BLUETOOTH CONTROLLED HOME AUTOMATION SYSTEM

PREPARED BY: GROUP CG08

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INTRODUCTION

The use of smart devices in everyday life is growing rapidly, and home automation is a significant area of advancement. Home automation technology enhances comfort, efficiency, and convenience in living spaces by allowing easy control of household appliances.

Our project, the Bluetooth Controlled Home Automation System, aims to provide a user-friendly and cost-effective solution for automating household tasks. Utilizing Bluetooth technology, users can control home appliances via their smartphones. Key features include text-controlled light bulbs and a temperature-based fan control system.

Text-controlled light bulbs allow users to switch lights on or off and adjust brightness with simple text commands, enhancing convenience and energy efficiency. The temperature-based fan control system automatically adjusts fan speed based on room temperature, ensuring optimal cooling and energy savings.

Overall, our Bluetooth Controlled Home Automation System simplifies household management, making homes smarter, more efficient, and comfortable.

PROBLEM STATEMENT:

Traditional home automation systems can be expensive and complicated to install, often requiring extensive wiring and setup. Many people are looking for simpler, more cost-effective solutions that they can install and manage themselves. Our project addresses this need by creating a system that uses Bluetooth technology. The system also includes a feature to automatically control the fan speed based on the room temperature.

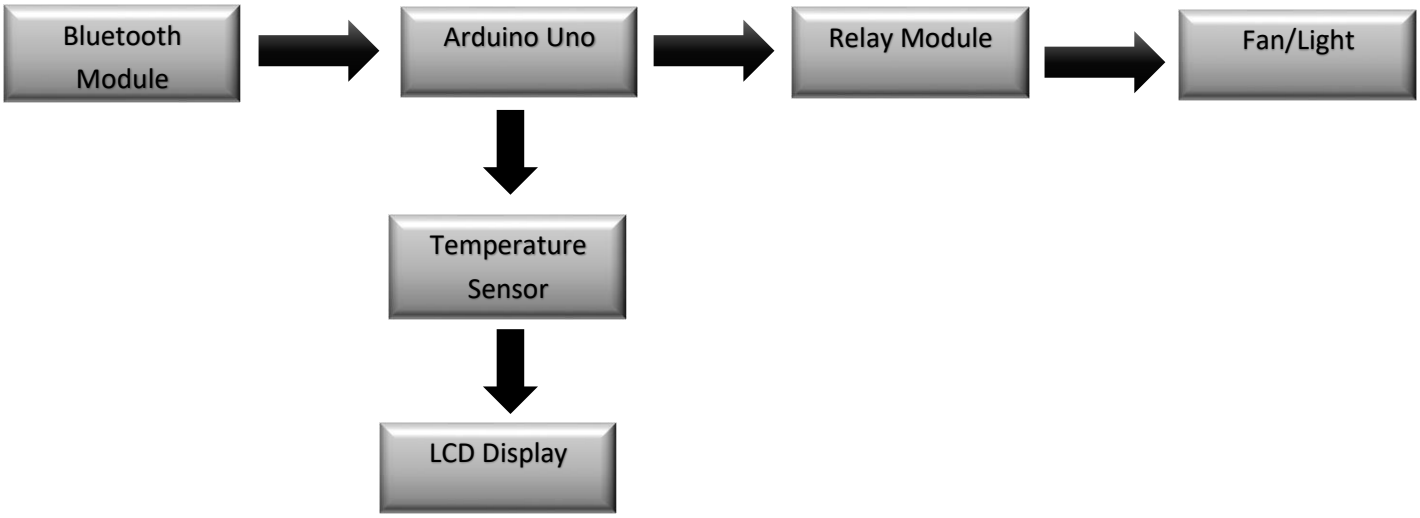
SOLUTION & SCOPE:

Our solution involves using Arduino microcontrollers to build a Bluetooth-enabled home automation system. By using widely available and inexpensive components, we have created a system that is easy to assemble and use. The system allows users to control various home appliances such as lights and fans through text commands sent via a smartphone. In addition, a temperature sensor is integrated to automatically adjust the fan speed according to the ambient temperature, ensuring optimal comfort and energy use.

