Any Time Medicine (ATM) Vending Machine for Medicine Self-Dispensing

Y. G. Usha[1*], Shruti C. Tiganibidari[2], M. V. Sai Mangala[3], T. B. Rekha[4], M. N. Ravi Shankara[5]

[1,2,3,4]*Student, Department of Electronics and Communication Engineering, Sapthagiri College of Engineering, Bangalore, India*

[5]*Associate Professor, Department of Electronics and Communication Engineering, Sapthagiri College of Engineering, Bangalore, India*

*Corresponding author: ushayg3198@gmail.com

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: **Arduino Mega2560, RFID, LCD, Keypad, Database, GSM.**

1. Introduction

With the ever-increasing population in developing countries like India many people are unable to get the required medicines which could be due to various reasons. This results in poor health conditions which might even cause deaths. Also, people are prone to get medication errors which involves the usage of wrong medicines for a particular disease and the administration. The rising statistics have motivated many researches in developing systems which can reduces these errors. Hence it becomes very crucial to design and develop a system that can be useful in providing medicines as and when required at a considerable price.

At present with the growing technology people usually prefer the appliances which are automatic and hence quick. A medicine vending machine as the name itself suggests is a vending machine which dispenses the medicines according to the user's choice. By having an over-the-counter vending machine in the workplace, work sites without clinics or pharmacies can be benefited from increased work efficiency and avoid under performance of the employees. People can have access to medicines during off hours. In this project the system provides provisions for general medicines, prescribed medicines and first aid. The system is designed taking into consideration the drugs and medicines which are banned. The user can then go with other alternatives. This is one of the greatest advantages. Hence there is no doubt that this system can improve patient's safety. The proposed system is controlled fully by Arduino Mega 2560. The users are provided with national health care card. For the efficient usage of the system, the user has to use a unique identification that can prevent any skepticism among the patients as to what medicines have to be taken from the device. Once the input is taken, the system will check if the required medicine is available or not. If it does, system will check user's balance and medicines are dispensed or else a message is displayed reminding the user to recharge the card.

2. Literature Survey

The paper [1] design an automatic medicine vending machine using PIC microcontroller interface with GSM, LCD Display, Keypad, NFC Tag, Dispenser box. This system providing medicines at all time and helpful to the rural areas and this system is fully managed by the PIC microcontroller so it does not require human intervention but the drawback is it provides only generic medicine and does not provide any prescribed medicine.

The paper [2] design an automated reminder medicine box using microcontroller Atmega 328P interface with SD card shield, RTC, LCD Display, LED, Speaker. This device can remind the aged patient to take the proper medicines on right time and also informs the patient to take medicine before or after meal through a LCD and speaker but this method would help only a single patient.

The paper [3] design a medicine dispensing machine using Raspberry Pi and Arduino controller. This machine allows the user to select the required medicine and should pay the required amount, after the system verifies the amount received then it dispenses the medicine and ensure availability of drugs 24/7, but the drawback of this system does not have any user authentication process so any one can use this system, so this might be privacy and security issue.

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The paper [4] design an intelligent medicine box using IoT and this system is designed to provide tablets for a patient in-time and also reads the human heart rate by using the sensor and also designed to make alarm when the patient take wrong medicine, so this system acts like a medication reminder but this system is not portable and network disruption issues so cannot monitored from anywhere and this system is only use for a single patient.

The paper [5] design an Autonomous pill dispenser using Arduino wemos interface with LCD display, RTC, Buzzer, motor driver. This system is designed to alert the patient to take the tablet on-right-time by using the alarm and mobile notification and pill dispensing also automated, but cannot place this system in the public places and only a single patient can use this system.

3. Methodologies

The objectives of this proposed system are as follows:
1. To get registered user authenticated.
2. To provide user input via keypad.
3. To dispense medicines entirely regulated by the motor drivers of the system.
4. To update the database and balance after the medicine is dispensed. To send system notification to refill it, when the medicine is almost over.

Methodology for objective-1:
- The user must first register in a particular authorized center.
- RFID tag and password will then be given to the user.
- To access the system the user must carry out the identification process.
- User must first swipe the card during transaction to activate the machine.
- RFID tag is scanned and categorized by means of Unique Identification Number (UNI) by RFID reader and it is not necessary that the RFID tag should be in the line of sight to a reader.
- The RFID reads the user id and enable the service to the particular user, if the identity does not match it will display the appropriate error message.
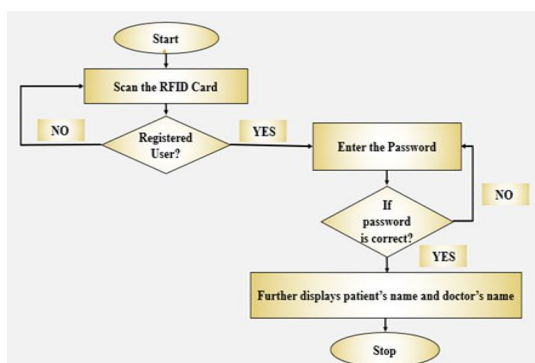

