



Water ATM with a Bottle Dispenser

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Abstract: Intrusions in computing environment are a very common unwanted malicious activity that is going on since the inception of computing resources. There are many numbers of security measures have taken place for the last decades, but as Technology has grown up, so as the security threats. With the whole world depending on computers, being directly or indirectly, it is a very important issue to prevent the malicious activities and threats that can hamper the computing infrastructures. Intrusion Detection System (IDS) is the standard measures to secure computing resources mostly in a network. Our proposed system mainly focused on the accuracy of the detection system. Since in order to detect the attack accurately large number of data set is needed and in order to process that data machine learning techniques are needed. So in our proposed system we used machine learning random forest algorithm for the training of the model and detection of the attacks using our tool.

Keywords: IR Sensor, Arduino, DC Motor, Water Pump.

I. INTRODUCTION

For both the economy and for human existence, water is a crucial resource. Solving and managing the water shortage is currently one of the biggest obstacles. Only 0.08% of the groundwater on Earth is currently being used by humans for a variety of purposes. The need for high-quality water is growing every day as water supplies are being depleted. According to the International Water Management Institute, most of Central and South America, Asia, and all of Africa and the Middle East will either run out of water or be unable to purchase it by 2025. Water was readily accessible in the past and provided for all of the needs of the populace. It was primarily used for meal preparation. Access to clean drinking water is essential, and vending machines have become a common solution for providing bottled water. However, the existing systems often require manual operation or lack automation. Vending machine is fully automated the transactions can be done by the customer without any manual in the intervention or time restrictions. Some vending machines accept cash in the currency forms only while the others accept both the cash and the credit cards for the electronic transactions. If the vending machines have mobility, they can be moved to the new places and they will continue delivering the services as usual. There is no cashier, they give the clients the free choice to at any time of the day, and clients can shop for their intended product on a 24-hour basis, throughout the year. This project addresses these issues by developing a coin-based water bottle dispensing and refilling system using Arduino.

1.1 MOTIVATION

A water ATM with water bottle dispenser is motivated by the need to address critical challenges in water access, environmental sustainability, and convenience. It provides an affordable and hygienic solution for clean drinking water, especially in areas with limited or unreliable centralized water distribution. By offering water at a low cost, it becomes accessible to low-income populations while promoting better health by reducing the reliance on untreated water sources. Environmentally, it encourages the use of reusable bottles to reduce single-use plastic waste and may include recycling mechanisms for old bottles, contributing to waste management. Such systems also align with sustainable water use practices, minimizing wastage. They empower local communities by creating employment opportunities and fostering awareness about water conservation and hygiene. Conveniently located in urban areas, public spaces, and transit hubs, these ATM provide on-the-go hydration, sometimes offering bottles for those without reusable containers. By addressing these diverse needs, Water ATM with Bottle Dispensers contribute significantly to public health, environmental conservation, and societal well-being.

1.2 OBJECTIVES

The main objective of the Water ATM with Bottle Dispenser is to provide convenient and accessible clean drinking water to users, particularly in underserved or remote areas, promoting equitable access to safe and purified water. The system aims to reduce the environmental impact of single-use plastic bottles by encouraging the use of reusable bottles, thus contributing to a significant reduction in plastic waste. Additionally, the Water ATM ensures the water dispensed



is of high quality, meeting health standards and improving public health by preventing waterborne diseases. Another key objective is to foster water conservation by offering a cost-effective and automated solution, eliminating the need for physical water distribution services. The system will also feature a cashless payment option, making it user-friendly and accessible to a broad range of individuals. Furthermore, the project will raise awareness about the importance of sustainable water usage and environmental responsibility. By tracking water usage data, it will also help optimize water supply and improve resource management. Ultimately, the Water ATM with Bottle Dispenser is designed to be scalable, ensuring it can be replicated in other regions, with a focus on sustainability and long-term operational efficiency.

II. METHODOLOGY

Water ATM with a bottle dispenser involves a structured methodology starting with a needs assessment and planning phase, where community engagement and site selection are crucial to understanding local water needs and determining optimal locations for the units. It takes a methodical strategy to design a coin based water dispenser system for an embedded system. The methodology for implementing a water ATM with a bottle dispenser involves several structured steps to ensure its effectiveness and sustainability. It begins with identifying the need for clean drinking water in specific areas and setting clear objectives such as affordability, accessibility, and sustainability. The system design phase includes creating a blueprint for the ATM, selecting appropriate purification technologies (like RO or UV), and planning for energy sources, including renewable options like solar power. The water source is then identified, tested for quality, and equipped with suitable filtration systems to meet health standards. During development, the physical structure, including storage tanks, dispensers, and sensors, is built, while software is developed to provide a user-friendly interface and integrate cashless payment systems. The operational workflow allows users to select water quantities, make payments, and receive purified water, with an option to use or purchase reusable bottles. Sensors monitor water quality, system performance, and maintenance needs. Regular inspections and quality assurance processes ensure consistent functionality, while user education programs promote the benefits of reusable bottles and clean water access. Feedback from users is collected to make improvements and upgrades, ensuring the system remains efficient and user-centric. This comprehensive approach ensures the water ATM with a bottle dispenser meets its goals of providing clean, affordable, and sustainable water access.

