AUTOMATED MEDICAL DISPENSING SYSTEM USING ROBOTICS

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ABSTRACT

In today's world, people are suffering from several diseases and due to this the need for medication has increased exponentially. An average person takes 2-3 tablets a days and there is a chance for the person to let slip from the memory. In order to avoid such mistakes an automated system for dispensing medicines is required. In the paper, we present a prototype robotic system that automatically dispenses medicines to the patients in the hospital. The robot model which carries medicines for patients will deliver them at the respective time. The robot uses line follower method to deliver the pills to the patient's room. In this way the medication errors can be prevented and the need for the patient to remember their medicines is not needed anymore.

KEYWORDS: Medication error, Automatic Delivery, IR Sensor, Microcontroller.

I. INTRODUCTION

Medications are offered by health services throughout the world. However, with substantial and increasing medication use comes as a growing risk of harm. This is compounded by the need to prescribe for an ageing population with increasingly complex medical needs and the introduction of many new medications. These issues are particularly relevant in primary care. In many cases, prescribing is initiated in primary care and those initiated in the hospital may also be continued in primary care. A substantial amount of literature about medication errors is based in the hospital setting, but there are differences in the type of clinical problems encountered, classes of medications used and the organization of services in primary care. This means that the risks posed in primary care and the solutions required may differ from those in hospital settings.

The Robot model has a keypad and a display unit which is used to enter the data of the patient and their medicines. The data such as the patient name, patient ID , patient room number, name and quantity of the medicines with their respective timings. The model uses both IR Sensor and Ultrasonic Sensor for its movement. The Ultrasonic sensor works in such a way that it sends and receives the pulse signal to measure the distance of the target.

II. MOTIVATION

Medication plays an important role in healthcare as one grows older. People are more likely to develop one or more chronic illnesses with advancing age that require medication, and, in general, appropriate medication can help the patient live longer and more active lives. However, medication use in older adults is also more likely to be associated with safety concerns. Age-related challenges like memory loss can cause seniors to under dose or overdose. Poor eyesight can make it harder to read instructions or distinguish between pills. Physical ailments, such as arthritis, can make opening medication containers difficult. A number of technological interventions have been proposed to assist older adults with these issues, including the use of electronic reminders, smart pill boxes that track and report usage, and stationary pill dispensers that release medicine at appropriate times. Unlike these

interventions, robots have the potential to emulate the ability of a human caregiver to physically deliver medicine to the patient. As such, when compared to other technological interventions, we would expect the robot to lower both the physical and mental workload associated with taking medicine and thereby improve medication adherence.

III. LITERATURE SURVEY

There have been several researches in the field of medical science to develop a system that reduces the dependency on the caretaker and also that reminds patients about their medicines.
As per A. Jabeena, Rohit Roy, Animesh Kumar Sahu, N.Sardar Basha proposed a system that reminds patients about their pill. In this paper work, the system displays the time for the next medicine in a LCD screen and when the time arrives, it generates messages repeatedly, along with LED blinking indicating which compartment to open.

As per Ying-Wen Bai and Ting-Hsuan Kuo proposed a system that reminds patients about their pill. This design uses a Bluetooth bracelet to cooperate with the reminder machine. The bracelet will sound and flash to remind the user to take pills from a specific bag .
As per Wissam Antoun, Ali Abdo ,Suleiman Al-Yaman, Abdallah Kassem, Mustapha Hamad and Chady El-Moucary proposed a model that uses an Android application which is responsible to dispense the pills, using arduino via Bluetooth connected to the phone which starts sending commands indicating which container should be opened by the stepper motor.
In the literature survey it has been noted that until now the progress of work has been only in reminding the pills but only a less amount of work was done to deliver the pills to the patients.