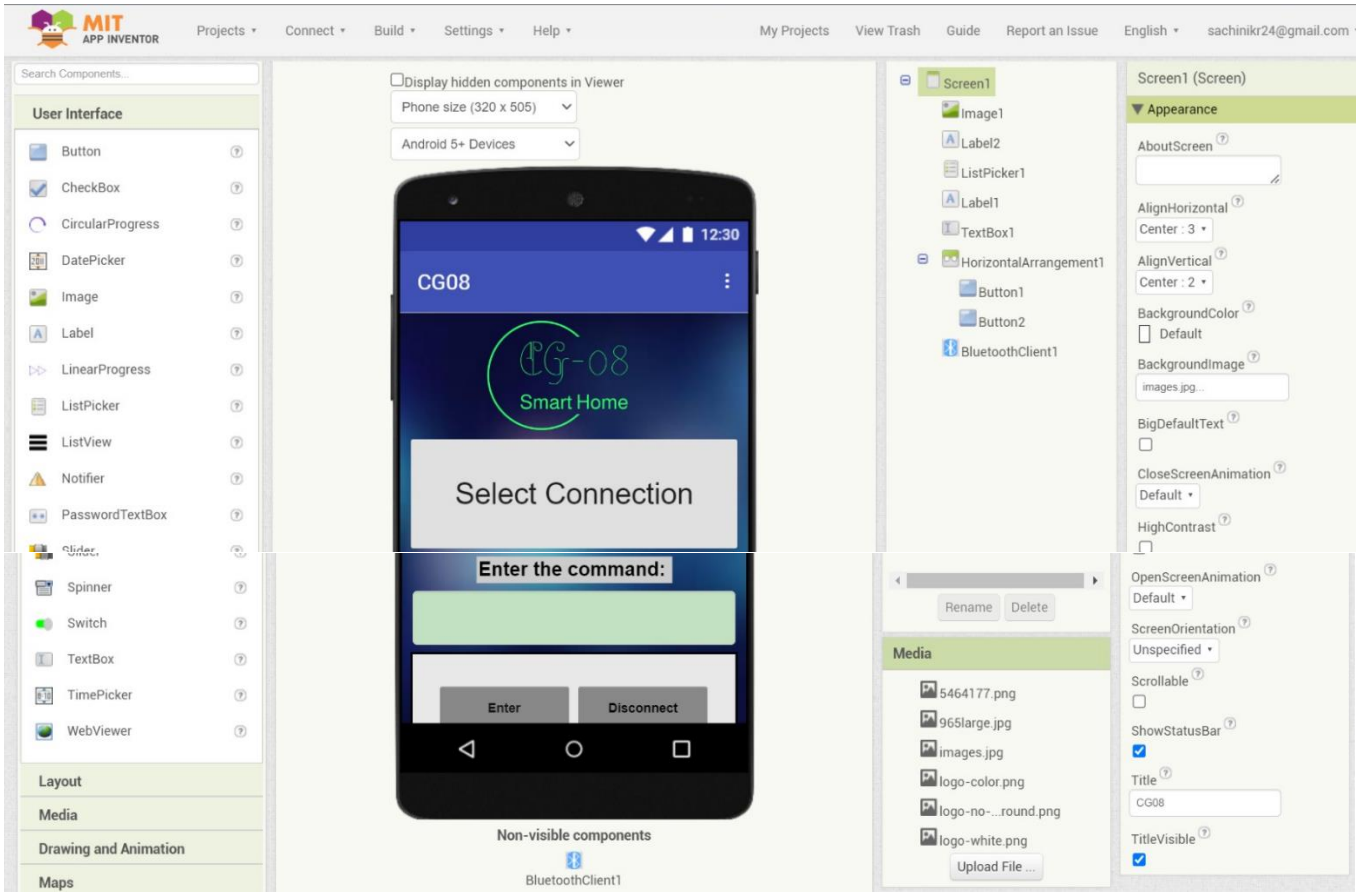
Developing a temperature-based fan control system that automatically turns off and cannot be manually controlled when the temperature is below 25°C, and that automatically turns on and can be manually controlled using text commands when the temperature exceeds 25°C, with fan speed adjusting according to the temperature.

