SMART TABLET CABINET

MINI PROJECT REPORT

Submitted in partial fulfillment of the
Requirements for the award of Bachelor of Technology Degree
In Electronics and Communication Engineering
Of APJ Abdul Kalam Technological University

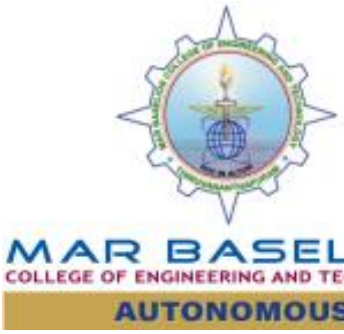
By

ADARSH.V (RegNo:MBT20EC011)

ADITH.V (RegNo:MBT20EC012)

MOHAMMED FINAZ.A (RegNo:MBT20EC062)

MRIDUL.M (RegNo:MBT20EC063)



DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
MAR BASELIOS COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
MAR IVANIOS VIDYANAGAR, NALANCHIRA,THIRUVANANTHAPURAM,695015.

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CERTIFICATE

This is to certify that this mini project report entitled “SMART TABLET CABINET” is a bonafide record of work done by ADARSH.V, ADITH.V, MOHAMMED FINAZ.A and MRIDUL.M of the sixth semester Electronics and Communication branch towards the partial fulfillment of the requirements for the award of Bachelor of Technology Degree in Electronics and Communication Engineering of APJ Abdul Kalam Technological University.

Guide	Coordinator	Head of the Department
Mr Sherry Varghese George **Asst. Prof,** **Dept. of ECE** **MBCET**	**Dr.Luxy Mathews** **Assoc. Professor,** **Dept. of ECE** **MBCET**	**Dr. Jayakumari J** **Professor,** **Dept. of ECE** **MBCET**

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ABSTRACT

It is a frequent observation that people give more preference to their work and other material things than taking care of their health. Working adults may forget to take their medicines, the situation can only be worse in the case of the aged. Taking care of the aged and ill people is of serious concern for everybody. In the modern age it is difficult for family members to be available all the time to support the old and sick. It is necessary to provide medication to the sick on time. Or else it may lead to unnecessary doctor or hospital visits, illness and even death. Hence there is a need to design a medication dispensing device that can help people to take medication on the correct schedule. Automatic medication dispenser is designed specifically for users who take medications without close professional supervision. It relieves the user of the error-prone tasks of administering wrong medicine at the wrong time. The major components of this medication dispenser are a pill container cum dispenser, an alarm system, an LCD display, and a motor controller. The overall operation is to facilitate the user to set the timings to dispense pills at required timings. The alarm system is designed to provide a beep sound. The major objective is to keep the device simple and cost efficient.

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CHAPTER-1

INTRODUCTION

In today's fast-paced world, one of the significant challenges faced by elderly individuals is the lack of attention and support they receive, particularly in terms of medication management. With many people working in demanding jobs or living far from their aging parents, ensuring that medications are taken correctly and on time becomes a daunting task. To address this issue, an automated pill dispenser mechanism has been developed, offering a solution to provide medications to the elderly at the correct time while incorporating reminder features through visual and auditory alarms.

An automatic pill dispenser is a technological solution designed to simplify medication management and improve medication adherence. It is particularly beneficial for individuals who take multiple medications or have difficulty remembering their medication schedules, such as the elderly or those with chronic conditions. This introduction provides an overview of the working principles behind an automatic pill dispenser, highlighting its key components and functionality. The primary objective of an automatic pill dispenser is to ensure that medications are taken at the right time and in the correct dosage. The dispenser typically consists of a secure container or compartments that hold individual doses of medication. These compartments are pre-loaded with medications according to the prescribed schedule. The dispenser is programmable, allowing users or caregivers to input the medication schedule and dosage instructions. This can be done through a user-friendly interface. The programming capabilities of the dispenser enable customization based on individual needs and medication regimens. At the designated time, the automatic pill dispenser activates an internal mechanism to release the appropriate dose of medication from the corresponding compartment. The release mechanism can be based on mechanisms such as mechanical rotation.

