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Design of Automated Medicine Vending Machine using Mechatronics Techniques

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Abstract: *Medical facilities available in metropolitan cities and towns are much reachable by the people compared to the people in the rural areas and villages. Getting medicines from the medical stores is a time taking process and medical stores may or may not available all the time. So, this can be considered as the manual process. Automatic pill dispenser is the technique which can reduce the wastage of time. Due to insufficient transport facilities in many places people are not easily approachable to the hospitals. Senior citizens and physically challenged person find difficult to travel and also feel exhausted to wait in the queue for a long time to consult a doctor..*

Keywords: Medicine, Wending Machine, Automation, RFID Scanning, Embedded System

I. INTRODUCTION

24/7 General medicine vending machine, is a device that can send out medicines. Device can fetch out the medicines automatically for the basic common symptoms find the medicines provided by the machine are only for the timely relief and in emergency case, the person has to get professional medical assistance. People at rural places cannot get access to medicines that are providing to them freely by the government. The aim of this project is that people would be able to access the medicines via patient kiosks in public places such as pharmacies, malls, bus / railway stations, on highways, areas where medical stores are limited. Regular replenishment can help in knowing the requirements in the region but also ensure availability of medicines 24x7. This device is aimed to be helpful for the illiterate and underprivileged sectors of India.

Medicine plays an important role in human's life for every situation. An automated medical system is introduced to reduce the man power time and energy. It is similar to an ATM through which we get the required money at any time & any place. The same system is followed for the pharmaceuticals also. Medicines for B.P, diabetics, cold, fever, headache, and first aid medicines like bandage, cotton, ointments, and other routinely used tablets can be obtained. When RFID card is inserted, the details of the particular user are read by the RFID reader and displayed. After the identification of the valid person, list of medicines will be displayed on the TFT display, then user selects the required medicines by entering the corresponding number of selected medicines by using the keypad . After entering the required list, the amount will be calculated according to the medicine and their quantity. The amount will be deducted from the RFID card and immediately the transaction details will be sent through GSM to the user. After payment deduction the selected medicine are delivered automatically from the system. For this delivery system the pic controller uses a slider arrangement with the help of servo motors which provide rotational mechanism

Problem statement

Medical facilities available in metropolitan cities and towns are much reachable by the people compared to the people in the rural areas and villages. Due to insufficient transport facilities in many places people are not easily approachable to the hospitals. Senior citizens and physically challenged person find difficult to travel and also feel exhausted to wait in the queue for a long time to consult a doctor.

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Proposed System

The project aims to build an PIC based medicine dispenser that dispenses medicine according to the doctor‘s prescriptions. The dispenser is comprised of both hardware, software. The system will be reliable in the sense that it will dispense the correct medicine. The Automatic Drug Dispenser is a sophisticated design that helps people with taking their medication directly from the machine without any human interventions. People can get medicines directly from that machine. Major advantage is that people would be able to access the drugs via patient kiosks in public places such as drug stores, malls, bus, railway stations, on highways, areas where medical stores are limited to overcome this issues we created Automated drug dispensary machine in which Initially the user will give their input as per their need and after their required input he/she will be directed to the payment option, once the payment is done the medicine dispensed from that machine.

II. LITERATURE SURVEY

In “ZhardEM This paper highlights the importance of medicine in all aspects of human life and discusses the benefits of implementing an automated medical system, which operates similarly to an ATM and is suitable for dispensing various medications and first-aid supplies. Users can access the system by inserting an RFID card, which displays their details, and then select and pay for the medications they need before receiving them.[1]

Sarika Oundhakar shared information about the machinery and technology used in vending machines found worldwide, which reduces the need for human intervention and increases efficiency. The machines are able to dispense medicines based on user requirements, making it convenient for people to access medication without waiting in long lines. Additionally, we gained knowledge about how different instruments within the machines operate.[2]

A prototype called "All Time Medicine and Health Device" was created to provide medication and healthcare to those in need. It is a vending machine that dispenses doctor- recommended drugs to anyone who requests them. The vending machine is powered by a Raspberry Pi, a small computer. The system includes a physical vending machine and an online interface that allows doctors to send prescriptions electronically and store patient information. Users must authenticate themselves before receiving medication by entering their user credentials. The system has both an Android app and a website interface for users to access their details.[3]