PROJECT DESIGN AND IMPLEMENTATION

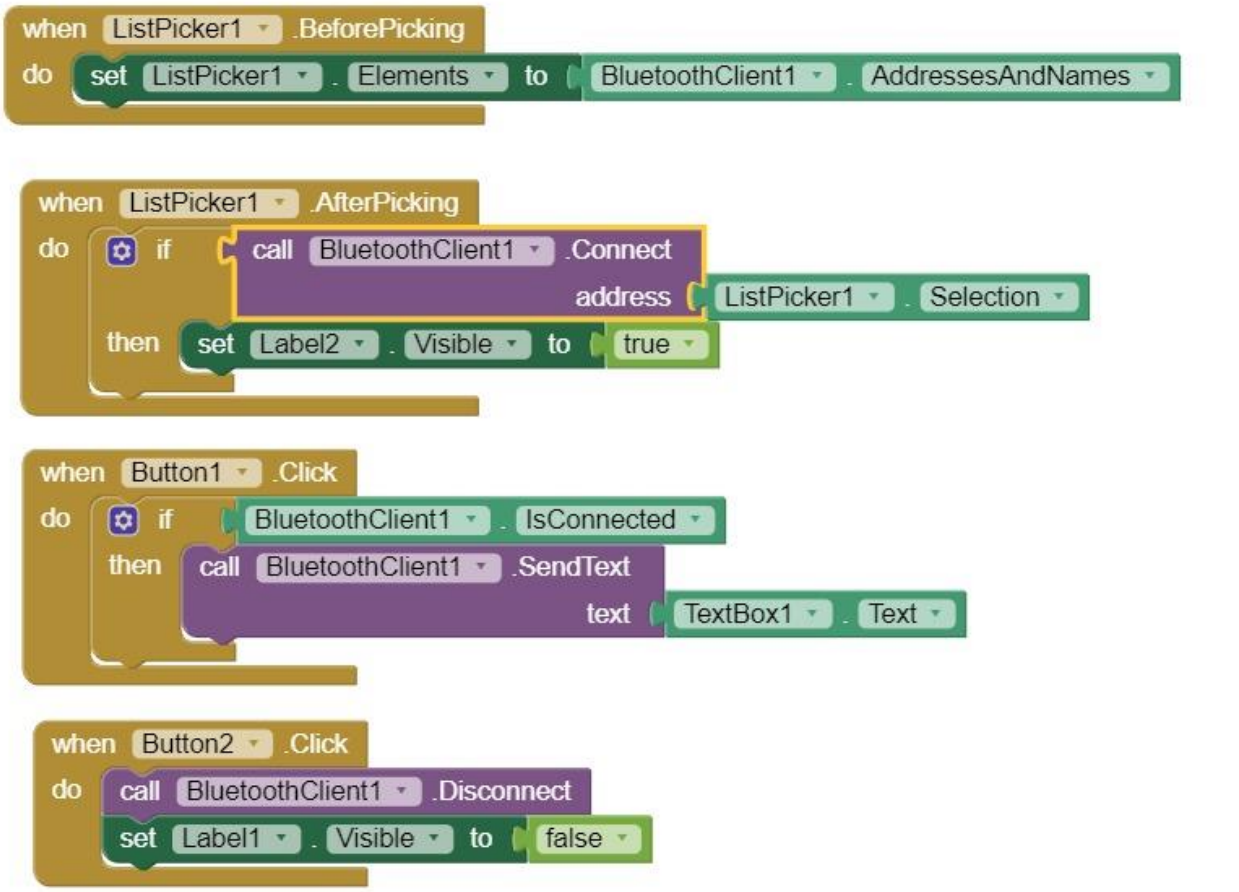
HARDWARE DESIGN INCLUDING BLOCK DIAGRAMS AND SCHEMATICS:



SMART HOME APP DESIGN USING MIT SOFTWARE:

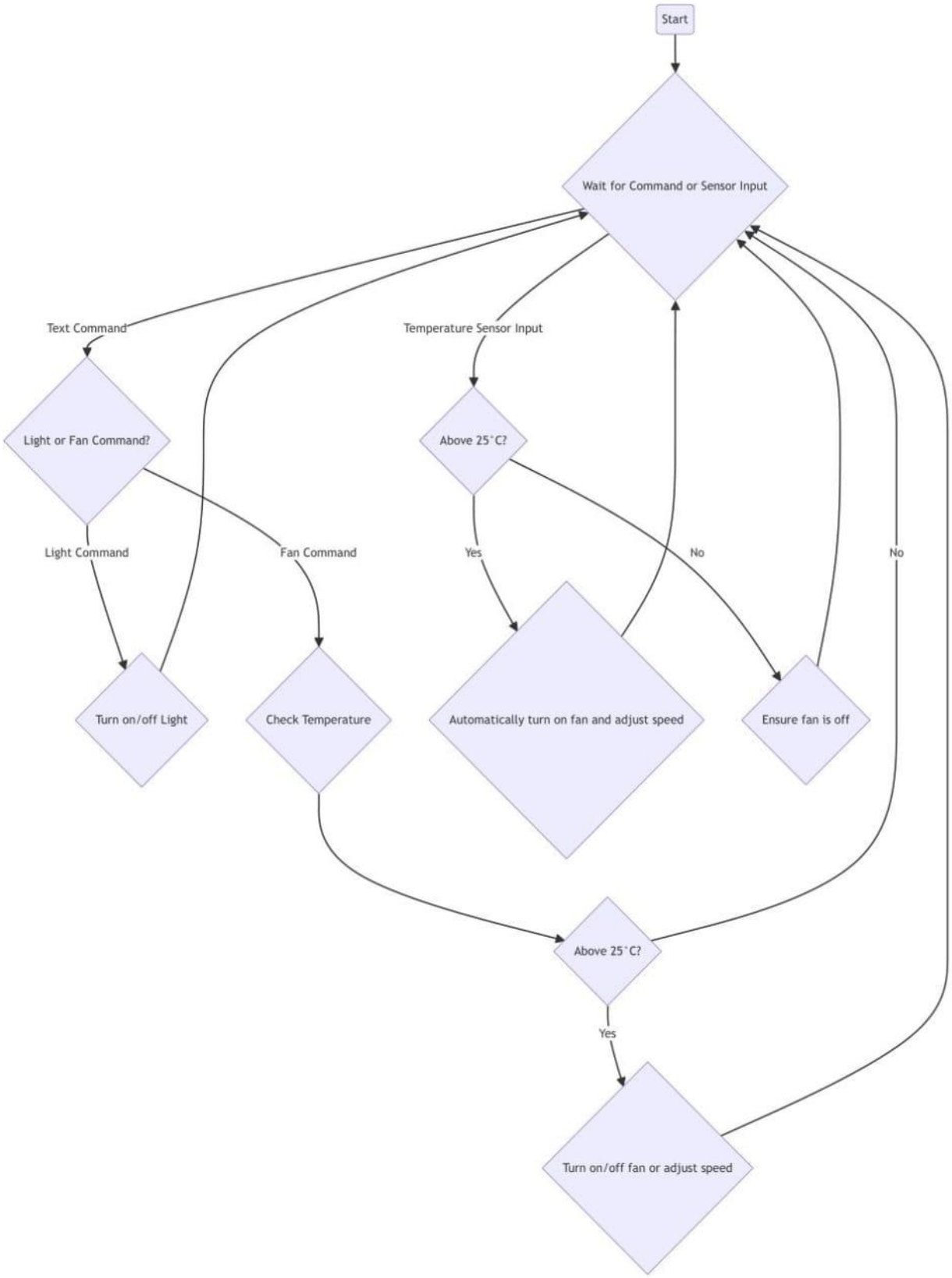


BLOCK DIAGRAM

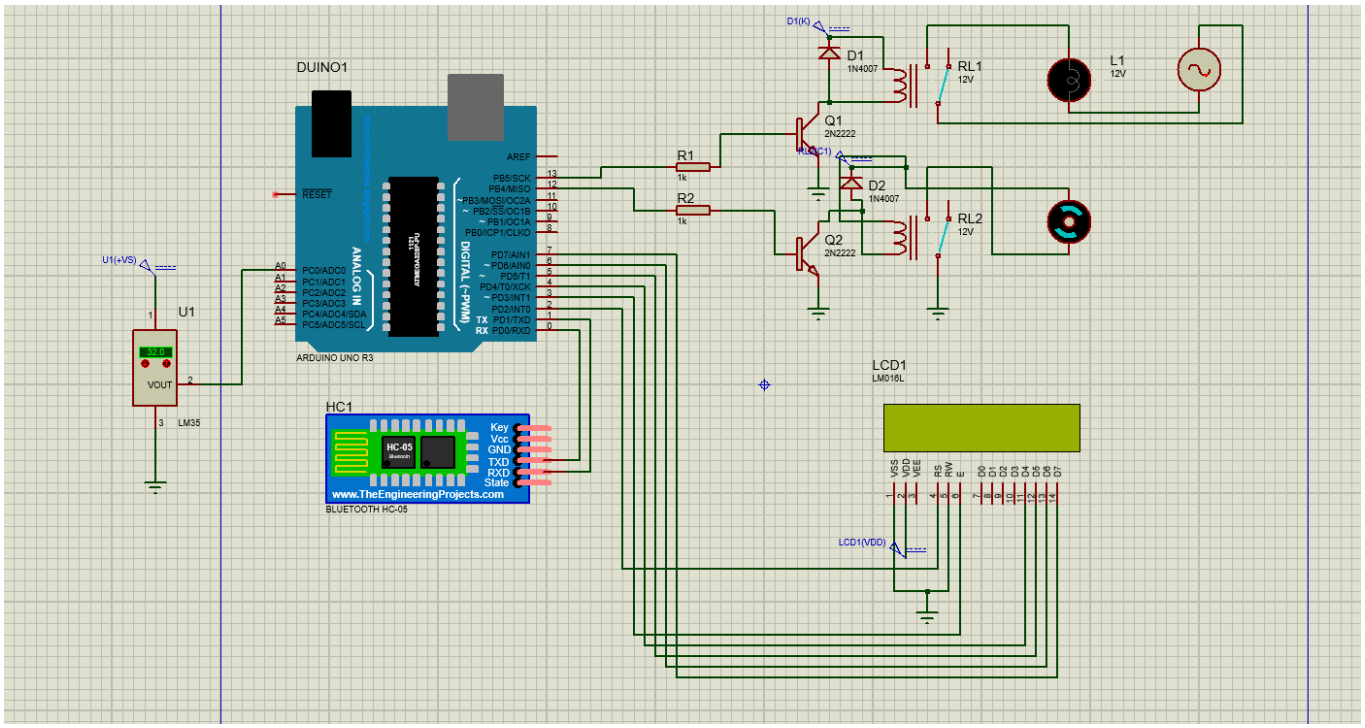


COMPONENTS:

FLOW CHART FOR THE WORKING PRINCIPLE OF SYSTEM:

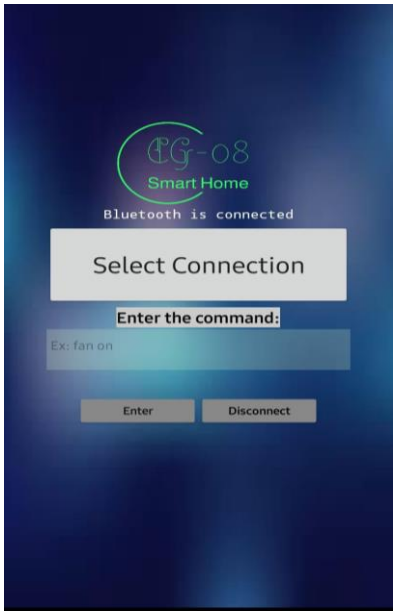


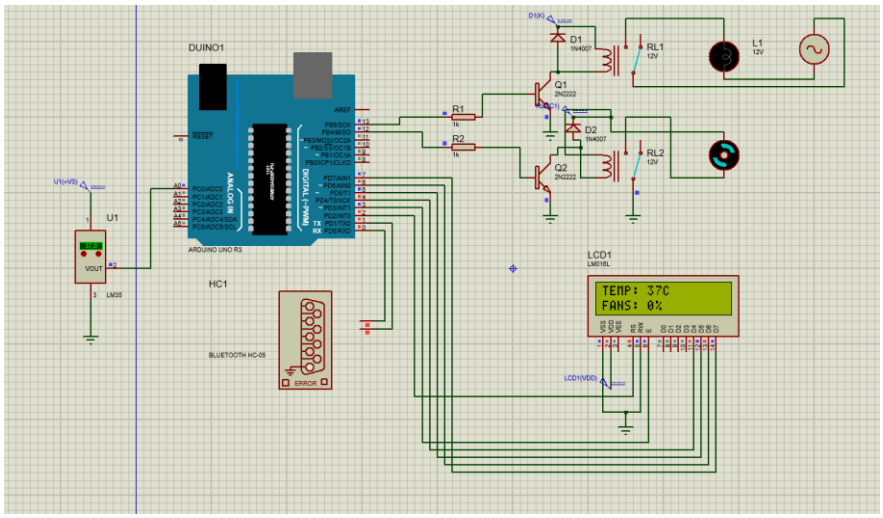
Proteus Design: We used Proteus software to design and simulate hardware components before actual implementation. Proteus allows us to create virtual models of our circuits, test their functionality, and troubleshoot potential problems without the need for physical components.

