Smart Medicine Dispenser Machine

Abstract: **Prescription required keeping us healthy, however old age people required caretaker who can deal with their medicines plans. Because of the busy schedule and less time it's really hard to take proper medicines at a specific time. In various diseases patients have to take so many medicines in a day, but most of the time they forget that which medicine they have to take on which time, it is highly possible they will take wrong medicines on wrong time, & not taking medicines rightly can have serious health related issues and even cause a death. Because of that we need a caretaker which will give medicine on time. This smart medicine dispenser can solve this problem by informing the patients to take the medicine at the accurate time.**

Keywords: Microcontrollers, Servomotor, LCD, RTC, IR sensor

I.INTRODUCTION

Many medicinal errors are occurred due to the patient's elderliness or large amounts of pills every day. Usually there are a large number of varieties of medicine elderly have to take so keeping track of the right medicine at a right time for everyday can become a challenging experience for elders usually a variety of medicines elder peoples have to take at a different times so it becomes a challenging experience for elder peoples. On the other side nowadays doctor prescribing a large amounts of medicines to the patients so it becoming a big problem in nowadays to take a right medicine at a accurate time and in this busy world peoples usually tends to forget which medicine is to be taken on which time, they forget about their medication schedule, which leads them to major consequences like illness and even death. We observed this need of patients and elders and came with the solution. Automatic Medication Dispenser is one such approach to help them take their medicines efficiently. With this device there is a endless possibilities to how, where and when this automatic medicine dispenser come to help many peoples and elders in their life. After completing this device we took feedback from many patients and we found there is a huge need for this device in the medical field. We are going to add some other important features in future scope as we got so much feedback. This paper explains different steps to be followed to design this device.

II. LITERATURE SURVEY

The cases of taking wrong medicines have increased during last years as people get old the human body tends to malfunction and this increases the risk of taking wrong medicines. A study published in the journal of American Medical Association in 2008 found that more than 40% of age 65 and older than that American peoples take 5 medicines per day .The study found that 46.5% of the patients received a minimum of one inappropriate medication and 12.8% patients experienced a minimum of one adverse health outcome. According to the survey carried out in India 74% of the total deaths in the hospital is caused by the overdose or the under dosage of the medicines.

III.PROPOSED IDEA

The main objective of that system is to solve this basic problem of the patients and elders by giving them an easy, simple and errorless solution. The principal concept must be attended to unravel above mentioned problem is to design a self-medicine dispensing device which needs no human interference. In this project we are using the compartment which is used to store the medicine. Dispensing of the medicine achieved using a servo motor. There is an alarm system inbuilt in the device which consists of a Speaker for alert.

IV.METHODOLOGY AND IMPLEMENTATION

Detailed design used to detect the internal framework, mechanism and components used in

the application. This gives the information of all the operations to be performed by the final prototype as well as work flow from different inputs to the different outputs. Following figure shows the internal structure of this prototype.

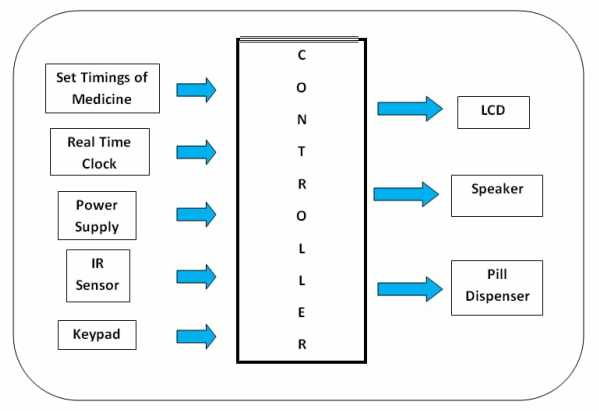

Fig 1: Block Diagram

A. Microcontroller:

Arduino is used for a variety of applications. Arduino has multiple input-output analog and digital ports which is used to interface various sensor relays, switches and other various circuits. The board follows UART (Universal Asynchronous Receiver and Transmitter)protocol for serial communication. It has on board USB port, which is used for uploading programs. It can be programmed with C or C++ programming languages. Arduino provide its own compiler and Arduino programs can be compiled with various IDE supported languages. It has 6 analog pins and 14 input-output digital pins. It has 32 kb flash memory. 2 kb of SRAM and 1 kb of EEPROM. The microcontroller Atmega328p works on frequency of 60MHz.The recommended input voltage of Atmega 328p is 7-12V.Arduino boards are available in various sizes like Arduino Nano, Arduino pro Mini, Arduino UNO, Arduino Mega and Arduino Leonardo. Arduino provide its own compiler which is used to program

