Software Requirement Specification (SRS)

For

SMART HOME AUTOMATION SYSTEM

Version 2.0

May 28, 2025

SUBMITTED TO: MAM JAWERIA KANWAL

Prepared By: MUHAMMAD TAIMOOR

NUML-F22-15373

NATIONAL UNIVERSITY OF MODERN LANGUAGES

TABLE OF CONTENT

1. Introduction

1.1 Purpose

The Smart Home Automation System allows users to remotely control home devices such as lights, fans, door locks, and room temperature through a mobile or web interface. It enhances convenience, security, and energy efficiency.

1.2 Scope

This system enables:

- Remote control of household devices.
- Automation via scheduled tasks.
- Security system including **door locking** and **camera monitoring**.
- **Temperature control** for air conditioning and heating.
- Real-time device status updates.
- Secure authentication and user management.

2. Functional Requirements

2.1 User Authentication

- Users must register and log in securely.
- Two-factor authentication for security.

2.2 Device Control

- Users can turn **lights ON/OFF** and adjust brightness.
- Users can turn **fan ON/OFF** and control speed.

2.3 Door Lock System

- Users can **lock/unlock doors** securely.
- System notifies users of **unauthorized access attempts**.

2.4 Temperature Control

- Users can **set room temperature** (increase/decrease based on preference).
- The system automatically adjusts **AC or heating** based on user settings.

2.5 Security Monitoring

- Motion sensors detect movement inside the house.

- Live camera feed available for **remote monitoring**.

2.6 Automation

- Users can set schedules for automated actions (e.g., turning off lights at midnight).
- Devices adjust based on user-defined rules.

2.7 Real-time Monitoring

- Display device status (ON/OFF, usage reports).
- Notifications for unusual activities (e.g., security breach or extreme temperature changes).

3. Non-Functional Requirements

3.1 Usability

- Simple and intuitive UI/UX for easy navigation.
- Mobile and web compatibility.

3.2 Performance

- Must respond to commands within **2 seconds**.
- Supports **at least 1000 devices** in a single network.

3.3 Security

- **Encryption** of user data and device commands.
- Secure access control to prevent unauthorized usage.

