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## Medical Assistive Robot (MAR)

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### Abstract

Accessibility to basic healthcare is an important one in terms of development towards building a healthy future. The MEDICAL ASSISTIVE ROBOT is a device used to provide correct medication at correct time with the right amount of dosage without the aid of nurse. The robot also act as path following robot so there is no need to reach the robot in order to take the pill instead of that robot will reach the patient, it also consist of an object detecting sensor(IR) to avoid the obstacle in the path. The device uses RFID card to link the patient id which hold all the data of the patients such as identity and their prescription etc.. A specially designed wheel like structure with N number of slots acts as pill storage space. The arduino microcontroller used to automate the whole process. Each slot of pill storage named to a particular tablet in terms of rotating angle of stepper motor. Suction pump used to pick the pill. The process starts when the user taps the RFID card. In this work the device is designed and manufactured in an efficient way. There are some other devices that perform similar function Ex: The Automatic pill dispenser, All time medication but this project deals with integration of the doctors prescription, which results in overcoming the manual error. The objective of this project is to reduce the avoidable medication errors in the absence of the doctor also help the older people who are poor in memory.

**Keywords:** Rfid, Arduino, H Bridge, Lcd, Suction Pump, Dispenser Slot.

### 1. Introduction

An assistive robot is a device that can sense, process sensory information, and perform actions that benefit people with disabilities and elder people. Many assistive robots for elderly and disabled people have been developed in the past few decades. But very few of them become commercially available due to their cost-benefit ratio.

Robots used in the field of Medicine today are

- Telepresence- physicians use robot to help them examine and treat patients in rural or remote locations.
- Surgical Assistants- Assist surgeons with performing operations.

- Rehabilitation Robots - Used in recovery of people ex: mobility, strength.
- Pharmacy automation - Robotic systems to dispense oral solids in pharmacy
- Disinfection robot - Used to disinfect the whole room in mere minutes

The present invention relates to automatic medicine vending machine, which has the capability to dynamically receive input from the user and then dispense the correct medicine based on the received input. The main advantage of the present invention is that its reprogrammable which results in increased flexibility of the project and in addition to this it can dispense pills to multiple

patients. Now a days considering the cost-benefit ratio mostly microcontrollers are used to automate the process. The system mainly consist of two sub system first the mechanical structure for the pill storage and the movement of the robot and secondly the electrical circuit which consist of a power supply, Aurdino mega microcontroller, H-bridge, LCD display, RFID reader and card. Now a days every hospital has a data base in which they store the patient details and their medical records so we can simply transfer the prescription details from that to the RFID card. RFID cars act as prescription card for the patient. In the programming stage each pill is defined to a particular slot. So the care taker only job is that to ensure filing of medicine in the correct defined slot

### 1.1 Motivation

Medication plays an important role in healthcare. People are prone to have illnesses with advancing age that require medication, and, in general, proper medication can help the patient have healthy and more active lives. But the major problem is that the 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.[1-5]

### 1.2 Objective

- To break the barriers of spending quality time with patients
- Assurance for safe use of correct medications with prescribed quantity
- Reducing the side effect or even death due to wrong medication
- Ensuring avoiding avoidable medication errors Ex: wrong medication, over or under dose

### 1.3 Literature Survey

**WissamAntoun, Ali Abdo ,Suleiman Al-Yaman, Abdallah Kassem, Mustapha Hamad and Chady El-Mou Cary(2018)** A model suggested using an Android application that is responsible for dispensing the pills, using arduino connected to the phone through Bluetooth, which starts sending commands indicating which container the stepper motor should open..