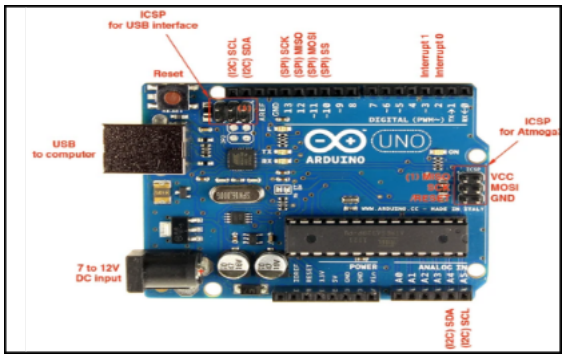

Fig 2 : Arduino Uno

B. RTC :

A RTC module is a real time clock used to provide time related information for different embedded and electronics applications. It has four pins namely VCC, Ground, Data, Clock, Reset. It supports 400 KHz I2C interface. The operating voltage range for RTC modules is 2.3V – 5.5V. It is small in size and consumes very less power to operate. It is mainly used in computer peripherals to keep accurate time.

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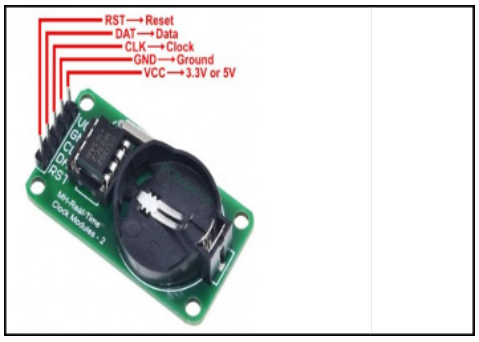

Fig 3 : RTC Module

C. Servo Motor:

A servomotor is a type of motor which is used to rotate the gears or object connected to it with a very great precision of angle. If you want to rotate an object with a particular angle then you can use a servo motor for this task. It works on the servo mechanism which consists of three parts namely Controlled Device, Output Sensor, Feedback System. A closed-loop system which uses positive feedback to control the final position and motion of the shaft. It can rotate up-to 180 degrees. The servo motor has three pins namely VCC, Ground, PWM pin. It is widely used in CD or DVD players which moves the tray. It requires 4.8V – 6V DC power for operation. To control it with an Arduino we have to include Servo library in Arduino IDE.

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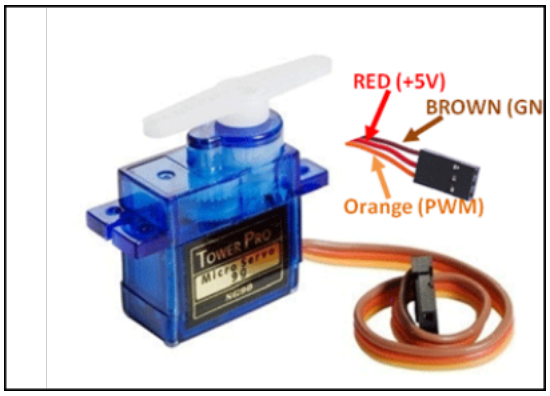

Fig 4: Servo Motor

D. Pill Containers:

For prototype PVC pipes are used to load the medicine-boxes and small air sealed boxes are used for storing the medicine which saves the medicine from the environmental effects and reduces the cost[3]. There are 3 containers used and the capacity of the each container is 15 days.

E. Power Supply:

Power supply sections provide necessary power to the whole circuitry. A 12V DC power supply is required for the microcontroller and for the speakers.

F. Keypad and Display:

The 4x3 matrix keypad is used. It is used to take input from the user and the 16x4 alphanumeric displays is used to view the time set and reset operations decided by the patient[1]. By using keypad we can 3 alarm clocks for each container that means total 9 alarms we can set.

