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Automatic Digital Pharmacy

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***Abstract*: According to a study conducted by World Health Organization approximately 65% of the population depends on medicines on a daily basis. Medicine plays an important role in the life of human beings for every situation due to the increase in health-related issues because of unhealthy lifestyle followed by many in recent years. Adding to this the elderly population is also more in our days. Using the conventional method of buying medicines from a pharmacist becomes a big challenge during non-working hours or late in the night. In these scenarios there is a need for the supply of medicines, especially vital medicines during emergencies so that the user needs can be met. An automated medicine dispensing system is proposed in this project to help people in such scenarios. It is similar to an ATM through which we get the required money at any time. The same system is followed in the proposed project as well. Medicines for B.P, diabetes, cold, fever, headache, and other routinely used tablets can be made available for such emergency situations. In the proposed project we are using RFID cards as generic prescriptions which can be obtained from the physicians. This machine designed to provide such healthcare at areas where having a medical store may not be feasible or possible. It allows the user to select a medicine, pay the required amount after which it verifies the amount received and dispenses the medicine.**

***Keywords*: Arduino Uno board, GSM module, IR sensor, Servo motor, RFID card, RFID reader, LCD display.**

1. Introduction

Today, automation plays an important role in human life. People always look for convenience even in handling commodities and other basic needs in life such as food and medicine. Automation not only refers to reduced human effort but also energy efficiency and time saving.

According to a study conducted by World Health Organization approximately 65% of the population depends on medicines on a daily basis. Administering of wrong drugs or wrong dosages, due to negligence may lead to various complications. The system is developed to cater to the needs of patients who are dependent on long-term regular medication and seeks to simplify the dispensing and hence drastically improve their quality of life.

Accessibility to basic healthcare is an important cornerstone of development towards building a healthy future. This paper presents a machine designed to provide such healthcare at areas where having a medical store may not be feasible or possible.

Due to the physical and infrastructural limitations stabilizing a medical store at remote areas this machine has been designed to be a standard unit required minimum dissension to operate for long period of time.

2. Block Diagram

Drugs are very valuable to the community especially to those who are under medication. The machines designed for outdoor use require a doctor's prescription to be fed into the system, either through a dispenser placed in the clinic, or through a healthcare worker. While this prevents misuse, it again poses the problem of not being feasible in remote areas due to the shortage of healthcare professionals and issues faced in establishing a clinic in developing countries. This medicine dispenser designed addresses those shortcomings by its ease of installation at any location. And because it is aimed at mainly providing basic medicinal assistance till proper care can be received, it contains only over-the-counter medicines; which are easily available.

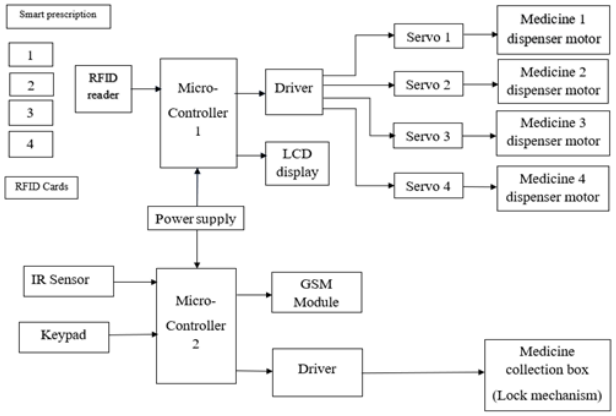

Fig. 1. Block diagram of the system

An automated medicine dispensing system is proposed in this project. It works similar to an ATM. In the proposed project we are using RFID cards as generic prescriptions which can be obtained from a physician. When RFID prescription card is scanned, the prescribed medicine details are read by the RFID reader and displayed on the LCD along with the price. Here we

are using Arduino Mega 2560 microcontroller with regulated power supply.

The medicine corresponding to the RFID prescription is dispensed automatically from the system to a medicine collection box and an SMS with the pricing is sent to the owner. Here we are using four servo motors to control the opening and closing actions of the slit to the medicine collection box. By using the GSM module, a SMS is sent to the owner along with the prices. After the user pays the amount online to the owner using a simple QR code scan-based method to receive an OTP. The user needs to enter it through the keypad provided which in-turn unlocks the door of the medicine collection box. Hence the required medicine is dispensed.

