

Fabrication of Smart Food Product Vending Machine using Arduino

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Abstract

In modern vending machines, heavy items cannot be stacked because the item falls from a higher level into a lower compartment. There are two problems in the current market, one is the Single axis movement which makes it difficult to hold delicately packed food items and the other one is the Collection Bin which at the bottom of the machine makes it difficult for elderly people to bend down and pick the product. The product vending machine which is now been developed eliminates the problem of the product falling from a higher level as this machine has both X and Y axis movements. The delivery bin moves near the item which is selected by the user and delivers it safely. In the near future cashless transaction methods can include Paytm, Debit card/Credit card transactions etc. The display used here is an LCD display and there can be improvements in the future by replacing the LCD display with a touch screen display. Android apps can also be used for the transaction. Voice recognition technology can also prove to be a big breakthrough in the field of vending machines. The machine is designed to provide a more efficient and convenient way of purchasing food items without the need for human intervention. The system utilizes various sensors, such as ultrasonic sensors and load cells, to detect the presence of products inside the machine and the number of products dispensed.

Keywords: Food products, battery, automatic food items, vending machine.

1. Introduction

The Arduino microcontroller is programmed to manage the entire vending machine operation, including product dispensing, coin validation, and change dispensing. The system utilizes various sensors, such as infrared sensors and ultrasonic sensors, to detect the products availability and the number of products available in the machine. The smart vending machine's main advantage is its ability to provide a quick and efficient way of buying a food product. It reduces the need for staff to manage the machine, making it a cost-effective solution for businesses that want to provide quick access to food products without incurring additional costs. Additionally, the vending machines intelligent capabilities ensure that it can track sales and inventory levels and generate reports, making it easier for businesses to manage their inventory and sales data. There is no cashier, they give the clients the free choice to purchase the products at any time of the day, and you can shop for your intended product on a 24-hour basis, throughout the year. An automatic medicine vending machine with self-contained on-site medicines dispensing mechanism and a storage facility for the plurality of medicines that can be dispensed based on the user requirement. Major components of the machine include stepper motors for dispensing the medication, large storage space to store the pills, an inventory monitoring system to keep track of the storage.

2. Construction

Automatic medicine vending machine uses an Arduino board and one LCD display, RFID reader, GSM MOTOR and 2 Motors. The mechanical part has 2 components for storing three different types of food items. The display was coded to show the different types of food items present in it. Whenever user presses the required food item button, the motor rotates and dispenses the food item from it. If food product is not available in machine message is passed through GSM MODEM

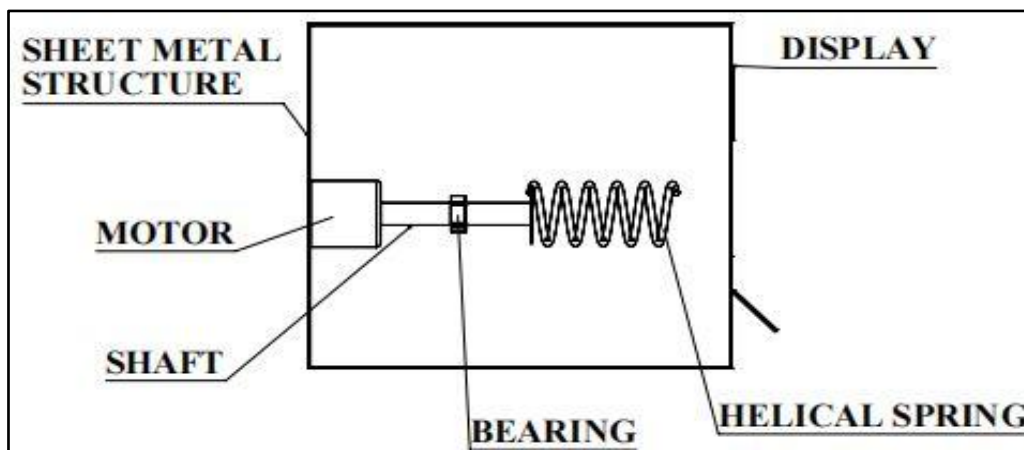


Figure 12D Layout of fabrication model

3. Experimental Setup



Figure 2 Fabricated model of vending machine

The functionalities of the vending machine were tested and will be discussed in this subsection. Before the user activate the system, “Welcome to the vending machine” will be displayed to the user. After the user press “Next” button, the user is requested to scan their card using LCD display as shown in Fig. 7.1. After the user scan the card using RFID card or

RFID tag, LCD Display will display the user ID and card balance as shown in if the user has registered the card. On the other hand, if the user has not registered, an error message “Sorry, your card is not valid” will be displayed and then followed by initializing the system.