**Ying-Wen Bai and Ting-HsuanKuo (2016)** 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

**WissamAntoun, Ali Abdo and Suleiman Al-Yaman and Abdallah Kassem, Mustapha Hamad and ChadyEl-Mou Cary;** Presents a concept Smart Medication Dispenser (SMD). The aim is to help patients , particularly seniors, take their drugs on time in an easy way without the likelihood of missing pills, and also reduce the risk of accidental over- or under-dosing. It can have severe effects, such as prolonged healing, sickness and even death, if drugs are not administered correctly. By advising and alerting patients to take the required dose at the correct time, the smart medication dispenser (SMD) might solve such problems. It also offers direct contact between patients and caregivers as it will alert the caregiver immediately in case his / her pill has been missed by the patient.[6-9]

### 2. Proposed Work

The micro controller ARDUINO MEGA 2560 is used to interface components such as RFID, IR sensor, L293D motor. The arduino also used to store the program and patient details by interfacing with the RFID. The robot waits in its start-position till the time (programmed) arrives to deliver the medicines to the patient in their respective room. Then the robot starts to travel in the preprogrammed path. There is an IR sensor present in the robot for obstacle detection, by a signal which will be reflected back only when there is a obstacle in the path. In such cases the IR sensor sends signal to the microcontroller which will on the buzzer and stops the movement.After it reaches the patients the patient or caretaker need to tap the RFID tag in the RFID reader. After reader reads the tag the LCD screen shows the unique no of the patient for the error free dispensing of medication, it gives the authentication to the microcontroller which rotate the pill storage wheel using the servo motor. The suction pump suck the medication and put it in a empty box then it wait for few seconds for the patient to take the medication.

#### Components:

##### A) Hardware Requirements:

- Stepper motor

- Ir sensor
- H bridge
- RFID reader and tag
- Lead screw
- Pill storage wheel
- Suction pump
- Arduino mega 2560

## B) Software Requirements:

- ARDUINO IDE

### Stepper motor

Stepper motors are brushless DC motors its used mainly where we need to move /rotate in discrete steps. It consist of multiple coils arranged in groups which is called as phases. Based on energizing each group in a particular sequence the rotation direction of the motor is achieved. Compare other DC motors it has good low speed torque. Since it is more precise its used in applications like CNC,3DP

### IR Sensor:

In order to sense their surroundings, an infrared sensor emits and/or detects infrared radiation. Transmitting an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver is the fundamental principle of an infrared sensor, which is used as an obstacle detector.

### H-Bridge:

The H Bridge is a simple electronic circuit that allows us to apply the charging voltage in either direction. It is widely used to power DC Motors in robotics applications. We can run DC motors in the clockwise or anticlockwise direction by using H Bridge.

### RFID:

Radio Frequency Identification system consist of two main components, a transponder or tag which contains unqi id it also attached to an object to be identified . The second component is reader/Transceiver also know as interrogator. The reader consist of a Radio Frequency Module and a antenna which generates high frequency electromagnetic field.

### Leadscrew:

A lead screw, also referred to as a power screw or conversion screw, is a screw used to transform turning motion into linear motion as a connexion in a system. Screw threads have higher frictional energy losses compared to other linkages due to the wide area of sliding interaction between their male and female members.

### Pill storage wheel:

It is a funnel like structure specially 3-D printed using poly lactic acid polymer because it is biodegradable. It consist 5 triangular shaped segments where each one is allocated to a specified medicine it also has an empty portion used to deliver medicine to the tray/bin. Each segment is located in terms of rotation angle of stepper motor .

### Suction pump:

It is the motor which takes the electrical power from the power source and converts it into mechanical power in the form of suction with air flow. The pump chamber fixed volume of air compression, stretching the pumping air intakes with the outside atmospheric pressure difference, at a pressure difference, the gas sucked into the pressure chamber and discharged from the exhaust port.

### Arduino mega2560 controlling unit

The Arduino Mega 2560 is an ATmega2560-based microcontroller module. It has 54 digital input / output pins, 16 analogue inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator , a USB connection , a power jack, an ICSP header , and a reset button (of which 15 can be used as PWM outputs). It contains all the microcontroller needs to support; just connect it to a computer with a USB cable or power it to get started with an AC-to - DC adapter or battery.