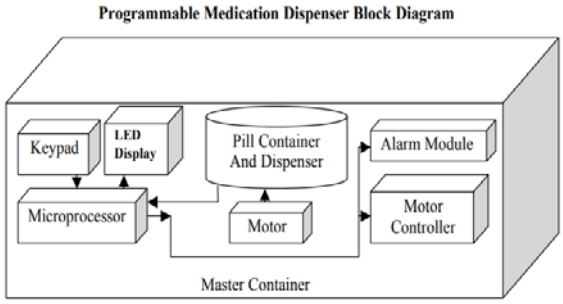
IV. PROPOSED WORK

Initially the robot is placed in the home position. Using the data entered it checks if the time has arrived to deliver the medicine. After the time arrives the robot selects the path to the patient's room and it uses line follower method to travel in the selected path. After it reaches the patient's room, it voices over the patient's ID (or) Name and waits for the fingerprint authentication. The patient or care taker places their finger in the fingerprint scanner. Once the fingerprint is authenticated the respective pill box opens and it displays the medicine name and quantity. The patient or the care taker takes the medicine and presses the push button. The robot uses a GSM module to send information whether the patient has taken their medicines or not to the registered mobile number. The robot closes the pill box and returns to its home position.

V. METHODOLOGY

The micro controller ARDUINO MEGA 2560 is used to interface components such as RTC, Ultrasonic sensor, IR sensor, L293D motor driver, fingerprint sensor and GSM module, and also is used to enter and store data about the patient using a keypad present in robot. The robot waits in its home position till the time arrives to deliver the medicines to the patient in their respective room. Using real time clock RTC module the microcontroller checks if the time has arrived and once the time arrives the microcontroller selects the path in which the robot has to travel using the data entered. The robot uses a line follower technique to travel where the path is represented by a black line. The IR sensor in the robot send a light signal and receives back the signal only when there is a black line by this method the robot is made to move only in the black line path. After the path is selected by the microcontroller the IR sensor detects the black line and sends information to the microcontroller which will make the robot to move in the selected path with the help of the motor driven by the motor driver. There is an ultrasonic sensor present in the robot for obstacle detection, by generating a sound wave which will be reflected back only when there is a obstacle in the path. In such cases the ultrasonic sensor sends signal to the microcontroller which will stop the movement.
After it reaches the patients room the system voices over the patient ID or patient name from the DF mini player using speaker. Now the system waits for fingerprint authentication. The patient or the caretaker places their finger on the fingerprint scanner. The optical fingerprint scanner compares the fingerprint with the data and if it matches, it gives the authentication to the microcontroller which opens the pill box using the servo motor. In the LED display it displays the medicine and its quantity. After the patient has taken the medicine the push button

is pressed which will close the pill box. The robot uses a GSM module to send information whether the patient has taken their medicines or not to the registered mobile number. The number may be the patient's relatives or guardian.



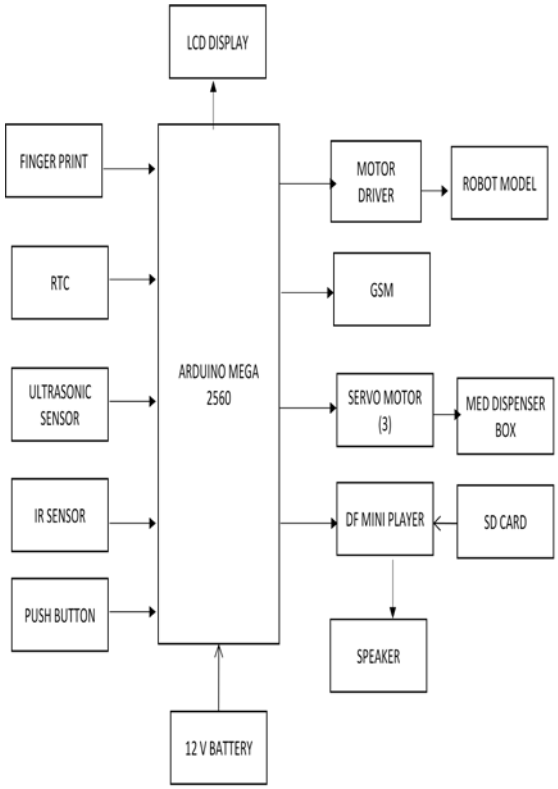
The robot closes the pill box and uses the same line following technique to return to its home position.