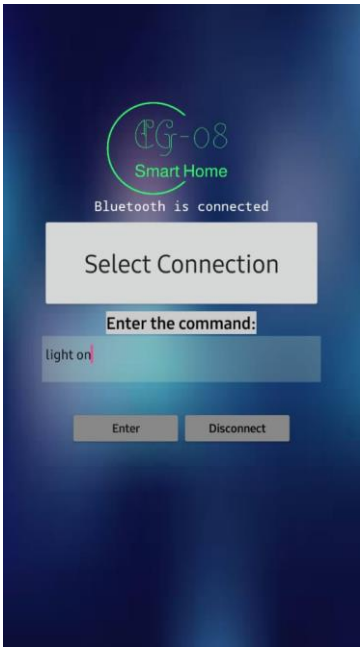


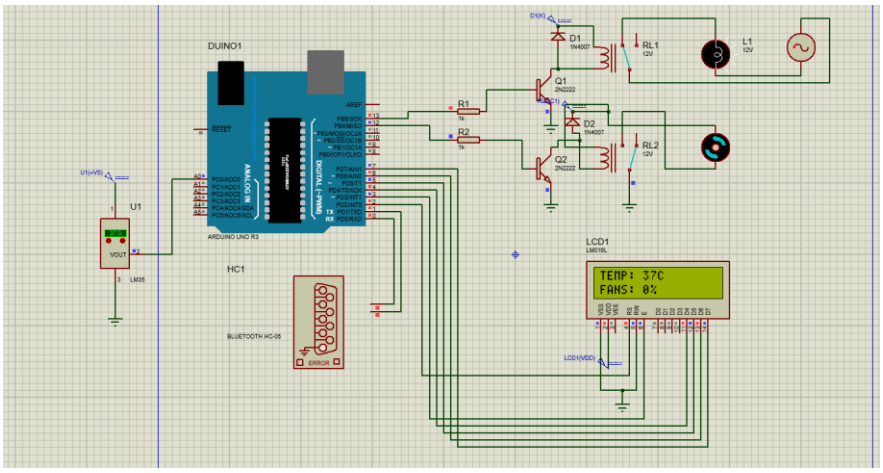
INTERFACING:

Interfacing the Bluetooth module with the Arduino allows for wireless communication between the user's smartphone and the home automation system.

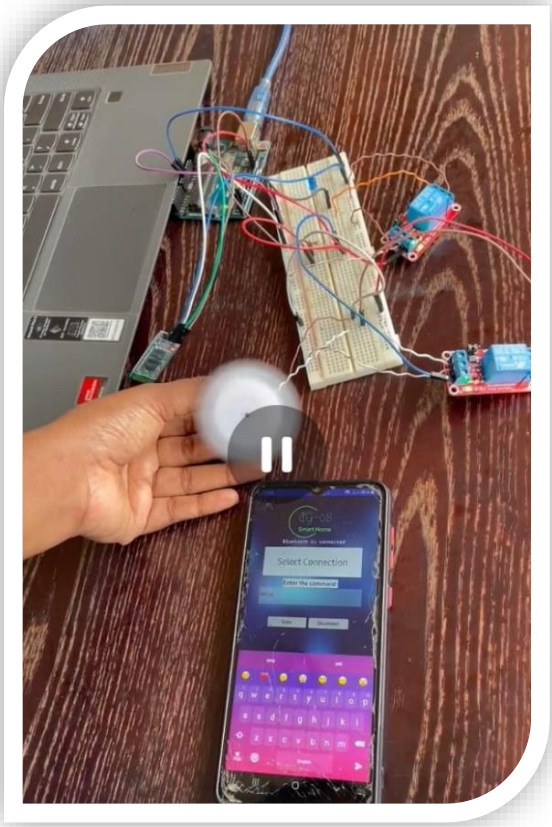

EG-08
Smart Home
Bluetooth is connected
Select Connection
Enter the command:
Ex: fan on
Enter
Disconnect