In conclusion, automatic pill dispensers offer a technological solution to streamline medication management and enhance adherence. Their programmable features, reminder systems contribute to improved medication intake and reduce the burden of medication administration for individuals, caregivers, and healthcare professionals alike.

CHAPTER-2

LITERATURE SURVEY

K R Karthikeyan,E Dharan Babu,S Ranjith,S Arunkumar in ‘Smart Pill Dispenser for aged Patients’ they said An automated pill dispenser can indeed incorporate LED blinkers and an alarm system as part of its reminder mechanism. These features enhance the visual and auditory cues to alert the elderly individuals to take their medication at the designated time.In addition to the reminder mechanism, an automated pill dispenser typically includes other essential components such as secure storage compartments for medications, a programmable interface to set dosing schedules, and a mechanism for dispensing the correct dose at the designated time. Patented in 2021.

Shaantam Chawla in ‘The autonomous pill dispenser: Mechanizing the delivery of tablet medication’ she said A compact and circular disc-shaped structure with individual compartments is a feasible design for an automated pill delivery system. Such a design allows for efficient and organized dispensing of medications. The compartments can be tailored to accommodate various pill sizes commonly available in the market, ensuring compatibility with a wide range of medications.When it comes to selecting and designing the compartments, considerations should be given to factors such as pill size, shape, and packaging. The compartments should be appropriately sized to securely hold each medication, preventing mixing or spillage.

Additionally, the structure should incorporate measures to maintain the integrity of the pills, such as protecting them from light, humidity, or accidental crushing. Patented on 2016 Madankar,Akhilesh Agrawal,Vedant Yede in ‘IoT based Advance PillReminder System for Distinct Patients Abhishek ‘ they said Indeed, the integration of Internet of Things (IoT) technology can greatly enhance the functionality and capabilities of an automated pill dispenser. IoT enables the seamless connection and communication between various components of the dispenser, providing real-time data monitoring, remote control, and enhanced user interaction.Here are some ways in which IoT can be integrated into an automated pill dispenser Connectivity and Remote Monitoring, Mobile Applications and Web Interfaces,Alerts and Reminders,MedicationInventory Management,Data Analytics and Insights.Patented on 2021