The author suggests developing a medical vending machine with a touchscreen interface for remote areas. This machine would provide basic medications based on symptoms and also offer information about nearby hospitals, doctors, and ambulances. The design and implementation of the machine would involve using IR touch technology and a cost-effective motor for dispensing medications. The software used would be similar to Visual Basic and would be programmed to cater to

patients' specific needs. The vending machine would also include features for ambulance and first aid services.[4] The author suggests creating a touchscreen medical vending machine that provides basic drugs based on symptoms in remote locations. The vending machine would offer popular prescription drugs without the need for a pharmacist, allowing users to select and purchase medication with coins. The goal is to provide convenient access to prescription drugs, particularly in situations where a pharmacy is not readily available. Health Care Vending machines are efficient, cost-effective, and promote health and wellness.[5]

In this paper, To solve the problem of long pharmacy lines in hospitals, we are implementing an automated system for dispensing medication. Patients receive an RFID card before seeing a doctor, which is scanned by the doctor to input the prescribed medicine count into a web app. This information is stored in a database and accessed by the patient when they scan their RFID card at the automated medicine vending machine in the pharmacy. This eliminates the need for waiting in line and reduces the risk of human error..[6]

This project aims to enhance vending machines by integrating smart technology, specifically through the use of the internet of things. The paper details the development and utilization of a secure cashless payment system in vending machines using IoT technology. The proposed method involves storing information in a server database, allowing users to access the vending machine through a screen or a web page to make purchases. The machine dispenses items using DC motors and a springbased mechanical structure, with the process being facilitated by wireless communication. Data storage and access can be achieved through Wi-Fi or an internet connection.[7]].

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III. METHOD OF DISEASE DETECTION

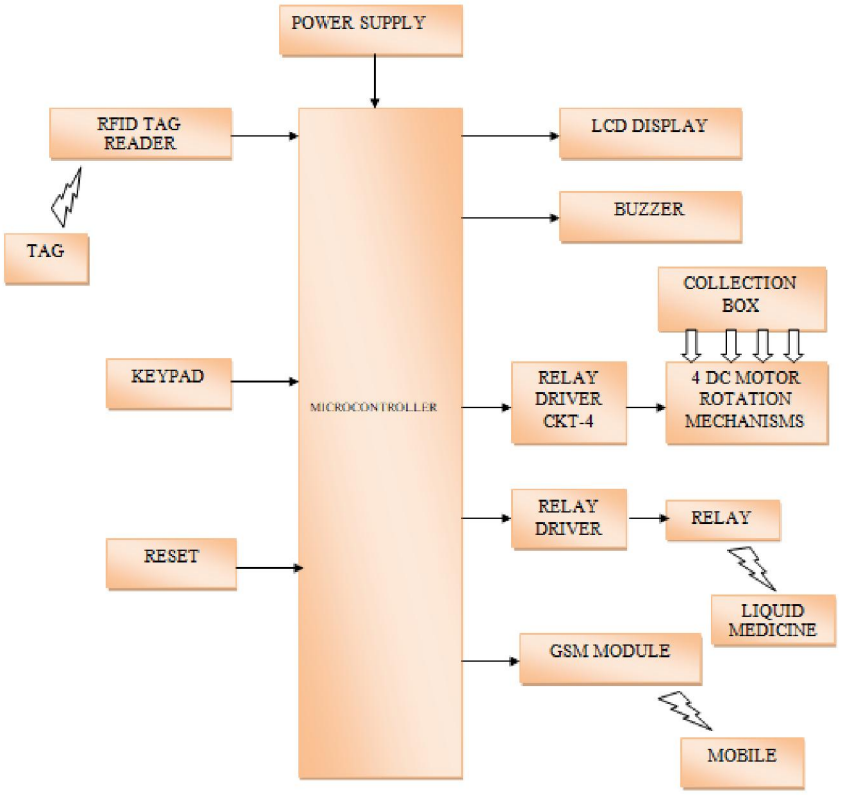

Fig. 1. Block Diagram

The Microcontroller, with the help of the motor drivers, drives the concerned medicine cabinet having the medicine that the user needs. These motor drivers control the rotation of the motor that dispenses medicines from the medicine cabinet. The motor rotates the disk attached to it, which has a cavity. This cavity when coincides with the cavity of the medicine cabinet, the medicine falls and arrives at the outlet. Thus the medicine dispensing function is fully controlled by the motor drivers. The user can then pick up the medicine from the outlet. This is a fully automatic process as no manual support is needed.

Medicines form an integral part of this project as they are the main product, which are to be dispensed according to the user's input. Only medicines that can be consumed without prescriptions can be used by the machine as anything else would be illegal as it would require a genuine license of a medical practitioner. These medicines are those which can be consumed on appearance of symptoms without consulting a doctor. However, they do not cure if the illness is of a more serious nature. Examples include common cold, indigestion, vitamin tablets for deficiency, stomach upsets, cough etc.

PIC18f4520Microcontroller

PIC18f4520 is a 40 PIN Micro-controller from Microchip with 13 channel 10 bit Analog to Digital Converter.