3. Hardware Design

A. *Arduino Uno*

The Arduino Uno board contains Atmega3248p microcontroller, it is a 28pin IC microcontroller as shown in figure 2. In that 28pins, 7pins are power pins, 6 are input/output analog pins and 14 input/output digital pins. This Arduino board operates at 5volts and it requires 7 to 12volts of input voltage. It has flash memory of 32Kb in which, 0.5Kb is used by system booter, 2Kb of static random-access memory and 1Kb of electrically erasable programmable read only memory. Microcontroller is a heart of computer which is placed on a single IC.

Fig. 2. Arduino Uno board

B. *RFID Card (Radio Frequency Identification)*

RFID uses electromagnetic fields to automatically identify and data capture. RFID technology cannot be easily replicated and therefore it increases the security. RFID is a technology similar in theory to barcodes, it uses electromagnetic fields to automatically identify and track tags attached to objects contain electronically stored information.

Fig. 3. RFID Card

C. *RFID Reader (Radio Frequency Identification)*

It uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to inventory goods. There are two types. Passive tags are powered by energy from the RFID reader's interrogating radio waves. Active tags are powered by a battery and thus can be read at a greater range from the RFID reader; up to hundreds of meters. RFID is one method of automatic identification and data capture.

Fig. 4. RFID reader

D. *Servo Motor*

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The function of the servo motor is to receive a control signal that represents a desired output position of the servo shaft and apply power to its DC motor until its shaft turns to that position. Servo motor consists of a DC Motor, a gear system, a position sensor, and a control circuit. The DC motors get powered from a battery and run at high speed and low torque. It is controlled by controlling its position using Pulse Width Modulation Technique. The width of the pulse applied to the motor is varied and send for a fixed amount of time. The pulse width determines the angular position of the servo motor.

Fig. 5. Servo motor

E. *LCD Display*

Fig. 6. Liquid crystal display

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not

emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as reset words, digits, and seven-segment displays, as in a digital clock.

F. GSM Module

Fig. 7. GSM module

The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. It was first deployed in Finland in December 1991. By the mid-2010s, it became a global standard for mobile communications achieving over 90% market share, and operating in over 193 countries and territories.

G. Keypad

Fig. 8. 3X4 keypad

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pads mostly containing numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric input such as calculators, push-button telephones, vending machines, ATMs, combination locks, and digital door locks. Many devices follow the E.161 standard for their arrangement.

4. Working Principle

It is similar to an ATM through which we get the required money at any time. The same system is followed in the proposed project as well. Medicines for B.P, diabetes, cold, fever, headache, and other routinely used tablets can be made available for such emergency situations. In the proposed project we are using RFID cards as generic prescriptions which can be obtained from the physicians. This machine designed to provide such healthcare at areas where having a medical store may not be feasible or possible. It allows the user to select a medicine, pay the required amount after which it verifies the amount received and dispenses the medicine.

Here we are using RFID cards as generic prescriptions which were obtained from Physicians. The given RFID prescription card is scanned; the prescribed medicine details are read by the RFID reader and displayed on the LCD along with the price. The user needs to pay the amount online using simple QR code scan-based method in any of the online transaction applications (i.e. BHIM apps). If the amount shown on the LCD and the amount paid by the user matches, then the user receives an OTP. The user needs to enter this OTP through the keypad provided which in turns unlocks the medicine collection box. Thus, the required medicine is dispensed. Hence the process ends.

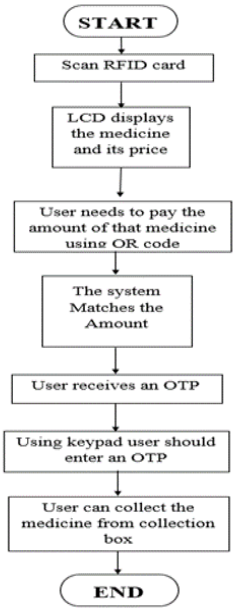

Fig. 9. Flowchart

5. Results

Fig. 10. Results of automatic digital pharmacy

Automatic digital pharmacy hosts several functionalities which makes this device a helpful and reliable alternate solution to the existing medical assistants. The medication in the form of tablet strips are stored in the container of the dispenser, the

details of those medications are displayed in the LCD. The designed prototype can have up to four strips of tablet.

6. Conclusion

The implementation of new technologies designed to overcome the disadvantages of conventional method of buying of medicines from a pharmacist, which includes less reliability, inconvenience. The proposed system is made easy and helpful in emergency scenario. This project offers a complex assistance and medicine dispensing system. Specifically, this project is an open source platform. The whole operation of the system is controlled by Arduino by triggering other embedded devices. The system enables secure transaction as it uses QR code and magnetic lock.

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