CHAPTER-3

COMPONENTS

- ARDUINO BOARD
- LCD DISPLAY
- BUZZER
- BREADBOARD
- JUMPER WIRES
- RTC MODULE
- STEPPER MOTOR
- CELL

CHAPTER-4

TECHNOLOGY IN GENERAL

BLOCK DIAGRAM

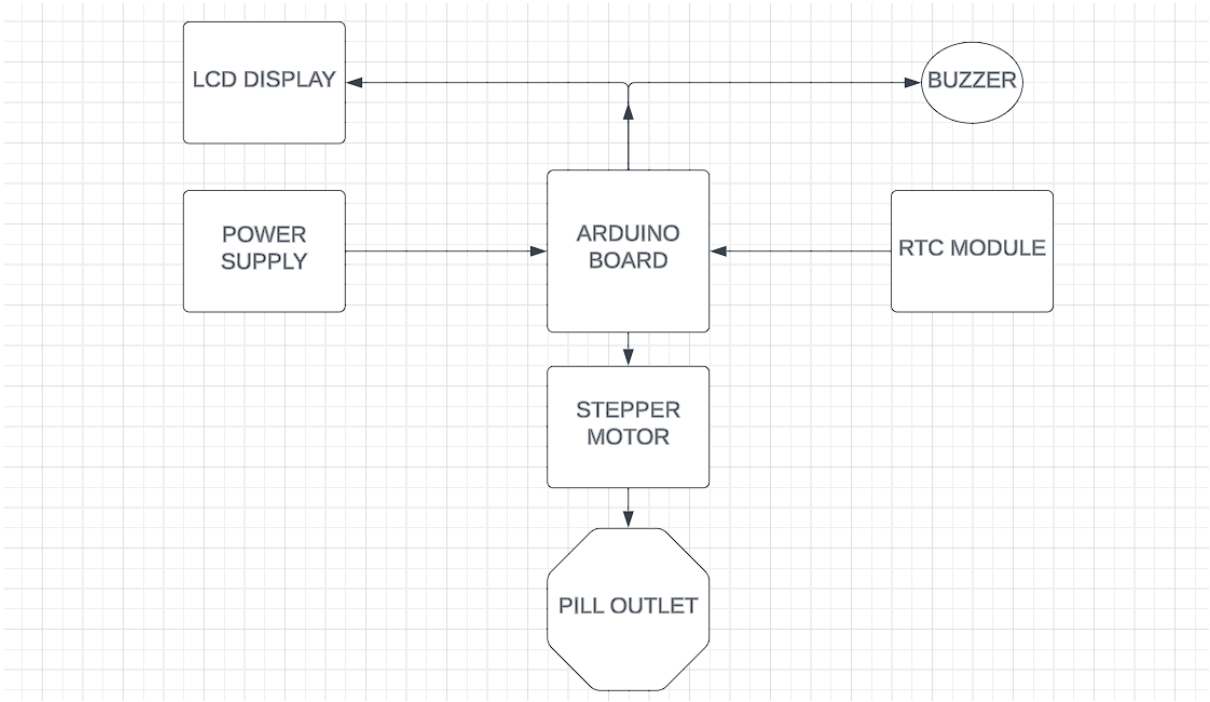

fig 4.1(Block Diagram)

Real-Time Clock (RTC) Module : The inclusion of an RTC module allows the pill dispenser to obtain real-time information, such as date and time. This information serves as an input for the microcontroller to determine the appropriate timing for pill dispensing.

LCD Display : The pill dispenser incorporates an LCD display to provide a visual representation of the current date and time or any relevant information related to the medication schedule. It allows users to view the scheduled dispensing times or any additional notifications.

Buzzer Alert : To notify the user when a pill has been dispensed, a buzzer or sound-producing device is employed. When a pill is released and drops into the funnel, the buzzer is activated, providing an audible alert.

Motor Return : After a brief delay of a few seconds to ensure the pill has been dispensed, the motor returns the quadrant to its original position, ready for the next pill dispensing cycle.

Stepper Motor : A stepper motor is an electromechanical device that converts electrical power into mechanical power. Also, it is a brushless, synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor’s position can be controlled accurately without any feedback mechanism, as long as the motor is carefully sized to the application.

CHAPTER-5
TECHNOLOGY IN SPECIFIC

ARDUINO BOARD

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010. The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery. It has the same microcontroller as the Arduino Nano board, and the same headers as the Leonardo board. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

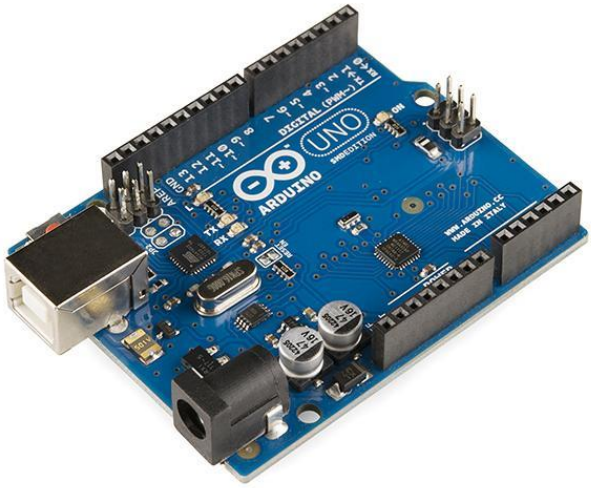

fig 5.1(Arduino Uno Board)

STEPPER MOTOR

An electromechanical device known as a stepper motor transforms electrical power into mechanical power. Additionally, it is a synchronous, brushless electric motor that has a large number of steps per entire rotation. As long as the motor is carefully sized for the application, the position of the motor can be regulated precisely without the use of a feedback system. Similar to switching reluctance motors are stepper motors. When an electrical pulse is applied, the stepper motor turns the motor shaft a specific amount using the magnetism theory of action. The rotor has six poles, whereas the stator has eight. To move the 24 steps needed for one full rotation, the rotor will need 24 electrical pulses. Here's another way to put it:The stepper motor can be controlled by individually igniting each stator. As a result, the stator will get magnetized and function as an electromagnetic pole that propels the rotor forward using repulsive energy. The rotor will move gradually and turn with excellent control thanks to the stator's alternate magnetizing and demagnetizing.