Fig 5: Keypad And LCD Display

G. IR Sensor:

The infrared sensor is used to sense the input from the patient when the medicine is dispensing time is going on and if a patient is not present to take the medicines it gives information to the controller. In our system IR sensor is mainly used for avoid the problem of medicine lost. Our system not dispenses the medicine till IR sensor not detects hand. If IR sensor will detect then system will dispense the medicine

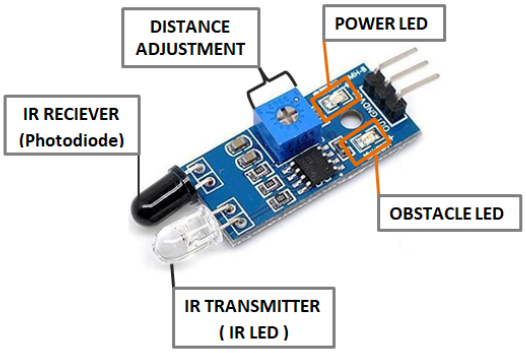

Fig 6: IR sensor module

H. Speakers:

The speakers are used to provide the voice indication to the patient [1]. It is also used to call the patient by its name and it can be also used to provide the warning sound to the patient.

V.ALGORITHM

1. Start
2. Connect the Power supply
3. Initialize Microcontroller, RTC and LCD Display.
4. Set alarm for each container and set RTC in current time.
5. Fill the containers with right medicines as per time.
6. An alarm will go off to indicate the timing for taking medicines.
7. If Wait=0 then system will not dispense.
8. If Wait=1 then controller inform to the motor.
9. If alarm=1Then system notify the user by the voice message

10. If IR=0 then stop the system will not dispense the medicine.
11. If IR=1 then stop dispensing then system drop the medicine in hand.
12. As per alarm, servo motors rotate and dispense the medicine.
13. Stop:

VI. Flow Chart

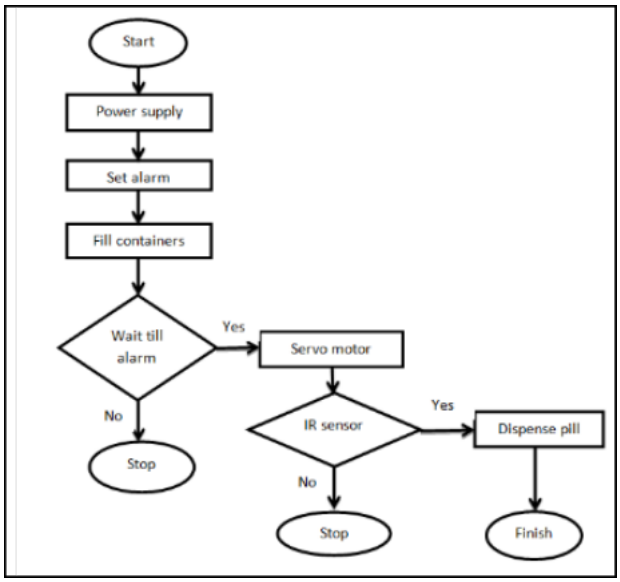

Fig 7: Flow Diagram

VII.SPECIFICATIONS

After analysing the working prototype, we were able to select some of the specifications of the final prototype.

A. Block Level Specifications
B. Technical Specifications

A. Block Level Specifications:

This determination describes the activity of each block to be used in the final prototype.

Blocks	Specifications
Microcontroller	Handle all the function of device
Keypad	Used to take user inputs, to set alarms
LCD Display	Show time to take pill & make user friendly environment
Speaker	Used for notification , in multiple languages
IR sensor	Detects the movement
Servo motor	Used to throw pills
RTC	Detects real time
Pill box	Store pills

Table 1: Block level specifications

B. Technical Specifications

Technical specifications are utilized to give the physical estimations of the prototype. Thus we have to choose every single estimation cautiously before definite execution. Below is the sketch of different technical specifications.

Metric	Specifications
Weight	<1.5Kg
Dimensions	45x25x15 cm
Manufacturing cost	<3000 Rs
Material used	Acrylic
LCD used	20x4
Microcontroller	Arduino uno, Atmega328p – 8 bit
Adapter	Input = 200 – 240V , Output = 12V , 1A

Table 2: Technical specifications

VIII. DETAILED DESIGN

In this section we have talked about the consequences of the prototype, Simulations, Prototype Models and Cost for the assembling. Fig 9 shows he actual prototype model.

