

Smart Medical Vending Machine Technology

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Abstract

Medicines are a very important aspect for the overall well-being of a person. They are essential in maintaining health, preventing illness, managing chronic conditions and curing disease. But the existing social status have caused a lot of health inequalities. This project helps in providing medicines for common health issues as well as for first aid. It displays the medicines present so that the user can select the medicines according to their requirement. The major advantage of this vending machine is that it can be implemented in public places such as Malls, National Highways, Railway Stations, Bus Stand and many other places providing access any time 24/7. The proposed system will be beneficial in saving life in rural areas, remote areas where medical stores remain unavailable in cases of emergency. This venture comprises of a processor which controls the other sub frameworks such as RFID, GSM, pharmaceutical allocator, and stock control.

Keywords: Medicines, medical dispenser, automatic medicines, vending machine.

1. Introduction

Vending machines have been used to serve the wide clientele with the variety of products handling from green grocery to processed products; the typical example is the snack vending machine that can be used for buying and selling of different kinds of snacks. If the 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 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. 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. Arduino is an open-source electronics platform accompanied with a hardware and software to design, develop and test complex electronics prototypes and products. The hardware consists of a microcontroller with other electronic components which can be programmed using the software to do almost any task. The simplicity of the Arduino language makes it very easy for almost everyone who has an interest in electronics to write programs without the understanding of complex algorithms or codes. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling, they have a much lower coefficient of friction than if two flat surfaces were sliding. If a shaft is supported by two bearings, and the center-lines of rotation of these bearings are not the same, then large forces are exerted on the bearing that may destroy it. Some very small amount of misalignment is acceptable, and how much depends on type of bearing. For bearings that are specifically made to be 'self-aligning', acceptable misalignment is between 1.5 and 3 degrees of arc. Bearings that are not designed to be self-aligning can accept misalignment of only 2–10 minutes of arc. Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.

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 medicine. The display was coded to show the different types of tablets present in it. Whenever user presses the required tablet button, the motor rotates and dispenses the medicine from it. If medicine is not available in machine message is passed through GSM MODEM.

3. Design Setup

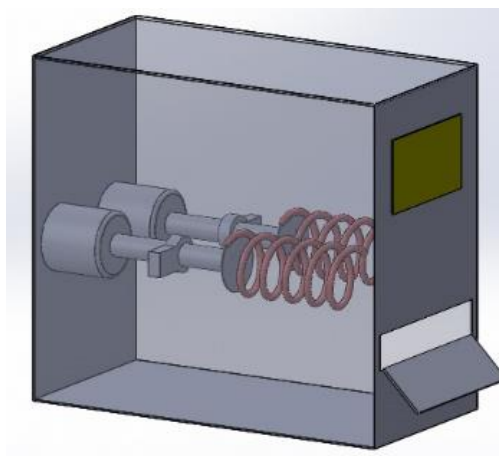


Figure 1 Isometric model of smart medical vending machine

4. Experimental Setup



Figure 2 Fabricated model of smart medical 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 3. 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.

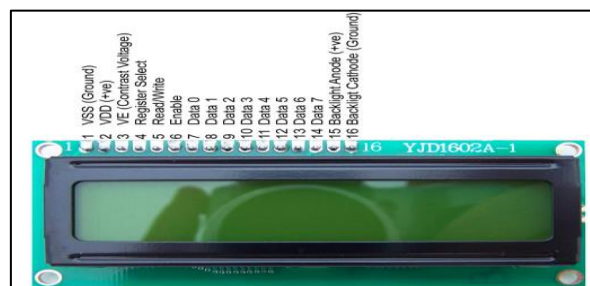


Figure 3 LED display

4.1 LED Display

LED displays are widely used in outdoor and indoor advertising due to their high brightness and long lifespan. They can display bright and colourful images and videos, making them a popular choice for large-scale digital billboards, stadium screens, and retail signage. As the cabinet is made of aluminum, it is lighter with higher precision, ensuring the disassembly to be convenient and quick. Technicians can splice cabinets within a few minutes, thereby greatly shortening the time for installation and disassembly and saving the labour cost.

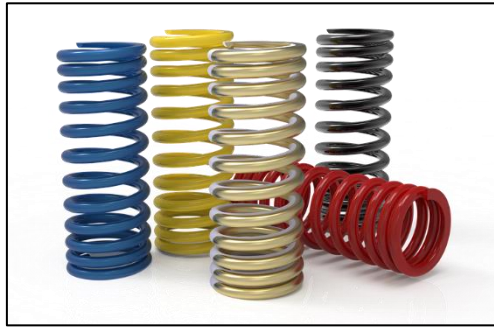


Figure 4 Helical spring

4.2 Helical Spring

A helical spring is a type of mechanical spring that is made by winding a wire around a cylinder or cone-shaped form. The wire is typically made of steel or other materials with high tensile strength and is wound in a tight coil. Helical springs are commonly used in a wide range of applications, including. Helical springs are used in automotive applications, such as suspension systems, shock absorbers, and brakes. They provide a stable and consistent ride quality and help to absorb shocks and vibrations. Helical springs are used in medical equipment, such as surgical tools and implants. They can be designed to be biocompatible and offer precise control over force and displacement

4.3 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.