fig 5.2(Stepper Motor)

BUZZER

A buzzer can be utilized in an automated pill dispenser to provide audible alerts and reminders.It can be programmed to generate audible sounds at designated medication times, serving as a reminder for users to take their medication. It can produce beeps to attract the user’s attention and prompt them to access the dispenser. In situations where a user fails to retrieve their medication within a specific timeframe, the buzzer can be activated to emit a continuous or intermittent alarm. This alarm indicates a missed dose, ensuring that users are aware of any deviations from their medication schedule. After a dose of medication is

successfully dispensed, the buzzer can produce a short sound or beep to confirm that the medication has been released. This audible confirmation provides reassurance to users that the correct dosage has been dispensed, aiding in medication adherence. By incorporating a buzzer into an automated pill dispenser, audible alerts and reminders are provided, enhancing the effectiveness of medication management. The buzzer serves as an important auditory component, complementing visual cues and notifications to ensure users are promptly reminded and informed about their medication

fig 5.3(Buzzer)

LCD DISPLAY

An automated pill dispenser that uses an LCD (Liquid Crystal Display) screen gives a visual interface that offers crucial data and user interactions. It displays the scheduled drug schedule, along with dosage information and instructions. The screen is easily accessible for users to keep track of their medication schedule and make sure they are taking the proper medicines at the right times. For each medicine, specific dosing recommendations are provided. This includes precise directions, such as taking a drug with food or avoiding certain substances, as well as details like dosage quantity, frequency, and other information. Users can assure effective administration when this information is easily accessible on the screen. To remind people to take their medication, it shows the current date and time.

fig 5.4(LCD Display)

RTC MODULE

The main purpose of a real time clock, also known as an RTC, is to maintain precise timekeeping even when a power source is off or a device is in low power mode. A controller, oscillator, and embedded quartz crystal resonator make up RTCs. They are designed as all-in-one units to perform better than separate components, make integration into new designs simpler, and shorten the time to market.

Registers are the name for the RTC's functions. In RAM memory, register data is programmed. Even when the RTC is functioning normally, the registers are frequently updated. Along with battery operation or another low power backup power source, the RTC design also features a power switch capability. The RTC can retain accuracy and consistency because of this.

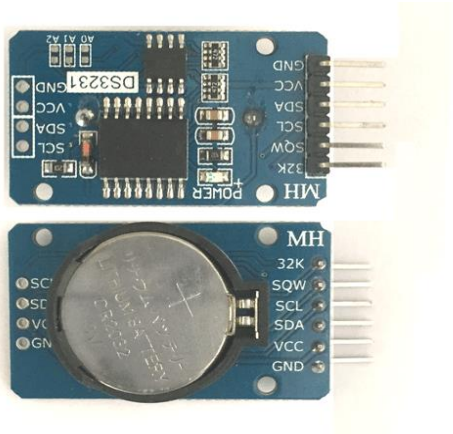

fig 5.5(RTC Module)