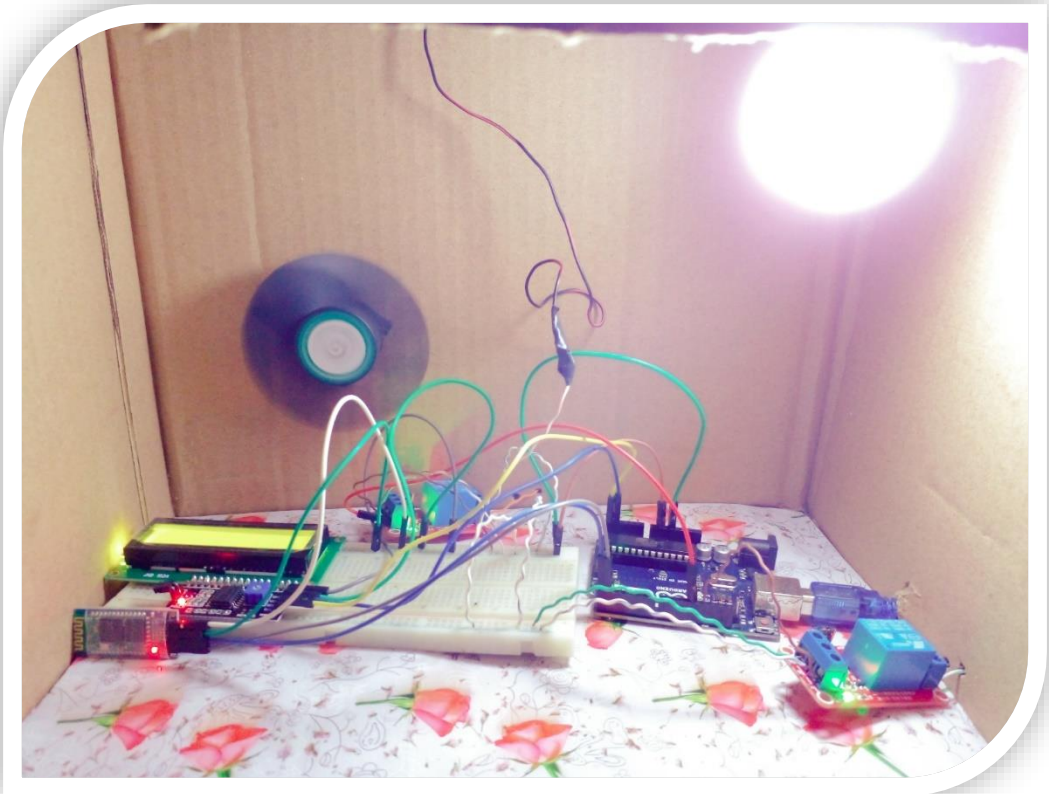

DUINO1
U1
HC1
BLUETOOTH HC-05
LCD1
TEMP: 37C
FANS: 0%
RL1
RL2
L1
Q1
Q2
D1
D2
R1
R2


EG-08
Smart Home
Bluetooth is connected
Select Connection
Enter the command:
light on
Enter
Disconnect


DUINO1
U1
HC1
BLUETOOTH HC-05
LCD1
TEMP: 37C
FANS: 0%
RL1
RL2
L1
Q1
Q2
D1
D2
R1
R2

IMPLEMENTATION:





CHALLENGES OR PROBLEMS FACED AND SOLUTIONS

During the development of the Bluetooth Controlled Home Automation System, we encountered several challenges.

❖ POWER SUPPLY ISSUES

Challenge:
There were instances of power supply instability, which caused the microcontroller to reset or behave unpredictably.

Solution:
- Used a regulated power supply to ensure a stable voltage output.
- Added capacitors to the power supply circuit to filter out voltage spikes and dips.
- Ensured proper grounding and minimized electrical noise in the circuit.

❖ SOFTWARE BUGS AND INTEGRATION ISSUES

Challenge:
Integrating different software components (Bluetooth communication, sensor data processing, and device control) led to unexpected bugs and system crashes.

Solution:
- Conducted thorough code reviews and testing to identify and fix bugs.
- Used modular programming practices to isolate different functionalities, making it easier to test and debug each module independently.
- Implemented robust error handling and recovery mechanisms to maintain system stability.

❖ LIMITED RANGE OF BLUETOOTH COMMUNICATION

Challenge:
The Bluetooth module had a limited range, which restricted the control distance for the home automation system.

SOLUTION:
- Optimized the antenna placement and orientation to maximize the Bluetooth range.
- Considered using Bluetooth repeaters or an alternative wireless communication technology for future enhancements to extend the range.

TIMELINE

Task	Week									
	5	6	7	8	9	10	11	12	13	14
Design Task Title Selection										
Literature Review										
Design Task title Submission										
Proposal Submission										
Circuit Design, Simulation and Programming										
Mid Review Presentation Submission										
Physical Implementation										
Mid Evaluation										
Final Testing										
Final Report										
Project Completion & Evaluation										

COMPONENTS AND COST

Component	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Arduino Uno	2	2850	5700
16x2 LCD module	1	360	360
6V relay	2	120	240
HC-05 Bluetooth module	1	950	950
12V fan	1	280	280
LM35 temperature sensor	1	200	200
12V power supply	1	650	650
Jumper wires	1 pack	170	170
Breadboard	1	140	140
LED	3	5	15
DC bulb	1	95	95
Bulb holder	1	80	80
1k resistor	2	50	100
1N4007 Diode	1	3	3
2N2222 Transistor	1	6	6
10uF capacitor	1	3	3
Total Cost			**8992**

REFLECTION ON APPLIED KNOWLEDGE

Throughout this project, we applied a wide range of concepts and skills learned in our course. Working with the Arduino microcontroller allowed us to practice programming in Arduino C/C++, interfacing with various hardware components, and handling asynchronous events such as Bluetooth communication. Designing the circuit required us to choose the right components, create the schematics and build a working prototype on a breadboard. We used Proteus for simulation, which helped us troubleshoot potential problems before physical assembly.