VI. COMPONENT SURVEY

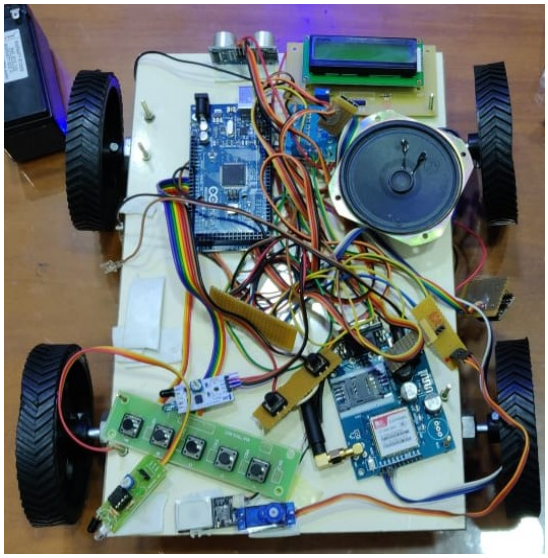
1. **Microcontroller Arduino Mega 2560** : It is used to interface components and to enter and store data about the patient.

2. **RTC**: It maintains seconds, minutes, hours, day, date, month, and year information
3. **LCD display**: To display the medicine name and quantity and to display data while data entry.
4. **Ultrasonic sensor**: It is used for obstacle detection when the robot moves in its path.
5. **IR sensor**: It is used in line follower technique to identify black line path.
6. **Fingerprint sensor**: It is used as a security system to ensure the medicine reaches the right person.
7. **GSM module**: It is used to send authentication messages information whether the patient has taken their medicines or not to the registered mobile number.
8. **Motor driver**: To drive the motor so that the robot moves in its path.
9. **Servo motor**: To open and close the pill box.
10. **DF Mini Player and speakers**: To play the necessary audio output after the robot reaches the patients room.
11. **Battery:** 12V battery for power supply.

VII. EXPERIMENTAL SETUP



VIII. RESULTS



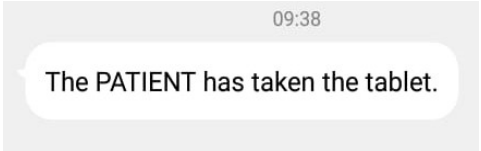
The prototype of the proposed system is shown above.

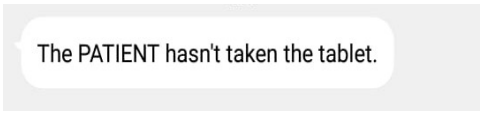
The working of the system is explained:
Step1 : Switching on the device.

Step 2: The time is set when the system needs to dispense the medicine and also the fingerprint is scanned.

Step 3: At the particular time, the system starts moving from its home position and reaches the patient's room.
Once the authorized fingerprint is kept, the servo motor dispenses the medicine.

Step 4: A Notification indicating whether the patient has taken the medicine is being sent to the registered mobile number.





IX. CONCLUSION AND FUTURE WORK

This study shows that reminding and automatic delivery of medicines in hospital can be done successfully through this automatic medical dispensing system using robot. This not only prevents the dependency on a care taker for a patient but also reduces the man power needed in a hospital to manage and maintain patience medication. Through this system we can also make sure that the patient has taken their medicine at the right time and can also maintain records of what medicines were prescribed to them. This system can be improved in the segment to deliver pills to the patients or older people who take medicines regularly in their home environment itself. This system would make it easy for patients and older people to take their medicines at the prescribed time and quantity without the need to depend on other people.

X. REFERENCES

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