Special PIC18f4520 Micro controller Features

Power- Up to 10 MIPS Performance at 3V

C compiler optimized RISC architecture

8x8 Single Cycle Hardware Multiply System

Internal oscillator support-31 kHz to 8MHz with 4xPLL

Fail-Safe Clock Monitor- allows safe shutdown if clock fails

Watchdog Timer with separate RC oscillator

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Wide operating Voltage range; 2.0V to 5.5V
nanoWatt Power Managed Modes

Fig. 3. PIC 18F4520

RFID Tag Reader

It is used to read unique ID from RFID tags. Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC. RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position. Basically, RFID systems categorized as active and passive based on how they are powered and their range.

When RFID tag comes in range of signal transmitted by the reader, transponder in the tag is hit by this signal. A tag draws power from the electromagnetic field created by reader. Then, the transponder converts that radio signal into the usable power. After getting power, transponder sends all the information it has stored in it, such as unique ID to the RFID reader in the form of RF signal. Then, RFID reader puts this unique ID data in the form of byte on serial Tx (transmit) pin. This data can be used or accessed by PC or microcontroller serially using UART communication.

Fig. 4 RFID tag Reader

DC Gear Motor

A 30 RPM – 12V Centre Shaft DC Geared Motors are generally a simple DC motor with a gearbox attached to it. This can be used in all-terrain robots and variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

30 RPM 12V DC geared motors widely used for robotics applications. Very easy to use and available in standard size. Also, you don't have to spend a lot of money to control motors with an Arduino or compatible board. The most popular L298N H-bridge module with onboard voltage regulator motor driver can be used with this motor that has a voltage of between 5 and 35V DC or you can choose the most precise motor diver module from the wide range available in our Motor divers category as per your specific requirements.

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Fig. 5. Voltage Sensor

LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

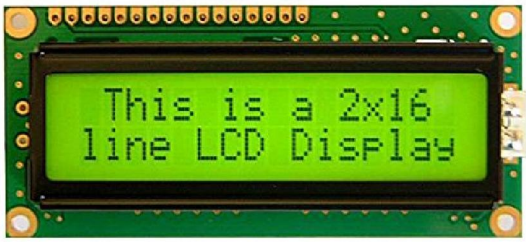

Fig. 6. LCD Display

IV. CONCLUSION

We conclude that automatic medicine vending machines are technically viable for individuals. It is based on the PIC controller and offers service. It ensures consistent access to medicines, including in rural locations. It's incredibly useful. These machines can enhance patient convenience, promote drug adherence, and minimize the burden for pharmacists and health care providers. Automated medical vending machine are widely used in hostels, railway terminals, airports, and rural locations. Implementing this approach eliminates the need for 24-hour availability and access time. The 24/7 General Medicine Vending Machine offers a flexible and simple solution for extending basic healthcare to all places, at a very moderate cost. The machine will dispense prescribed medicine

V. APPLICATION

1. The concept is very much useful in day to day life for common people.
2. This can be implemented everywhere such as shopping malls.
3. It can be implemented on National Highways.
4. It can be installed in Railway stations
5. This medicine vending machine is mostly used in healthcare field.
6. In providing the medical facility at the doorstep to the required one.
7. It will be useful in providing medical facilities in busy areas such as Railway Stations, Airports, markets etc.
8. Provide facilities to people during their journey as this can be installed in the aircrafts, rails and ships.
9. This system can be used by the defence organization such as military, air force etc.

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10. It will help rural India to get better medical facilities at much lower costs.

VI. FUTURE SCOPE

Our project is eco-friendly and does not causes any pollution and it is a new invention many practices are being carried out to make it uses for many fields The following new features may be added to improve performance of the Automated medicine dispensing machine:

- Implementation of system using NFC card: Currently we are implementing the system camera and we could use NFC card instead.
- Delivery of OTC medicine and first aid along with prescribed medication.
- In current system only prescribed medicines are dispensed but in future user can dispense medicine which does not require prescription like medicines that relieve aches, pains, and itches and first aid.
- The pillbox will accept coin payment. Currently, the payment is being carried out using smart card and those who don't have it can't purchase medicine from the pillbox. But in future cash accepting module will be implemented which will use to concept of image processing from the reorganization of the coin.

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This is to acknowledgement of the intensive drive and technical competence of many individuals who have contributed to the success of my project. It gives us great pleasure in presenting the paper on "Design of automated medicine vending machine using mechatronics techniques". We would like to take this opportunity to thank our guide, Prof. Sahane S.T., Professor, Department of Electronics and Telecommunication Engineering, Amrutnahini Polytechnic, Sangamner, for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful.

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