Overall, this project bridges the gap between theory and practice, improves our skills in programming, electronics and system integration, and deepens our appreciation for the complexities of real-world embedded systems.

CONCLUSION

The Bluetooth Controlled Home Automation System successfully demonstrates the potential of microcontrollers and Bluetooth technology in creating smart home solutions. By offering voice-controlled automation and temperature-based fan speed control, the project increases indoor comfort and efficiency. The system is cost-effective, scalable, and provides a foundation for future upgrades and integrations in line with the growing trend of home automation.

REFERENCES

Simulation of Home Automation Project using Arduino and Android App in Proteus - YouTube

Temperature Based Fan Speed Controller using Arduino (how2electronics.com)

Control of Lights + Fan using Wi-fi and Bluetooth - YouTube

SVSEMBEDDED , 9491535690, 7842358459: Control of Lights + Fan using Wi-fi and Bluetooth (svskit.com)

APPENDIX

CODE:


```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);
int tempPin = A0;
int temp;
int tempMin = 25;
int tempMax = 70;
int fanSpeed;
int fanLCD;
char check = 'Y';
String text;

void setup() {
  pinMode(13, OUTPUT);
  pinMode(12, OUTPUT);
  pinMode(tempPin, INPUT);
  lcd.begin(16, 2);
  lcd.init();
  lcd.backlight();
  Serial.begin(9600);
}

void loop() {
  while(Serial.available()) {
    delay(3);
    char c = Serial.read();
    text += c;
  }
  temp = readTemp();
  Serial.println(temp);

  if(text.length() > 0) {
    Serial.println(text);
```

```
35
36      if(text == "light on") {
37        digitalWrite(13, HIGH);
38        fanLCD = 0;
39      }
40      if(text == "light off") {
41        digitalWrite(13, LOW);
42        fanLCD = 0;
43      }
44      temp = readTemp();
45      if(text == "fan on") {
46        digitalWrite(12, HIGH);
47        check = 'X';
48      }
49      if(text == "fan off") {
50        check = 'Y';
51        digitalWrite(12, LOW);
52        fanLCD = 0;
53      }
54      if(text == "all on") {
55        digitalWrite(12, HIGH);
56        digitalWrite(13, HIGH);
57      }
58      if(text == "all off") {
59        digitalWrite(12, LOW);
60        digitalWrite(13, LOW);
61        fanLCD = 0;
62      }
63      text = "";
64    }
```

```
65
66    temp = readTemp();
67    Serial.print(temp);
68    if(temp == tempMin) {
69      fanSpeed = 0;
70      fanLCD = 0;
71      digitalWrite(12, LOW);
72    }
73
74    if((check == 'X') && (temp > tempMin) && (temp <= tempMax)) {
75      fanSpeed = temp;
76      fanSpeed = 1.5 * fanSpeed;
77      fanLCD = map(temp, tempMin, tempMax, 0, 100);
78      analogWrite(12, fanSpeed);
79      digitalWrite(12, HIGH);
80    }
81
82    lcd.setCursor(0, 0);
83    lcd.print("TEMP: ");
84    lcd.print(temp);
85    lcd.print("C ");
86    lcd.setCursor(0, 1);
87    lcd.print("FANS: ");
88    lcd.print(fanLCD);
89    lcd.print("%");
90    delay(200);
91    lcd.clear();
92  }
93
94  int readTemp() {
95    temp = analogRead(tempPin);
96    return temp * 0.48828125;
97  }
```

POSTER:

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PROBLEM STATEMENT

The current manual control of household appliances is often inconvenient and inefficient, lacking integration and adaptability to environmental changes. This leads to increased energy consumption and reduced comfort.

HIGHLIGHTS

Energy Efficiency:

- **Automates control of lights and fans, reducing energy consumption.**

Convenience:

- **Enables remote appliance control via text commands for ease and comfort.**

Cost-Effective:

- **Utilizes affordable, readily available components (Arduino, Bluetooth modules).**

Adaptability:

- **Easily extends to additional appliances and sensors for future upgrades.**

TEXT-CONTROLLED LIGHT BULB SYSTEM

- **Design and implement a text-controlled light bulb using Arduino and Bluetooth modules.**

TEMPERATURE-BASED FAN CONTROL SYSTEM

- **Develop a fan control system that automatically turns off below 25°C and cannot be manually controlled.**
- **Automatically turns on above 25°C with manual control using text commands and adjusts speed according to temperature.**

SYSTEM ATTRIBUTES

- **Ensure the system is user-friendly, reliable, and energy-efficient.**

DESIGN