IoT based Automated Medicine Dispenser

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Abstract - *Medicines play an important part in preventing illness, maintaining the health conditions, and also curing disease. It is a tedious task to distribute the medicine for the people in remote areas and also in case of minor accidents on highways there is a requirement of primary medications. In such cases, we require any time medicine dispensing machines. So in this paper, we have come up with a concept of IoT based automated medicine dispenser machine which is a computerized medicine storage system that ensures the supply of the medicine 24x7 hence it can also be named as Any Time Medicine (ATM) machine and also delivers the medicine in emergency conditions. In this IoT based automated medicine dispenser, we use a controller (Arduino mega) that controls the subsystems such as RFID reader, GSM module, Medicine dispenser, Inventor control, Wi-Fi module, and Servo motor. This project mainly focuses on delivering three types of OTC medication: Diabetes, Hypertension, and first aid kit. Finally, the paper concludes by describing the advantages, disadvantages, and future scope of the IoT based automated medicine dispenser.*

Key Words: **Arduino IDE, Thingspeak, RFID technology, WI-FI MODULE, SIM 800C GSM MODULE**

1.INTRODUCTION

After analyzing the death rates for 8 years John Hopkins patient safety experts calculates that more than 250,000 deaths occur due to the lack of proper medication. In the medical field, innovation plays a vital role in sustaining health. Similarly, it is observed that the majority of the population in India die due to the lack of availability of the medicines on time. The problem arises majorly during night times when there is an emergency need of medicines but the pharmaceutical stores are closed or the stock of drugs may not be available [1] the best solution in such situations would be the Any Time Medicine Dispenser. However, there are varieties of medicine dispensing machines available in the market. But most of them are customized for household usage hence it cannot be implemented for outdoor applications.

1.1 Objectives of the System

To solve these issues, we have come up with the idea of IoT based automated medicine dispenser whose main objective is to deliver the Over the Counter (OTC)

medicines in such places where there is no availability of medicines due to various factors like [2]:

- At the time of emergencies in remote places, the 24X7 pharmaceutical store would not be easily reachable.

- During the bad weather conditions, the medicine store would be closed or not accessible.

- In locations like railway stations, malls, highways, and many other places during the time of emergency the medicines won't be readily available.

IoT based automated medicine dispenser focuses to solve the above mentioned problem and provide healthcare to people. In this machine Arduino mega controller is programmed to carry out the activities such as input processing, storing the data in the cloud, message alerts through GSM, medicine dispensing, and movement of the motor. Hence, the Arduino Mega Controller is considered as a primary component of the system [6].

The medicine dispenser machine is completely automated which makes it easily accessible to any person containing a registered RFID card who then has to provide the desired input to the system, the amount is stored in the RFID card the overall price of the purchased medicines gets digitally transferred from RFID card and finally, the medicine gets dispensed. As this machine is fully automated, so it requires human interference only during the refilling of medicines.

1.2 Functionality of the System

The functionality of this system is quite simple which uses RFID (Radio   Frequency Identification reader) device to gather information from the RFID card/tag. The data from the RFID card is transferred to the reader through radio waves. Firstly, the user has to create an account by registering himself in a hospital or nearby pharmacy. After registration user can access the IoT based medicine dispenser using the registered RFID card.

Here the medicine dispensing process is carried out in four steps [1,3]:

- **Authentication of user registration**: When the card is inserted 12 digit number is read and then the user has to enter a pin for verification. After the verification process, the next step is to select the type of medicine.
- **Selection of required medicine**: Medicines are categorized into two types they are general medicine and regular medicine.
- **Payment**: After the selection process the total amount will be calculated and is deducted from the RFID card. Users can also refill the amount to their card.
- **Collection of requested medicine:** After the successful selection and payment process the medicine gets dispensed and the door opens with a buzzer sound indicating to collect the medicine.

2. PROPOSED WORK

The IoT based automated medicine dispenser system as shown in **Fig -2.1** consists of a controller (Arduino mega) that controls the sub-systems such as RFID reader, Global System for Mobile Communication (GSM), Medicine dispenser, Wi-Fi module, and Servo motor.
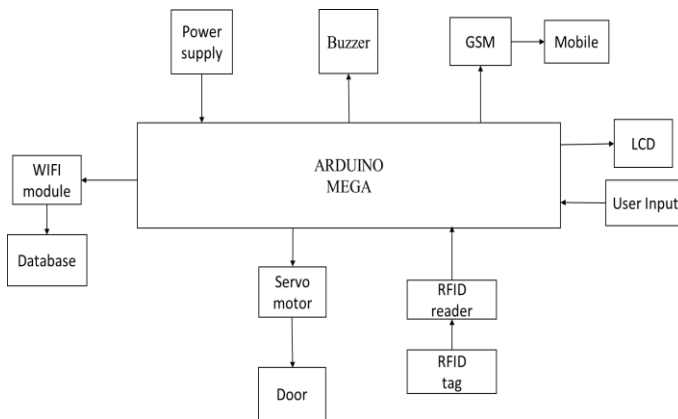