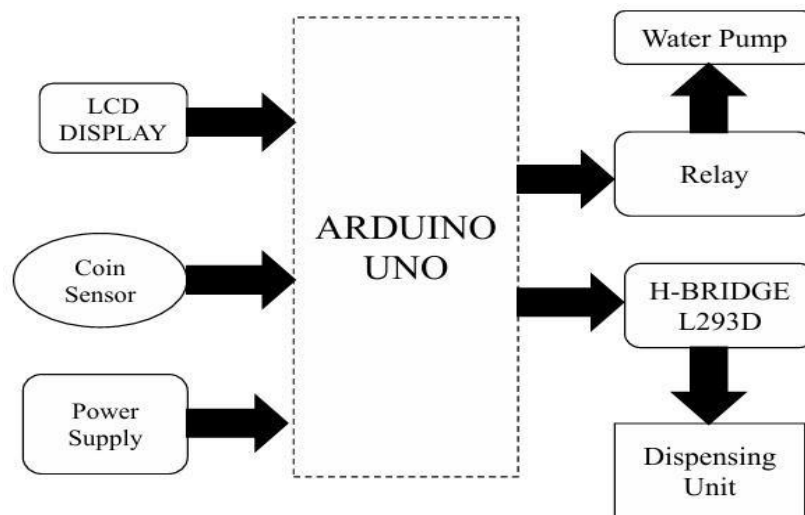


Fig.:1 Block diagram of “Water ATM with Bottle Dispenser”

III. IMPLIMENTATION

The flowchart illustrates the working process of a water ATM with a bottle dispenser controlled by an Arduino system. The process begins by initializing the Arduino and its components. The system waits for coin insertion, which is detected by an IR sensor. Once a coin is detected, the DC motor is activated to dispense an empty bottle. After dispensing the bottle, the system checks if the bottle is correctly placed for refilling. If the bottle is not placed, the system waits until proper placement is detected. Once the bottle is positioned, the water pump is activated to fill the bottle with water. After refilling, the water pump stops, and the process ends. This automated process ensures efficient dispensing and refilling, combining coin-based payment with bottle placement detection to provide a seamless and user-friendly experience. The system also minimizes waste by ensuring proper bottle usage.



The coin-based water bottle dispensing and refilling system operates through a series of coordinated actions initiated by the insertion of a coin. The key components and their interactions are described below:

- **Coin Detection:** The system uses an IR sensor connected to the Arduino to detect the insertion of a coin. When a coin is inserted, the IR sensor sends a signal to the Arduino.
- **Bottle Dispensing:** Upon receiving the signal from the IR sensor, the Arduino activates a DC motor. The motor is responsible for operating the mechanism that dispenses an empty bottle to the user.
- **Water Refilling:** After the bottle is dispensed, the user places it in the designated refilling spot. The Arduino then activates a water pump to fill the bottle with water. The water pump runs for a predefined duration to ensure the bottle is adequately filled.
- **Completion:** Once the bottle is filled, the system resets, ready to serve the next user upon coin insertion.