CHAPTER-6

HARDWARE IMPLEMENTATION

CIRCUIT DIAGRAM

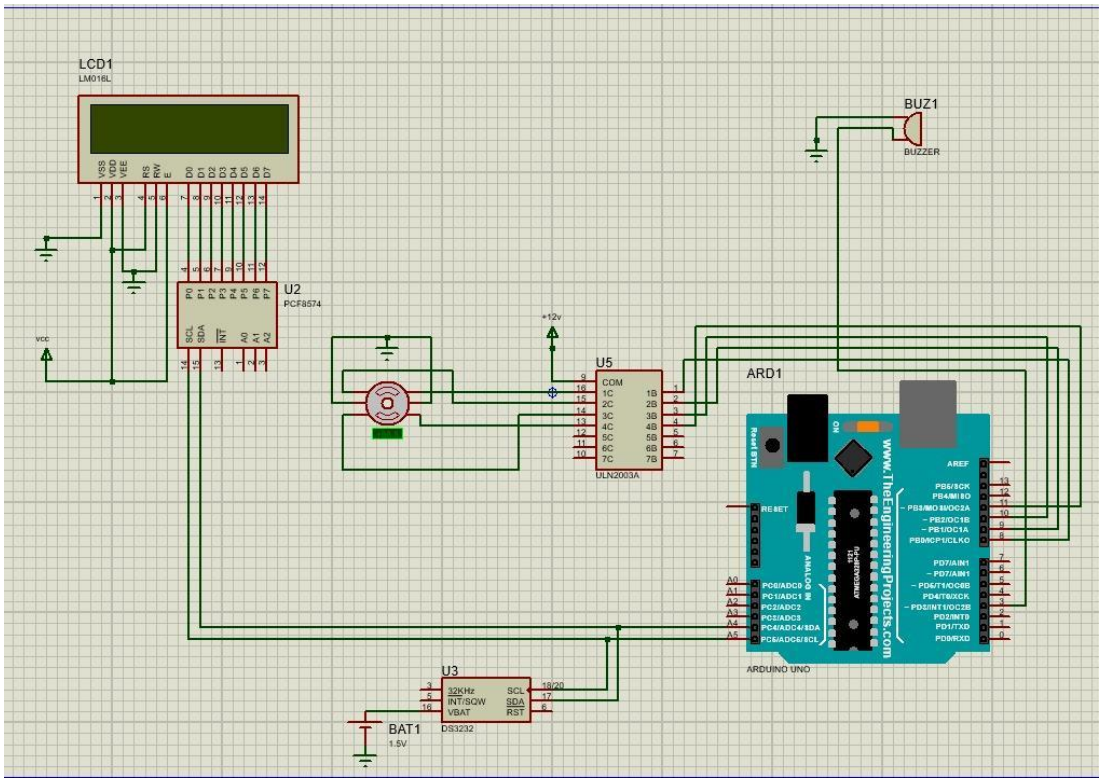

fig 6.1(Circuit Diagram)

WORKING

Pill Storage: The pills are stored in a cylindrical tube with dimensions modified to accommodate the size of the pills. The tube is designed in such a way that the pills can only pass through a hole located at one end of an arc-shaped quadrant.

Dispensing Mechanism: The dispensing mechanism consists of a motor connected to the pointed end of the quadrant. When activated, the motor rotates the quadrant by 90 degrees. This movement brings the pill along with it, causing it to drop into a funnel or chute for easy collection.

Pill Release and Storage: As the quadrant rotates, the other end of the arc closes the cylinder, preventing the remaining pills from falling through the hole. This closing action ensures that only one pill is dispensed at a time, while the rest remain securely stored within the cylindrical tube.

Control Components: The motor is connected to an arduino board which serves as the central processing unit of the pill dispenser. The microcontroller receives input signals, likely from a real-time clock (RTC) module, to synchronize the pill dispensing schedule based on the current time.

CHAPTER-7

SOFTWARE IMPLEMENTATION

ALGORITHM

1. Initialize Variables and Libraries:

- Include the necessary libraries (DS3231, LiquidCrystal, LiquidCrystal_I2C, Stepper).
- Define global variables for storing date and time components (styear, stmon, stdate, sthour, stsec),
- Define the buzzer pin (buzzer = 3),
- Create instances of DS3231, LiquidCrystal_I2C, and Stepper classes.
- Set the motor speed (motorSpeed = 10).

2. Setup Function:

- Initialize communication with RTC and Serial (9600 baud rate).
- Initialize the LCD with the I2C address (0x27), number of columns (16), and number of rows (2).
- Initialize the LCD backlight.
- Set the buzzer pin as an output.

3. Loop Function:

- Clear the LCD display.
- Read the current date and time from the RTC and store it in the 't' variable.
- Display the date and time on the LCD.
- Wait for 1 second (1000 milliseconds).

4. Check Time Condition:

- Check if the current time matches the specified time (20:40:00) using 't.hour', 't.min', and 't.sec'.
- If the condition is true.
- Activate the buzzer by setting the buzzer pin to HIGH.
- Call the 'rotatStepper()' function to rotate the stepper motor.
- Wait for 1 second.
- Turn off the buzzer by setting the buzzer pin to LOW.