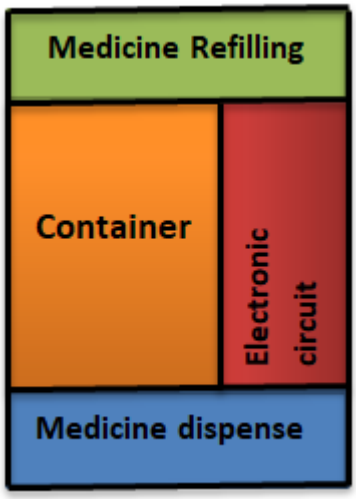

Fig 8: Medicine dispenser location

Fig 8 shows the location of our system. The electronic circuit is placed in front of container and we differ both sections from each other. Because of that the circuit is safe inside the electronic section

A. Prototype:

Fig 9: Prototype Model

B. Simulations results

We utilized Proteus software to simulate the code
before to real execution. Here are a few previews of
the equivalent.

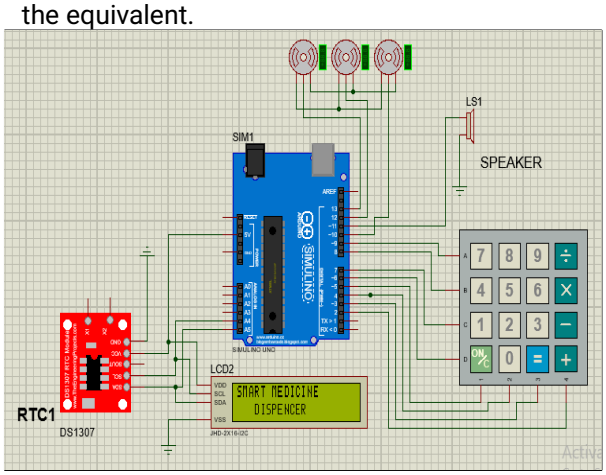

Fig 10: Simulation Result

C. Manufacturing cost

Components	Quantity	Cost (Rs.)
Arduino Uno	1	300
Speaker	1	100
20x4 LCD module	1	350
3x4 Keypad	1	150
Acrylic box	1	800
RTC	1	150
IR sensor	1	50
Servo motor	3	450
Total	8	2350

Table 3: Manufacturing cost

IX.RESULT AND DISCUSSION

This section provides tests related to the working of this device. There are a few conditions which give brief information about working of this device.

State I: Set alarm

Condition	IR sensor detected	Speaker	Pill dispensed	Result

1	No	No	No	Set alarms

Table 4: State I

In this state of working all the alarms are being set and while setting them IR sensor, speaker and servo motors remain off. In this state we can set up to three alarms for each container.

State II: Normal state

Condition	IR sensor detected	Speaker	Pill dispensed	Result
1	No	No	No	Waiting for alarm

Table 5: State II

In this state processor continuously check whether the real time and alarm times are same or not. While checking IR sensor and speaker remains in off state.

State III: Match time

Condition	IR sensor	Speaker	Pill dispensed	Result
1	no	active	no	Waiting for user response
2	active	off	yes	Pill dispensed successfully

Table 6: State III

This state has two conditions as follows:

Condition 1:
In condition 1, when the alarm time matches with real time, the speaker becomes activated and device goes to 'wait' state. While speakers are activated, IR sensor continuously checks for hand movement of the user. This process continues till 2 minutes and after that speakers automatically became off and device again goes into a normal state.

Condition 2:
If real time and alarm time became same and if IR sensor detects hand movement, then processor goes in this state where it gives the command to dispense pills. After dispensing pills processor goes into a normal state.

X. CONCLUSION

The main aim of this project is to cover a problem facing in current days. Now a day everybody is busier and older person require a caretaker. This system made a older person prescription very easy. This system is proposed especially for those people who used care taker for its medication schedule. In our system user set alarm as per its medicine time. If alarm time and real time will match then system is not dispense the medicine till user will not come. Because of that the chances of medicine lost is very less. We added the air tight small boxes to store the medicine because of that there is less chance to affect medicine by the environment.

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