low, reducing maintenance downtime. However, such models are relatively expensive and complex, making them less accessible for small-scale or budget-limited applications.

Most existing models use **IR sensors or ultrasonic sensors** for hand detection. While ultrasonic sensors offer more accurate range detection, IR sensors are more affordable and easier to integrate. For cost-sensitive applications, IR sensors are generally preferred despite minor limitations like sensitivity to ambient light, which can be mitigated with calibration and shielding.

Arduino-based systems are among the most popular in academic projects due to their open-source nature, ease of programming, and compatibility with various components. Studies also compared the use of **servo motors vs. DC motors or pumps**—servo motors allow precise control but are more expensive, while DC pumps are widely available and simpler to use. Our project builds upon these foundational works by combining **cost-effective components with simplified logic and reliable performance**. It avoids complex IoT integration and focuses on practicality and mass usability. The system is modular, making it easy to repair or upgrade. Furthermore, our design includes a compact enclosure, LED indicator for status, and optimized dispensing logic for minimal sanitizer wastage.

IV METHODOLOGY



The methodology outlines the structured approach used to **design, develop, test, and evaluate** the *Automatic Sanitizer Dispenser*. The objective of this project was to create a **touchless sanitizing system** that is affordable, reliable, energy-efficient, and suitable for use in public and private spaces. This section details the systematic steps taken throughout the development process.

The first phase began with **problem identification and goal setting**. During the COVID-19 pandemic, it became evident that traditional sanitizer dispensers posed a risk of cross-contamination due to physical contact. Hence, the goal was to develop a system that dispenses sanitizer automatically upon hand detection without requiring any physical touch. Next, a **conceptual design** was created, including a block diagram to visualize how the system components—sensor, microcontroller, pump, and power supply—would interact. It was important to ensure that the system was **modular**, allowing easy replacement or upgrading of parts, and **compact**, making it suitable for wall mounting or desktop use.

In the **hardware selection phase**, components were carefully chosen based on cost, power efficiency, and ease of integration. An infrared (IR) sensor was selected for motion detection, a microcontroller (such as Arduino) was used for processing, and a mini DC motor or pump was chosen to dispense sanitizer. The components were assembled on a breadboard for initial testing.

Software development involved programming the microcontroller to interpret sensor input and activate the pump for a precise duration. The control logic was written in Arduino IDE, ensuring the motor runs only when a hand is detected.

Finally, **prototype testing and refinement** were carried out. The system was tested for sensor range, pump efficiency, and power consumption. Based on testing outcomes, adjustments were made to improve sensitivity, reduce false triggers, and optimize sanitizer output.

This methodology ensured a practical, scalable, and safe product that effectively contributes to better hygiene practices.

V PROJECT OVERVIEW

The **Automatic Sanitizer Dispenser** project was undertaken to address the growing need for touchless hygiene solutions in public spaces, particularly in the aftermath of the COVID-19 pandemic. The primary objective was to design and build a low-cost, contactless sanitizer dispensing system that reduces the risk of cross-contamination and improves overall public health safety.

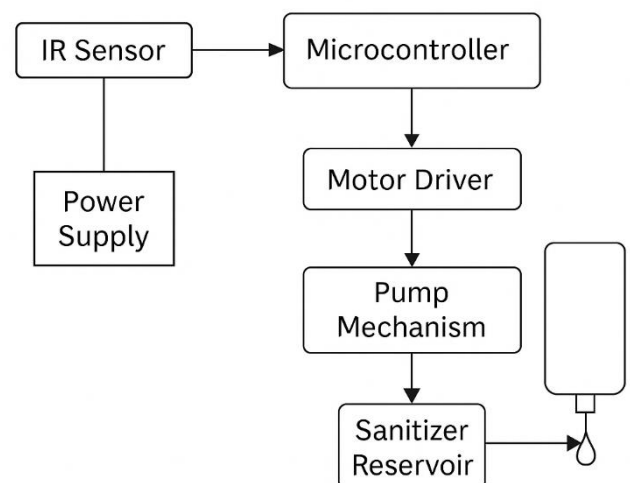
The system works by detecting a user's hand using an **infrared (IR) sensor**. When the sensor detects motion within a certain range, it sends a signal to an **Arduino microcontroller**, which then activates a **DC pump** to dispense a pre-measured amount of sanitizer. This process is fast, efficient, and completely contact-free.