5. Working Principle

This experimental set-up operates according to Michael Faraday's "Electromagnetic Induction" theory. According to the rule, an electromotive force can be produced by both a conductor travelling through a magnetic field and a change in the magnetic flux inside a magnetic field. A conductor either moves continuously in a stationary magnetic field or is placed in a moving magnetic field (when using an AC power source). As a result, the voltage in the circuit is measured when a bar magnet passes over the device. This has the benefit that magnetic fields can now be used to generate electrical energy in a circuit instead of merely using batteries. The electromagnetic induction concept underlies the operation of equipment including generators, transformers, and motors.

6. Future Scope

There are different types of medicines in a machine. The machine accepts money through the RFID tag and will not accept any other type of money. Once the tag has been detected, the machine automatically dispenses the right medicine. The automatic medicine vending Machine will cater to the needs of the customers with no further human intervention required. In future, doctor's prescription is read by using scanner technology after that data's are analyzed in the server doctor's ID verified and the Medicines were released this makes the unwanted medical issues. Now a days online payments play a vital role in money transaction in future after selecting the quantity of Medicines and QR Code is shown after paying the amount through the online mode Medicines and the Medical products released.

7. 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.

8. Conclusions

Any Time Medicine Vending Machine has been executed on Arduino. This system can fetch out the medicines without any human intervention. The main intent of this project is to make medicine accessible to all people irrespective of their locations. The user need to manually input the time of the day in which the medicine is being prescribed. the functionalities of the medical vending machine is tested multiple times and it finally validated. The limitations and future development of the system is also discussed. The prototype of Medical Supplies Vending Machine is successfully developed. For the aspect of economic, this system could save buyer time to purchase desired medicines and also save the cost of manpower of the owner to open 24/7. The owner also does not need to keep checking the availability of the medicines in the vending machine as he will be notified if there is any medicines currently out of stock. This can save the fuel cost and travelling time of the owner.

References

1. A Brolin, R Mithun, V Gokulnath and M Harivishanth (2018). 'Design of automated medicine vending machine using mechatronics techniques'.
2. Abhijeet Bhande, Aniket Tambe, Falguni Nimkar, Mr. Prabhu Reddy (2020). 'Automatic medicine vending machine'.
3. Balajee R M, Hitesh Mohapatra Deepak V Vijendra Babu D (2021). 'Requirements Identification on Automated Medical Care with Appropriate Machine Learning Techniques'.
4. Ch. Ravi P Sai Kiran V Ganesh Kumar (2018). 'The design and construction of a multi-drink vending machine'.
5. Chuanmei Hu Caixia Chen Lewis (2007). 'Automatic dispenser and method of administering medical pills, United States Patent'.
6. Dr S Sasipriya, Dr P. Mayil Vel Kumar, S. Shen bagadevi (2020). 'Face Recognition Based New Generation Atm System'.
7. G Adithya Varaprasad Reddy, A Suman Kumar Reddy (2021). 'Automatic Medicine Vending Machine'.
8. Huiling Xia, Chunzhi Wang, Lingyu Yan, Xinhua Dong, Yichao Wang (2019). 'Machine Learning Based Medicine Distribution System'.
9. Monika V N, Hema K M, Sonisha M, Savitha M M, (2015). 'An Based Intelligent Medicine Box Using Vending Machine Medical ATM'.
10. Mr M Ashok Kumar, S Soundar, Shrikant Bhange, Kaveri Niphade (2015). 'Automatic Medicine Vending Machin'.
11. Mrs T B Rajitha, Himanshu Pandey Mohammed Abdul Kader, Mohammad Nayin Uddi (2018). 'Design and Implementation of an Automated Reminder Medicine Box FOR Old People and Hospital'.
12. Nazerke Kulmukhanova, Amanzhol Daribay, Vishal Tank, (2017). 'Medicine Dispensing Machine Using Arduino Controller'.
13. Nilani Ratnasri, Tharaga Sharmilan, Sonam V. Manju, Abeera V.P (2015). 'A Secure Health for Patient Monitoring with Intelligent Medicine Box'.
14. P Dudzik, M Schoettner, M. Sangeetha, T.V. Janardhan Rao (2017). 'Automatic Medicine Vending System'.
15. Peck Huey, Eric Rudolphe, Sai Hong Chan (2017), 'Any time medical assistance and medicine vending machine using machine learning'.
16. Siva Sangavi, R Shwetha Reddy, Shashank Shinde, Tejas Kadaskar (2012). 'A Smart Pill Box with Remind and Consumption using IOT'.
17. Sivasubramaniyan, S Deepthi, Khalil Karam, Roy Abi Zeid Daou (2016). 'Design of a Safe and Smart Medicine Box'.
18. T B Rajitha, Himanshu Pandey, DeClaris (2009). 'A working example of healthcare interoperability: From dirt path to Implications, Engineering Management'.