Fig -2.1: Block Diagram of IoT Based Automated Medicine Dispenser

This system is proposed using the concept of the internet of things, and RFID technology which plays a pivotal role. Radio Frequency Identification is an important component of this project. It consists of a tiny silicon chip and an antenna, wherein the reader can scan and send the data to the database. So through this, it is possible to make every object to be trackable with the unique identification and we have utilized this key aspect in this work to build a system to identify the unique user by their Id. With the help of this RFID technology, the amount can be credited to the card which is used for the payment when the user requests the medicine. Also, in this system, we make use of

the cloud (ThingSpeak) technology for storing the amount of medicine dispensed after each transaction.
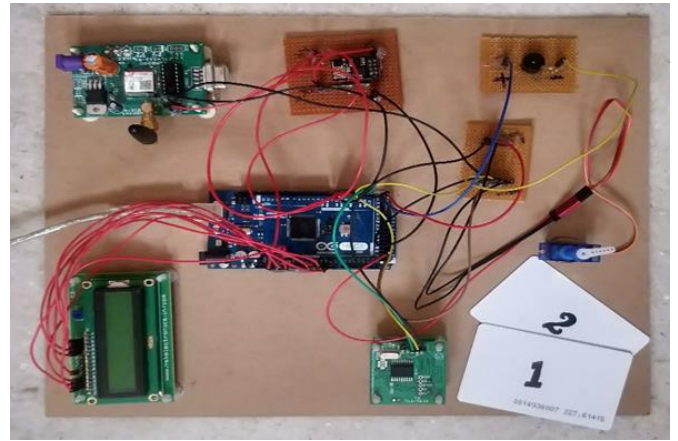
2.1 Methodology

Fig -2.2: Complete Setup of IoT Based Automated Medicine Dispenser

The system mainly consists of an RFID reader and a tag. The complete setup of IoT based automated medicine dispenser is as shown in **Fig -2.2**. To use this system firstly the users, have to register for obtaining the RFID card. The communication begins when the user swipes the RFID tag to the RFID reader. The RFID reader reads the details of the user when an RFID card is swiped and displays the read data. The system asks for the PIN from the user to avoid the misuse of the card. After user identification is done the LCD displays the list of medicines in the system which is divided into two types i.e., Regular type which contains BP and Diabetic medicines and the other one is General Type which contains a First Aid Box, are present in the system. Users can select the corresponding number of the required medicines. The selected medicine's expiry dates will be checked by the system. If the medicines are expired then the system displays an alert message on the LCD and also sends an SMS alert to the pharmacist to remove the medicines, and the transaction ends without dispensing the medicine. Depending on the medicine selected and their quantity amount will be calculated and the respective amount will be deducted from the card. Then the system delivers the selected medicines through a servo motor. Further, with the help of the GSM module, the generated e-bill will be sent as an SMS to the user's registered mobile number. After dispensing the medicine, the remaining medicine count in the system is updated to the cloud (ThingSpeak) through the WiFi module and this medicine data is represented in a graphical form. Later when the medicine count in the storage reaches the minimum level immediately an SMS alert will be sent to the nearby pharmacist suggesting the refilling of the medicine via GSM module.

2.2 Flowchart

The process flow of the system is explained in **Fig -2.3**.
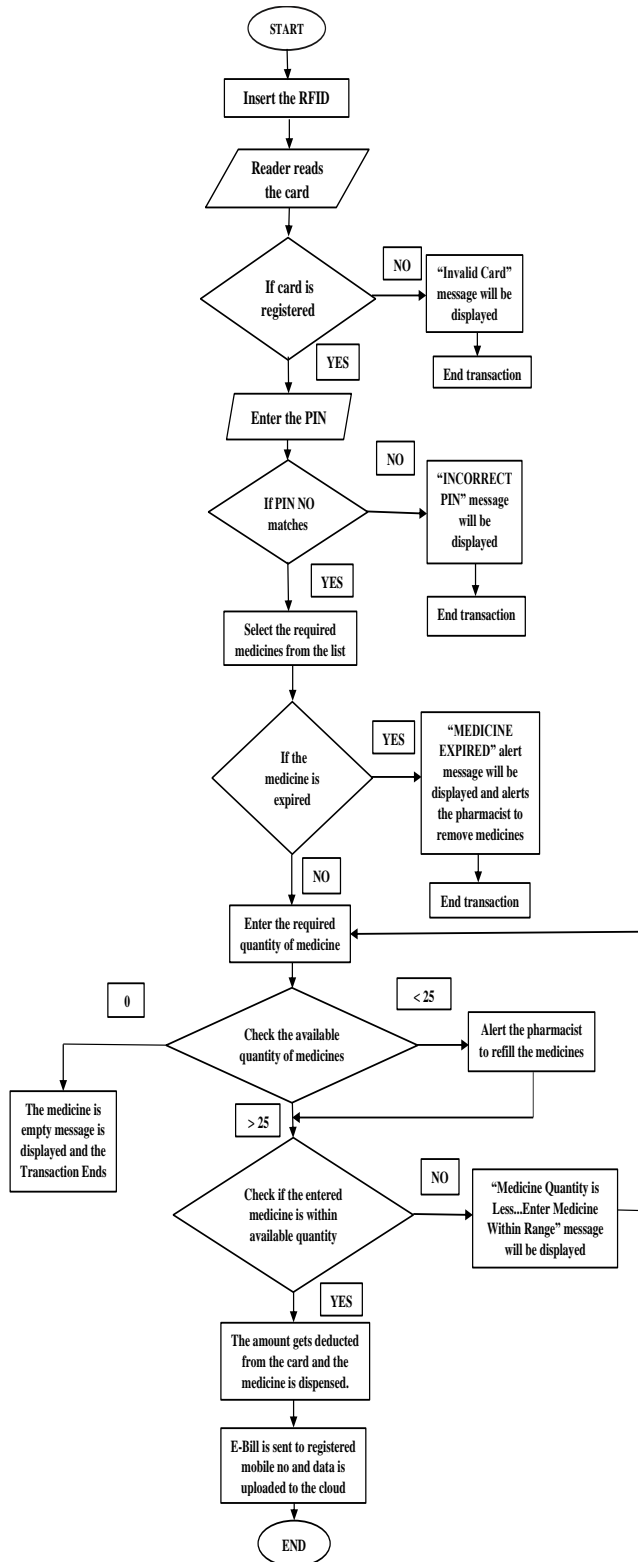