FLOW CHART

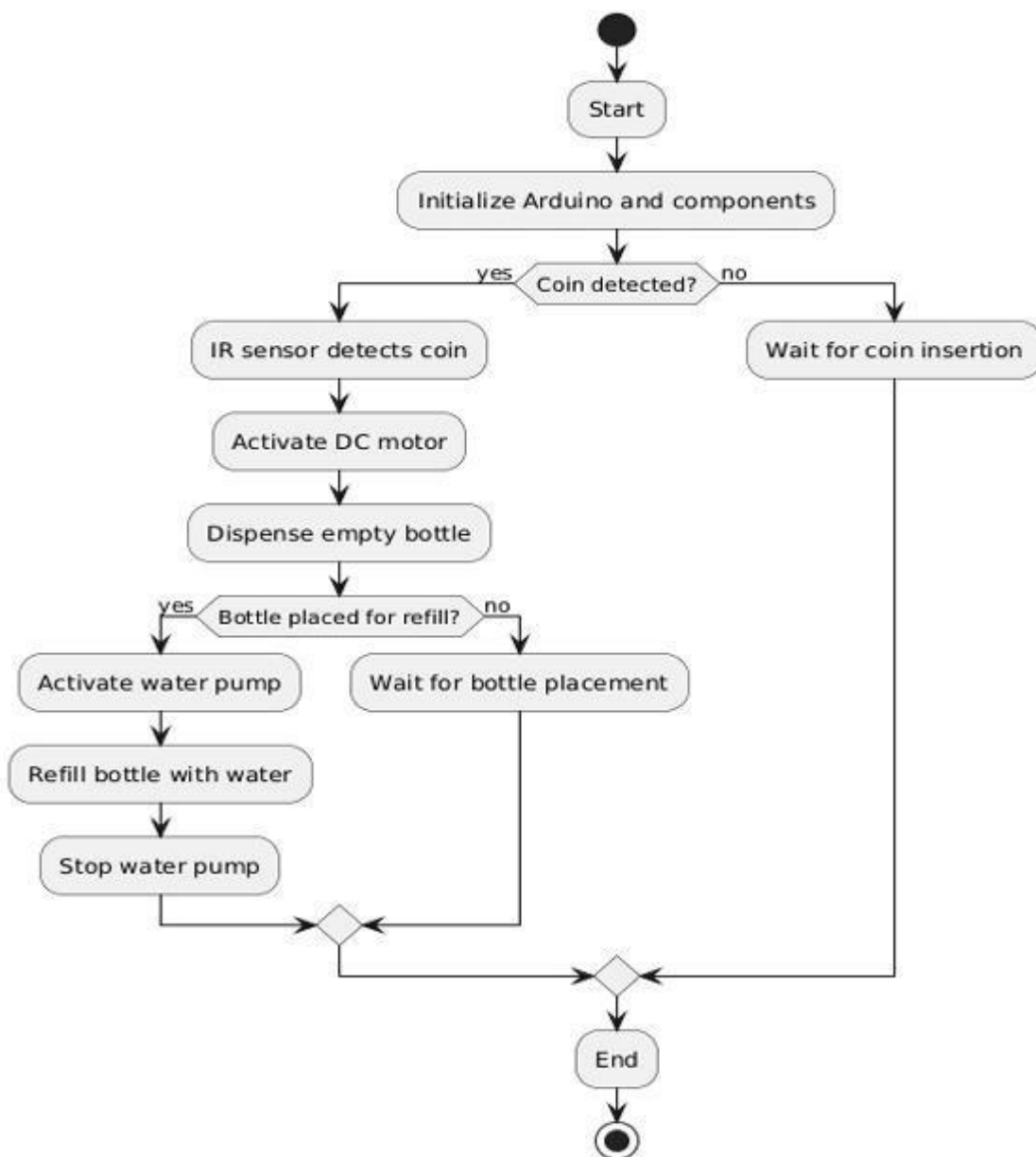


Fig.:2 Flow chart of Water ATM with Bottle Dispenser



IV. RESULT

This project successfully demonstrates the development of a coin-based water bottle dispensing and refilling system using Arduino. The system automates the entire process, making it user-friendly and efficient. It provides a practical solution for public places, ensuring easy access to clean water and promoting the use of reusable bottles. The project highlights the potential of Arduino in automating everyday tasks and addresses both convenience and environmental sustainability.

The below fig 2 shows the model of Water ATM with Bottle Dispenser

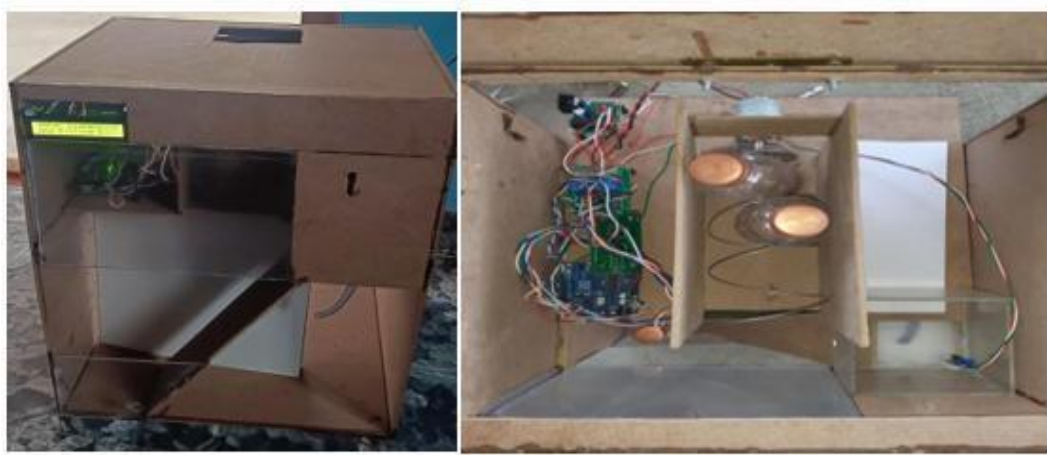


Fig.: 3 WATER ATM WITH BOTTLE DISPENSER

STEP1: The Coin Detection of IR sensor detects the insertion of a coin and sends a signal to the Arduino and the LCD displays corresponding information.



