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VENDING MACHINE FOR SOFT DRINKS AND OTHER APPLICATIONS

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ABSTRACT

Sewage "Vending Machine for Soft Drinks and Other Applications" The "Vending Machine for Soft Drinks and Other Applications" is an innovative, cost-effective project. This project presents the design and development of a smart vending machine capable of dispensing soft drinks and other consumer products. The system integrates hardware components such as microcontrollers, sensors, actuators, and a user-friendly interface with software logic to automate the selection, payment, and delivery process. Users can interact with the machine through a digital display and input system, allowing them to choose from a variety of products. Payment can be made using coins, cards, or mobile payment methods, depending on the configuration. The vending machine is also equipped with inventory tracking and fault detection system to ensure efficient operation and timely restocking. Its modular design makes it adaptable for various applications beyond soft drinks, such as snacks, bottled water, hygiene products, and more. This project aims to enhance convenience, reduce human intervention, and offer scalable solutions for automated retail in diverse environments such as schools, offices, public transport stations.

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1. INTRODUCTION

Embedded systems technology has reached a mature stage, and the sheer volume of available knowledge is astonishing. Yet, many embedded system developers often voice a similar concern—there is a lack of well-rounded, accessible resources online that address the numerous design and implementation challenges associated with this field. This scarcity is partially due to strict intellectual property policies of various companies and also the inclination to limit technical expertise to a small circle of specialists. An embedded computer typically refers to a computing system created for a particular application. Unlike general- purpose desktop computers, which can perform multiple functions such as browsing the web, reading emails, playing music, and word processing, embedded systems are generally intended for a single function or a few closely related operations for which they are programmed. Examples of embedded systems are abundant in modern households. Devices that incorporate digital clocks, for example, usually contain a small embedded microcontroller dedicated solely to time display. Similarly, modern automobiles are equipped with embedded systems that manage components like anti-lock braking systems and ignition timing by processing signals from multiple sensors. In most cases, embedded computers do not come with a standard interface. Even when they are equipped with basic user input and output components like keypads and LCD screens, they typically cannot handle a wid variety of inputs or outputs. A security alarm system, for instance, may have a keypad to enter a passcode and a screen to show status, showcasing minimal but specific I/O capability. An embedded system may be described as a control or computing system engineered to carry out a dedicated task.

Research Paper

2. PROBLEM STATEMENT

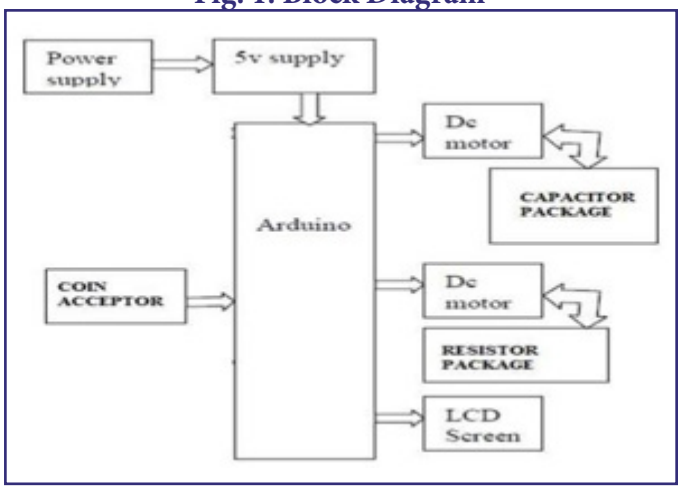
With the increasing demand for automation in public spaces and commercial environments, vending machines have become a common solution for fast and contactless product delivery. However, most existing vending systems are either highly complex and expensive — integrating advanced touchscreens and IoT — or very basic, with limited functionality and no adaptability. This creates a gap in the market for low-cost, semi-automated vending solutions that are both reliable and flexible.

The objective of this project is to design and develop an embedded system-based vending machine that can autonomously handle product selection, accept coin-based payment, and dispense items using motorized mechanisms. The system will also feature a simple user interface, fault detection capability, and modular architecture, making it easy to upgrade in the future.

In many public and semi-urban environments, the existing vending machines are not designed to support real-time feedback, stock monitoring, or remote alerts. Additionally, most machines are tailored for specific product types and lack scalability. Users also face challenges due to limited payment options and unclear status feedback, especially in coin-operated systems. To address these issues, this project proposes the development of a cost-effective, standalone vending machine that includes multi-product support, clear LCD-based communication, and a fault alert mechanism, making it suitable for schools, colleges, offices, and public places.

3. BLOCK DIAGRAM

Fig. 1: Block Diagram



BLOCK DIAGRAM DESCRIPTION

The proposed vending machine system is built around an Arduino Mega microcontroller, which acts as the brain of the system and controls all operations — including product selection, payment validation, and dispensing mechanisms. The working can be described.

4. EXPECTED RESULTS & DISCUSSION

The vending machine system was developed using embedded hardware and software components with the goal of delivering a functional, cost-effective, and modular product dispensing solution. After completing the hardware integration and software programming phases, the prototype was tested for various scenarios to ensure functionality, reliability, and user experience. This chapter discusses the results obtained from the implementation and testing of the system, along with an evaluation of its performance.

- Product Selection:

Users were able to selectproducts using the 4x4 keypad. The system correctly identified input combinations anddisplayed the corresponding product name and price on the LCD screen.

- Payment Verification:

The coin acceptor modulecorrectly detected valid coin denominations and generated corresponding pulse signals.The Arduino accurately counted these pulses, and the total inserted amount was displayedin real-time on the LCD.

- Dispensing Mechanism:

Once full payment was received, the system successfully activated the corresponding servo motor to open the product gate or rotated the stepper motor to align the selected product. The motor movements were smooth and accurate, with consistent item delivery.

5. CONCLUSION

The project titled “Vending Machine for Soft Drinks and Other Applications” was successfully designed, developed, and tested using embedded systems principles and cost-effective hardware components. The system effectively demonstrated the core functionalities of a vending machine — including product selection via keypad, payment validation

through a coin acceptor, dispensing of the selected item using motors, and user guidance through an LCD display and LED/buzzer feedback.

The project aimed to create an affordable and modular solution suitable for small-scale deployments such as schools, offices, and public waiting areas. Using the Arduino Mega as the control unit provided sufficient flexibility and scalability to interface with multiple peripherals while keeping the system reliable and efficient.

The vending machine prototype responded well to real-time inputs, handled various user interactions, and performed its tasks with consistency and accuracy. It also served as a practical example of combining hardware and software to automate a real-world process, showcasing the importance of embedded systems in everyday applications.

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