Fig -2.3: Process Flow Diagram

3. RESULT

When the RFID reader reads the card and after the entry of a password user can select the required type of medicine and the quantity of medicine. Based on the quantity selected total amount is calculated and displayed. Then the respective amount gets deducted from the card and medicine gets dispensed at the door by a servo motor. Then E-bill details are sent to the user registered mobile number as shown in **Fig -3.1**. The count of each medicine type is updated in the cloud database after medicine gets dispensed as shown in **Chart -3.1**.
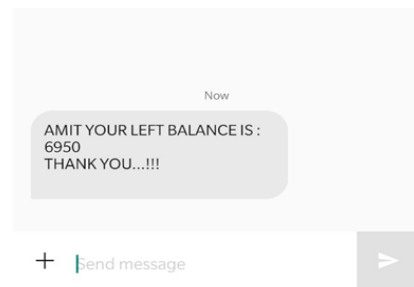

Fig -3.1: E-bill details sent to user mobile

Chart -3.1: Chart of Medicine Count Updated to Cloud After Every Transaction

When the medicine count is less than 25 an alert message is sent to the pharmacist to refill the medicine as shown in **Fig -3.2**. If the medicine is expired an alert message is sent to the pharmacist to remove the medicine as shown in **Fig -3.3**.
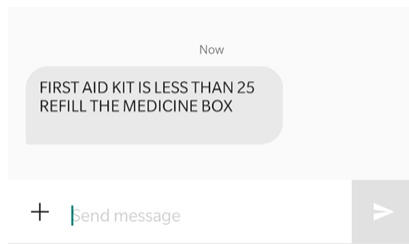
Fig -3.2: Alert message sent to the pharmacist to refill the medicine box
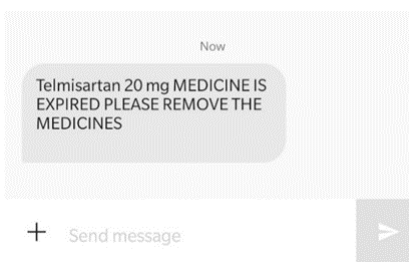

Fig -3.3: Alert message sent to the pharmacist to remove the expired medicines.

4.CONCLUSION

In India, several people die due to the inaccessibility of medicine on time. This IoT Based Automated Medicine Dispenser solves these issues and will allow the general population to obtain the medicine 24X7 or in an emergency condition. It helps in providing accessibility of medicines in rural areas, transport stations, oil pumps, and in highways. This machine reduces the time consumption and works with higher accuracy. It also helps in providing the medicines at reasonable rates. Each user is provided with a unique ID tag to recognize them individually and avoid the misuse of medicines.

5. FUTURE SCOPE

For any project to have an impact on society, there have to be continuous enhancements done to it over the designs to improve the services provided by it. It also has to improve the services provided by it. It also has to find new ways to reduce the cost per unit upon enhancements even if no new features are added. These are the following enhancements, which can be listed upon completion of the project:

- ➢ This Any Time Medicine Dispenser can further include facial recognition technology, biometric, or retina scanning making it more secure to avoid the unauthorized person handle the ATM.

- ➢ The cabinet within the ATM holding the medicine can be made as tamper-proof to provide the product safety and to reduce the risk of product damage.

- ➢ It can be made as an essential part of hospitals and clinics where medicines can be dispensed smartly and effectively.

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