Key components include an IR sensor, Arduino board, mini DC pump, power supply, and a relay or transistor module for switching. The dispenser is powered by a battery or adapter and is designed to be compact, energy-efficient, and easy to install in high-traffic areas such as hospitals, schools, and offices.

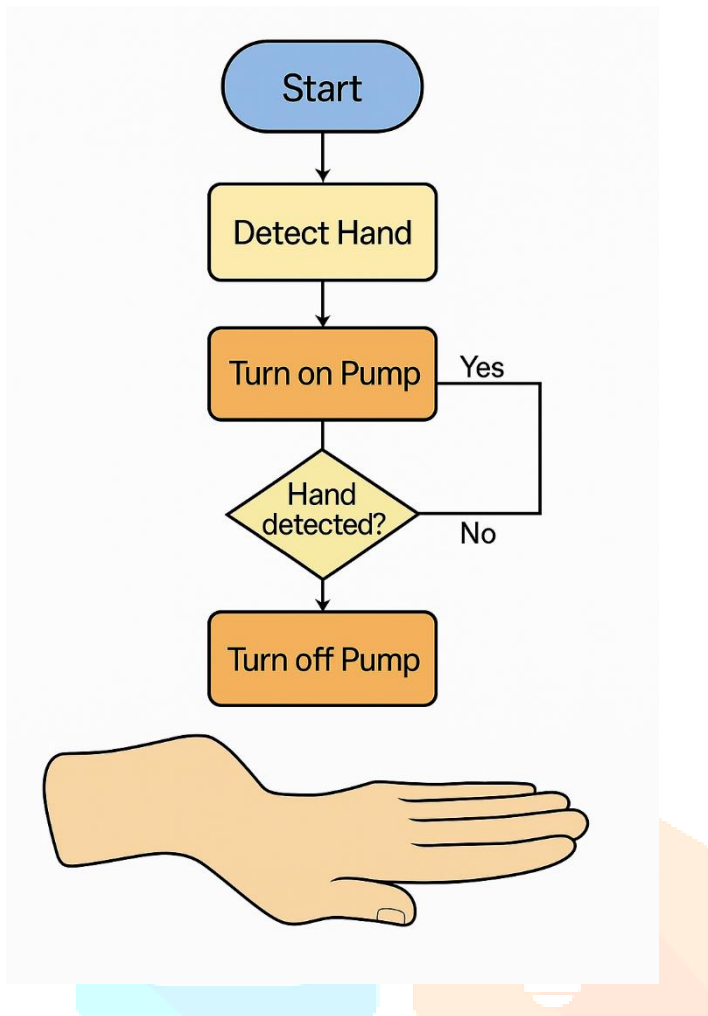
This project offers a scalable and practical solution for improving hygiene standards in everyday environments.

VI FIGURE

Block Diagram of the System



VII FLOWCHART



VIII CONCLUSION

The development of the **Automatic Sanitizer Dispenser** presents a practical and efficient solution to promote hygiene, especially in public and high-traffic areas. This project successfully demonstrates how simple and affordable electronic components—such as an IR sensor, microcontroller, and DC pump—can be integrated to create a **contactless, user-friendly device** that minimizes the risk

of germ transmission.

The system performed effectively during testing, accurately detecting hand presence and dispensing sanitizer in a controlled and timely manner. Its modular design allows for easy maintenance and future upgrades. Moreover, the use of low-power components ensures that the dispenser is energy-efficient and suitable for both indoor and outdoor use with minimal power requirements. Overall, the project fulfills its objective of providing a **low-cost, scalable, and hygienic alternative** to manual dispensers. It holds potential for further enhancement, such as incorporating IoT features for remote monitoring or solar power for energy independence, making it adaptable for a wide range of environments.

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