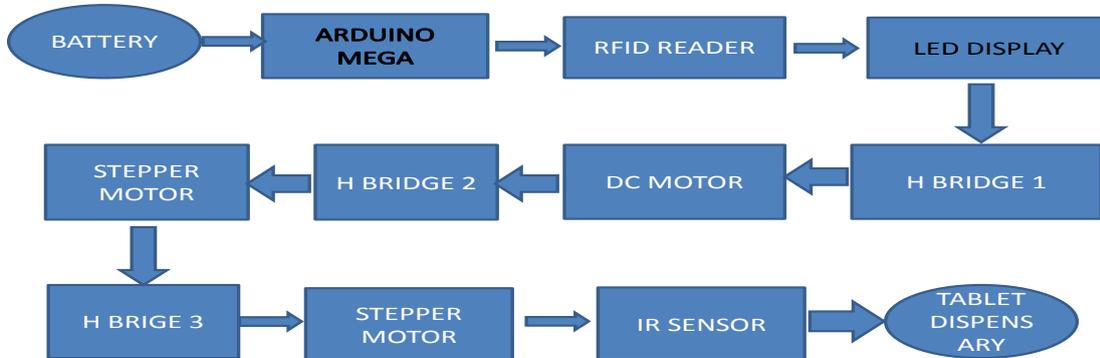
### Arduino IDE :

The Arduino IDE is a cross platform application that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino

Device. Arduino Uno, Arduino Super, Arduino Leonardo, Arduino Micro and many more are available for a number of Arduino modules. Each

of them includes a microcontroller that is actually programmed on the board and accepts the data in code form.

### 2.1 Sequence of Operation:



### Result:

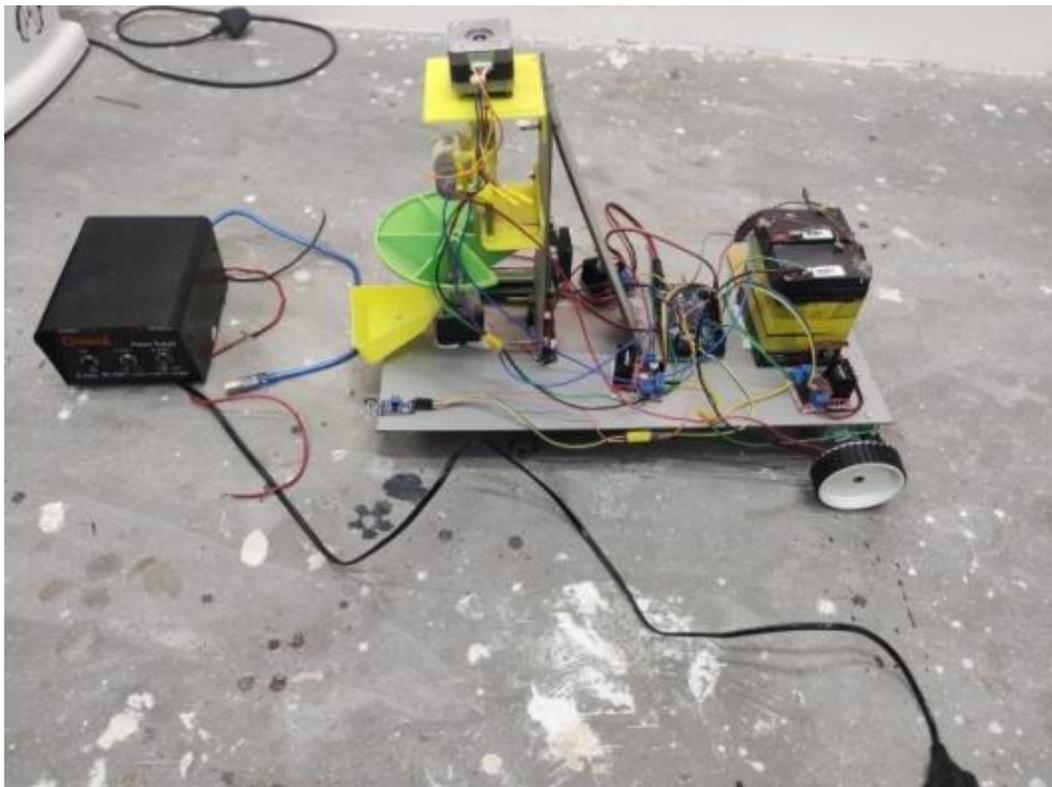


Fig.1 The prototype of the proposed system

### Conclusions

This project (prototype) shows that 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.

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