3.1 DC Motor



Figure 3DC Motor

Constructional a dc generator and a dc motor are identical. The same dc machine can be used as a generator or as a motor. When a generator is in operation, it is driven mechanically and develops a voltage. The voltage is capable of sending current through the load resistance. While motor action a torque is developed.

3.2 Specification

- DC Motor capacity : 12V
- Un loading : 130rpm
- Loading : 90rpm

3.3 Relays



Figure 4. Relays

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example, a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

3.4 Arduino



Figure 5. Arduino

The Atmega328 microcontroller on the Arduino board can be used to monitor the temperature of an electric bike battery. It can interface with temperature sensors and process the data to provide real-time temperature readings of the battery. Accurate temperature readings: The Atmega328 microcontroller can accurately measure the temperature of the electric bike battery using temperature sensors. This ensures that the temperature readings are reliable and precise. Efficient battery monitoring: The microcontroller can continuously monitor the temperature of the battery, ensuring that it does not overheat. Real-time monitoring: The microcontroller can provide real-time temperature readings of the battery, allowing the rider to monitor the battery temperature and take necessary actions to prevent overheating. User-friendly: The Arduino board is user-friendly and can be easily programmed to interface with temperature sensors and display the temperature readings on a screen. This makes it easy for the rider to interpret the data and take necessary actions.

3.5 Flow Chart

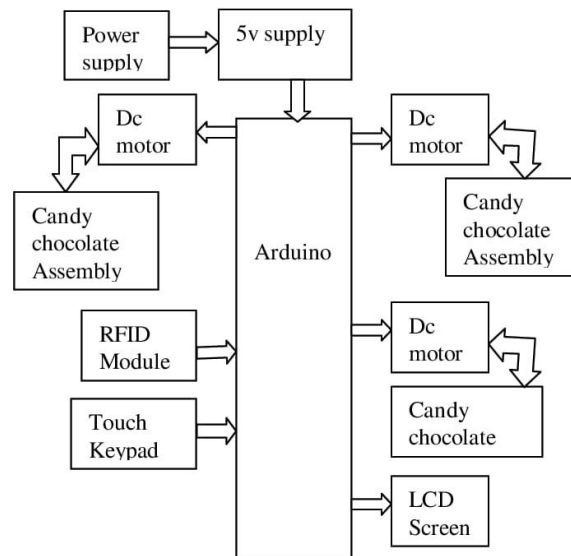


Figure 6. Flow chart

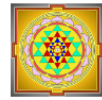
4. Working Principle

A smart food product vending machine using Arduino typically works on the following principle:

1. User Selection: The user selects the desired food item from the menu displayed on the vending machine's screen.
2. Payment: The user then pays for the item, usually through cash or a card. The vending machine's payment system verifies the payment.
3. Dispensing: The vending machine uses a motor to dispense the selected food item from the respective compartment.
4. Updating Inventory: After the item is dispensed, the vending machine updates its inventory to reflect the transaction and deducts the item's quantity from the inventory.

5. Hazards

The smart vending machines are expensive which requires higher initial investments. Moreover, it requires higher operational expenses and maintenance cost. It requires skilled staff to repair the smart vending machines. If your machine offers jamming problems every now and then, then temperature is the culprit for sure. You need to check if slots are empty or not. Machine will return the coins if items are not there to vend or there is a jam in there. If there are items in there, but coins are being returned you need to clear the jam. If the users do not have enough cash in hand to buy their desired medicine, then the vending machine fails to satisfy the users need and provides a bad experience. When a machine is unable to identify the product that customer wants, it fails to dispense it. This becomes challenging for operators to operate effectively. A vending machine requires proper care. A bit of advertising can help increase traffic to your vending machine. First, use eye-catching signs to make sure your location is very visible from the closest main road or thoroughfare. The average service life of vending machines is about 10 years, and a major cause of their disposal is the failure of



their refrigeration or heating units. Use Promotions to Increase Overall Machine Profits. Make Your Vending Machine Grab Attention. Convince People to Make a Purchase. Stock Vending Machine Shelves for Optimum Sales. Additional Tips for Increased Vending Profits.

6. Conclusion

A smart food product vending machine using Arduino is a highly efficient and provide convenient way to offer food and beverage options to the users. The Arduino microcontroller allows for real-time monitoring of inventory levels, which can reduce waste and optimize stocking levels. Additionally, the vending machine can be easily customized to offer variety of food and beverage options and payment methods, making it a versatile solution for various settings, such as offices, schools, hospitals, airports, and retail stores. Overall, a smart food product vending machine using Arduino offers a cost-effective and efficient solution for providing users with access to a range of food and beverage options while providing real-time inventory updates and alerts to the owners or operators.

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