5. 'rotatStepper()' Function:

- Set the speed of the stepper motor using 'myStepper.setSpeed(motorSpeed)'.
- Rotate the stepper motor 256 steps in one direction using 'myStepper.step(256)'.
- Wait for 1 second.
- Rotate the stepper motor 256 steps in the opposite direction using 'myStepper.step(-256)'.
- Wait for 1 second.

6. Repeat:

- The loop function repeats from step 3, continuously checking the time condition and updating the LCD display.

ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

TINKERCAD

Tinkercad is a free-of-charge, online 3D modeling program that runs in a web browser. Since it became available in 2011 it has become a popular platform for creating models for 3D printing as well as an entry-level introduction to constructive solid geometry in schools

Tinkercad uses a simplified constructive solid geometry method of constructing models. A design is made up of primitive shapes that are either "solid" or "hole". Combining solids and holes together, new shapes can be created, which in turn can be assigned the property of solid or hole. In addition to the standard library of primitive shapes, a user can create custom shape generators using a built-in JavaScript editor.

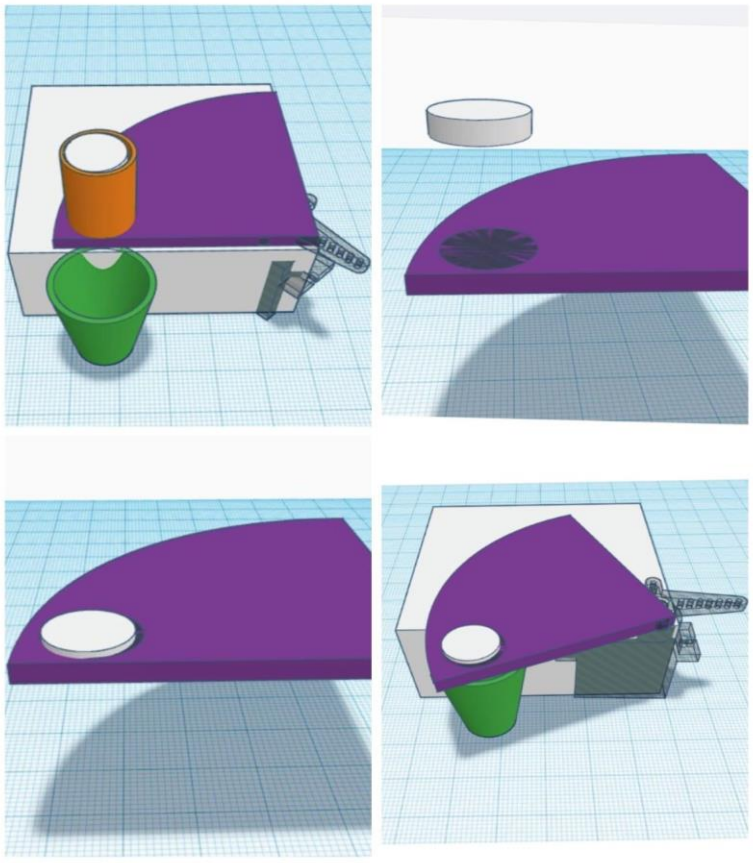

fig 7.1(3-D Model)

PROTEUS

Free online 3D modeling software called Tinkercad works in any web browser. Since it became accessible in 2011, it has grown in popularity as a tool for developing models for 3D printing and serving as an introductory course in constructive solid geometry at educational institutions.

Former Google engineers Kai Backman and Mikko Mononen established Tinkercad with the intention of making 3D modeling, particularly the design of tangible objects, available to everyone and enabling users to submit their designs under a Creative Commons license. In 2011, the website tinkercad.com was launched as a web-based 3D modeling tool for browsers with WebGL support. and the business relocated its headquarters to San Francisco in 2012. More than 100,000 3D designs had been released by the year 2012

By applying a hex file or a debug file to the microcontroller portion on the schematic, Proteus's microcontroller simulation functions. The associated analog and digital electronics are then co-simulated with it. This makes it possible to use it for a variety of project prototyping in fields including temperature control, user interface design, and motor control. It is also useful to general hobbyists and since no hardware is needed, it is simple to use as a teaching or training tool

CHAPTER-8

RESULT

Our prototype model of Smart Tablet Cabinet(STC) was successfully implemented in full working condition.STC serves as a reliable reminder and is good and easy to use. With the use of this device, the medication adherence will definitely improve, especially in elderly patients and patients with chronic and period medicine, which in turn will ensure better treatment effectiveness. Our device is simple, compact and portable.