Fig.: 4 WATER ATM Display the Coin Detection

STEP2: Bottle Dispensed upon receiving the signal from the IR sensor, the Arduino activates the DC motor, which dispenses an empty bottle.



Fig.: 5 WATER ATM Displaying Bottle Dispensed

STEP3: Water refilling after dispensing the bottle, the Arduino activates the water pump to fill the bottle with water.

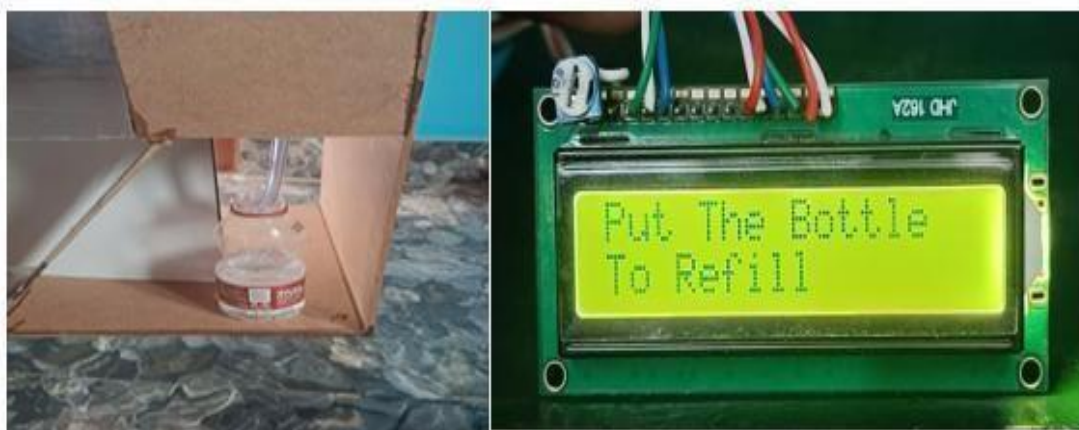


Fig.: 6 WATER ATM Display the Water refilling

User Interaction the system provides indicators (LED or an LCD screen) to inform users about the status of the operation (e.g., "Insert Coin," "Dispensing Bottle," "Refilling Bottle," "Operation Complete").

V. CONCLUSION

The coin-based water bottle dispensing and refilling system using arduino provides an automated and efficient solution for dispensing and refilling water bottles. By leveraging an IR sensor for coin detection, a DC motor for bottle dispensing, and a water pump for bottle refilling, the system ensures user convenience and operational efficiency. This project successfully demonstrates the integration of simple electronic components to achieve a practical and useful application in public and private settings.

A Water ATM with Bottle Dispenser represents a forward-thinking and sustainable approach to addressing critical challenges related to water accessibility and environmental conservation. This innovative system ensures the availability of clean, affordable drinking water, making it particularly beneficial for under served communities in urban and rural areas. By incorporating bottle dispensers, it encourages the use of reusable bottles, significantly reducing the dependency on single-use plastics and contributing to a healthier environment.

Furthermore, the Water ATM with Bottle Dispenser aligns with global sustainability goals, offering a practical solution to pressing issues like water scarcity and environmental degradation. Future enhancements, such as renewable energy integration, advanced filtration technologies, and customizable features like flavored water options, could expand its utility and appeal. Overall, this innovation holds immense potential to drive social, economic, and environmental progress, paving the way for a more sustainable and resource-efficient future.



FUTURESCOPE

1. Sustainable Water Access: It can provide clean, affordable water in urban and rural areas, addressing water scarcity and promoting health.
2. Environmental Benefits: Encourages the use of reusable bottles, reducing single-use plastic waste and promoting eco-friendly practices.
3. Smart Technology Integration: Advanced features like digital payment systems, IoT for monitoring usage, and real-time data analytics can enhance functionality and user experience.
4. Scalability: Suitable for deployment in schools, hospitals, public spaces, and transportation hubs, making it a scalable solution for various sectors.
5. Economic Opportunities: Creates business models for entrepreneurs and employment opportunities in maintenance, operations, and supply chains.
6. Government and NGO Collaboration: Can be integrated into government and non-profit initiatives for water accessibility and sustainability.
7. Customization and Expansion: Future designs could include additional features like UV sterilization, flavoring options, or integration with renewable energy sources for off-grid locations.

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