Fig. 1. Flow chart for objective 1

Methodology for objective-2:
- The further phase is enabled after the RFID authentication is completed.
- The user must choose the medication that is required to him/her in the next phase.
- This machine has an LCD screen of 20×4 characters that serves as a monitor to show the user input and output operations.
- Upon authentication, it displays the lists of medicines that include Prescribed, General and First Aid medicines and asks the user what sort of medicine he/she needs.
- The machine has a 4×4 matrix keypad for the user input.
- At that point, the individual should enter the amount of medicine required.
- Once the person makes a choice and quantity of medicine, he/she wants, the motor gets enabled to the stack where the medicine is stored.
- And if the amount of medication entered is greater than the amount available in the system, then the error message will be shown and then GSM will send the message to stock control to replace the medication.
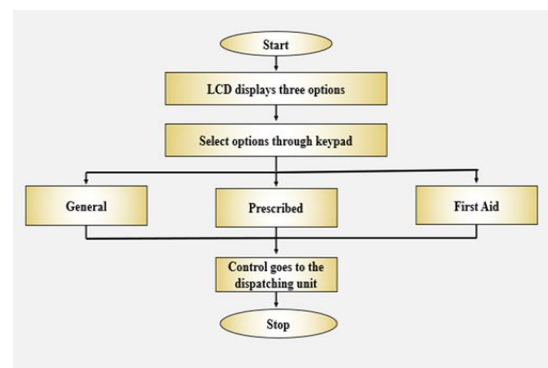

Fig. 2. Flow chart for objective 2

Methodology for objective-3:
- Medicine dispenser consists of a series of springs in which all the medicines are stored.
- It has a number of stacks in which the medicine strips are kept and the spring rotates with the help of DC motors.
- The rotation mechanism is required to move the medicine forward.
- The interfacing of the motors with the machine is to provide the mechanism for rotation to get out the medicines required.
- The computer then asks the patient if he/she wants to dispense more medication strip.
- When the user chooses to get more medicines, the

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machine can dispense the strip again.
- But if the consumer cancels it, the device resets and the lists of medicines appear in the LCD window once more.
- Medicine dispenser dispenses the prescribed medicines and the quantity of medicine as per user's instructions.
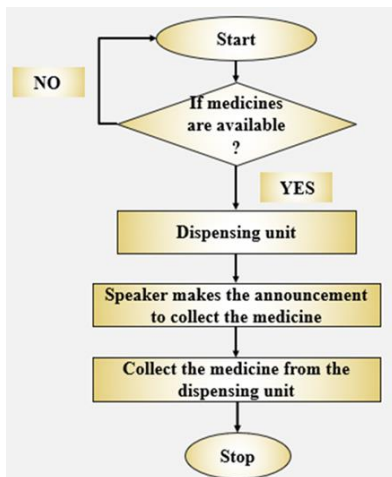

Fig. 3. Flow chart for objective 3

Fig. 4. Assembly of motor

Methodology for objective 4:
- Database will be revised after the drugs are given out.
- The database will be updated with the current value in stock and the number of pills that will be dispensed.
- Database of user will be modified with current balance.
- As the count of the items in stock reaches below the present threshold value, that value is read by the Arduino board.
- Using Arduino and GSM module, notification will be sent to the specified number given in the program to refill the medicines in the form of a text message.
- The SIM card which is loaded into the GSM module receives these messages.
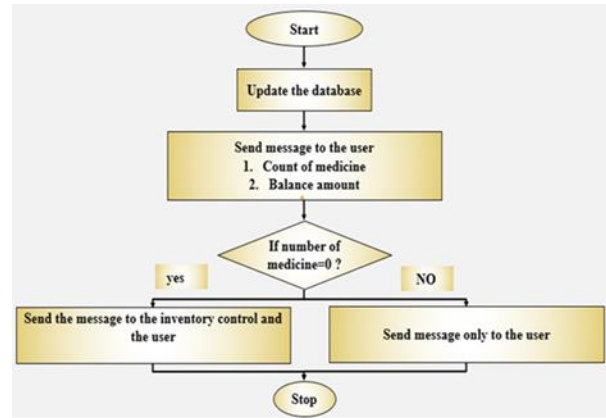

Fig. 5. Flow chart for objective 4

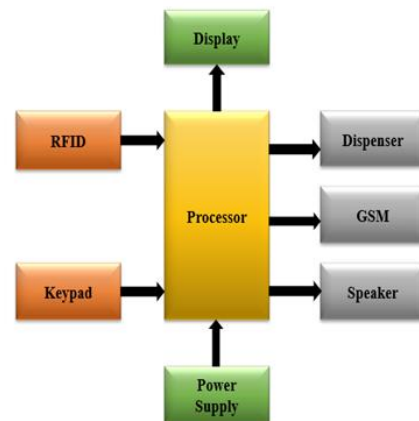Fig. 6. Remaining count and balance detail

4. Block Diagram

Fig. 7. Block diagram of the system

Connections are made as shown in the block diagram. RFID, keypad, LCD display, Speaker are interfaced with the Arduino mega 2560 where, RFID and keypad acts as input to the Arduino, LCD display, and speaker acts as output. Dispenser dispenses the medicines.

5. Advantages and Applications

1. This framework can be introduced in restricted space as it is versatile.
2. This idea is a lot helpful in everyday life for average folks.
3. Since online transaction is involved no fear for larceny.

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4. No distinct individual is required for upkeep.
5. Customary renewal can help in not just following utilization example and in this way taking prudent steps yet additionally guarantee accessibility of medications 24x7.
6. Senior residents need not travel excessively far for essential clinical medicines.

6. Conclusion

Any Time Medicine Vending Machine has been executed on Arduino Mega 2560. This system can fetch out the medicines without any human intervention. To magnify the security, RFID is used as each person would be able access only with their unique ID's. If the quota of medicines are over, using Arduino Mega 2560 and GSM alert message is sent to the authority for the refillment. The main intent of this project is to make medicine accessible to all people irrespective of their locations. Significant bit of leeway is that individuals would have the option to get to the medications by means of this proposed system in open places, for examples shopping centers, railroad stations, on parkways, territories where clinical store are constrained.

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