CHAPTER-9

TOTAL COST

1. ARDUINO UNO BOARD - Rs 850
2. RTC MODULE - Rs250
3. I2C SERIAL INTERFACE ADAPTER - Rs 85
4. BREADBOARD - Rs100
5. BUZZER -Rs 25
6. STEPPER MOTOR - Rs 280
7. 3-D PRINTING- Rs 2440

TOTAL COST-Rs 4030

CHAPTER-10

CONCLUSION

Our Medication reminder system is a useful resource for those who need technological help in completing or need help in working through day-to-day tasks and taking care of their health. It is a smart and organized system that is designed to help the elderly people in our homes, but we have not put any restrictions that stop an everyday user from using the system. Anyone can need medical attention and people forget to take their prescriptions as well. The STC will help them out in regulating their medications and can also help a working person with a busy schedule. It is a cost efficient, user friendly device upon which one can rely on for timely intake of medicines. Accurate and automatic dispense of pills is carried out by the combined action of the Arduino board, the alarm system and the dispensing unit.

CHAPTER-11

FUTURE SCOPE

As of now, STC can only dispense pills at preprogrammed time slots which can be selected using the corresponding pushbutton. To make it more user friendly, we may introduce a system where the user can set the medication time using their smartphones from anywhere. For this purpose we need to use a Wi-Fi module. Features to indicate that it is time to refill the pills can also be included. It is even possible to extend this STC system into a robo-doc. Like these, many functions can be added to the dispenser to improve its user friendliness and effectiveness.

CHAPTER 12

REFERENCES

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CHAPTER 13

APPENDIX

PROGRAM

```
#include <DS3231.h>

#include <LiquidCrystal.h>

#include <LiquidCrystal_I2C.h>

#include <Stepper.h>


int styear;

int stmon;

int stdate;

int sthour;

int stsec;

int buzzer = 3;


DS3231 rtc(SDA, SCL);

Time t;

LiquidCrystal_I2C lcd(0x27, 16, 2);

int motorSpeed =10;

Stepper myStepper(2048, 8,10,9,11);

void setup ()

{
```

```
 rtc.begin ();
 Serial.begin (9600);
 lcd.init();
 //rtc.setDate(19, 7,2023);
 //rtc.setTime (14,14,00) ;
 //rtc.setDOW (WEDNESDAY) ;
 lcd.backlight();
 pinMode(buzzer,OUTPUT);
}
void loop ()
{
 lcd.clear();
 lcd.backlight();
 t=rtc.getTime () ;
 lcd.setCursor(0, 0);
 lcd.print ("Date:");
 lcd.print (t.date);
 lcd.print ("-");
 lcd.print (t.mon);
 lcd.print ("-");
 lcd.println (t.year);
 lcd.setCursor(0, 1);
 lcd.print ("Time:");
```

```
 lcd.print (t.hour);
 lcd.print (":");
 lcd.print (t.min);
 lcd.print (":");
 lcd.println (t.sec);
 delay (1000) ;
 if(t.hour==20 && t.min == 40 && t.sec==0)
//if(t.sec%10==0)//(t.hour==19 && t.min == 11 && t.sec == 0)//t.hour == 7 && t.min == 30||
t.hour == 19
//t.date == 20 && t.hour ==7 && t.min == 30
{
 digitalWrite(buzzer,HIGH);
 rotatStepper();
 delay(1000);
 digitalWrite(buzzer,LOW);
}


}
void rotatStepper()
{
  myStepper.setSpeed(motorSpeed);
  myStepper.step(256);
  delay(1000);
```

```
  myStepper.step(-256);

  delay(1000);

}
```

1