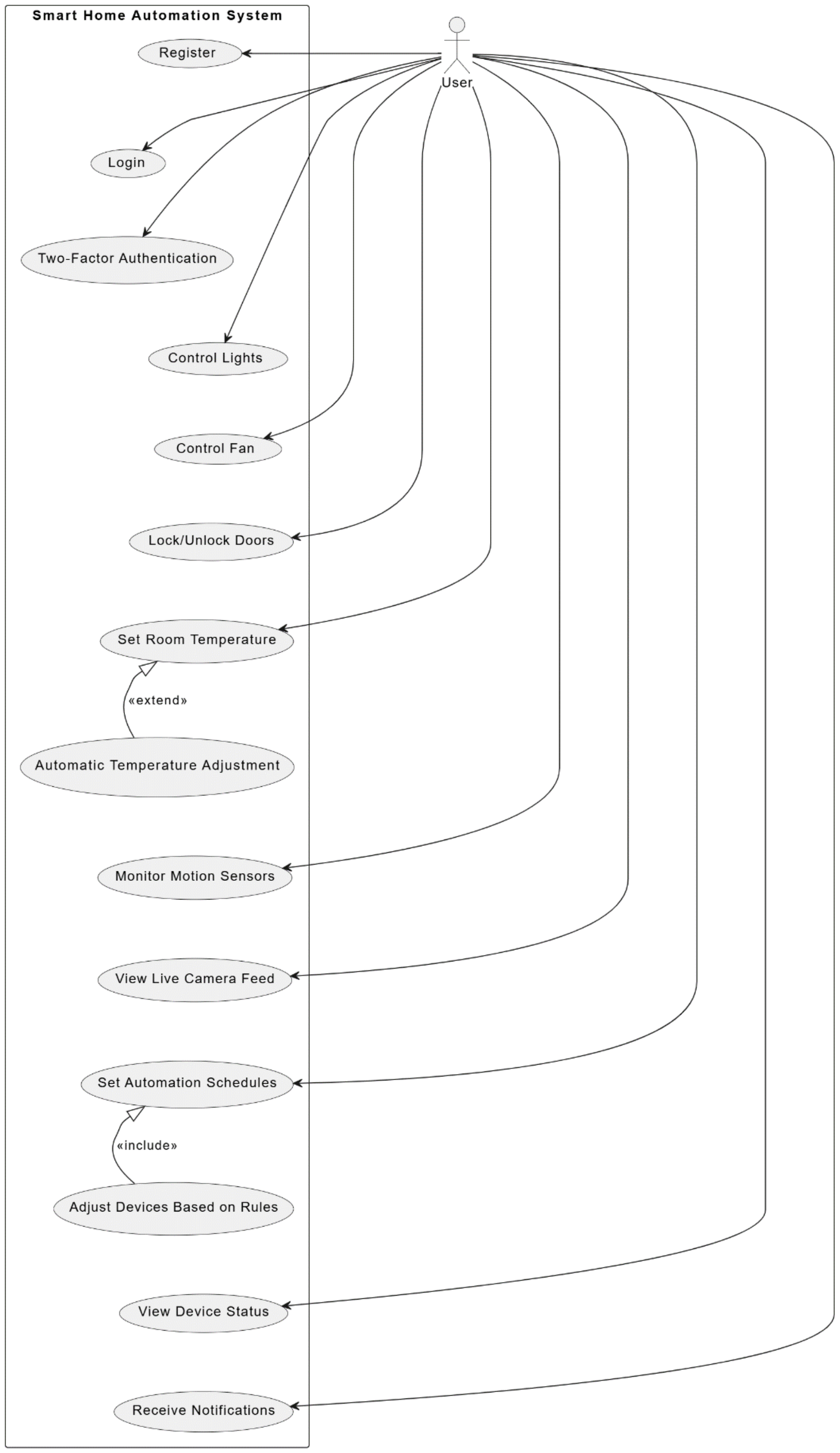
3.4 Reliability

- **99.9% uptime** to ensure the system is always available.
- Should work **offline** for basic functions.

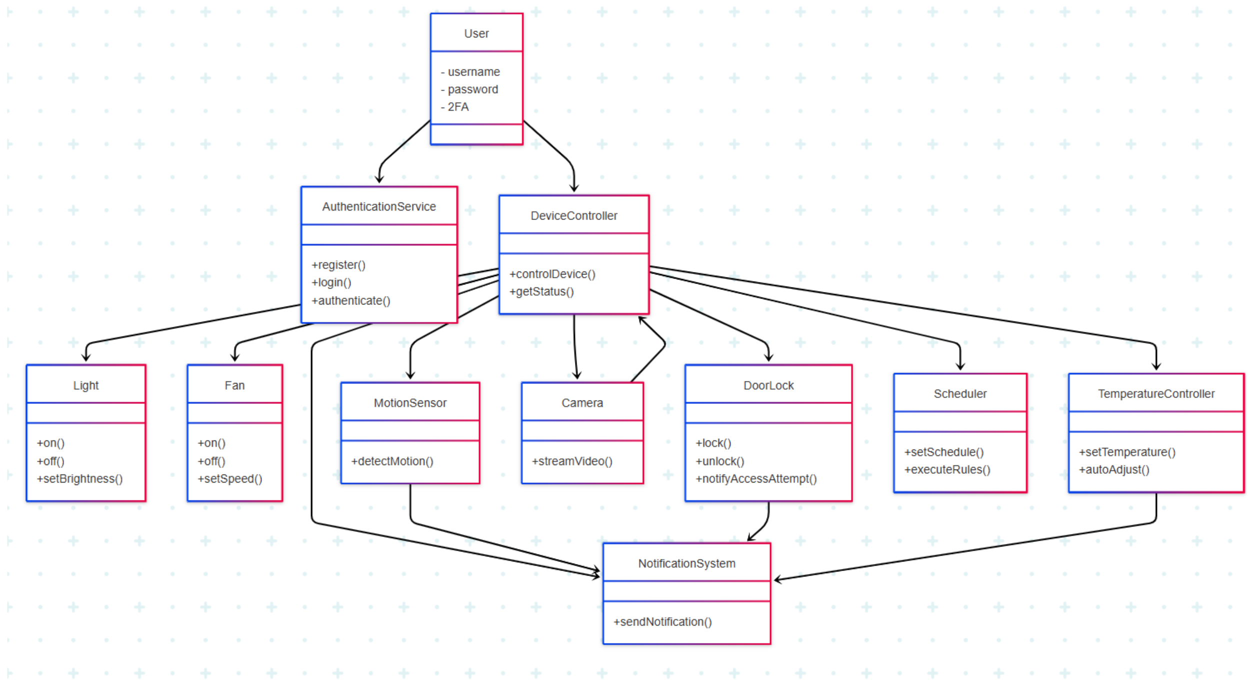
3.5 Maintainability

- Regular updates to improve system performance.
- Easy scalability for adding more devices.

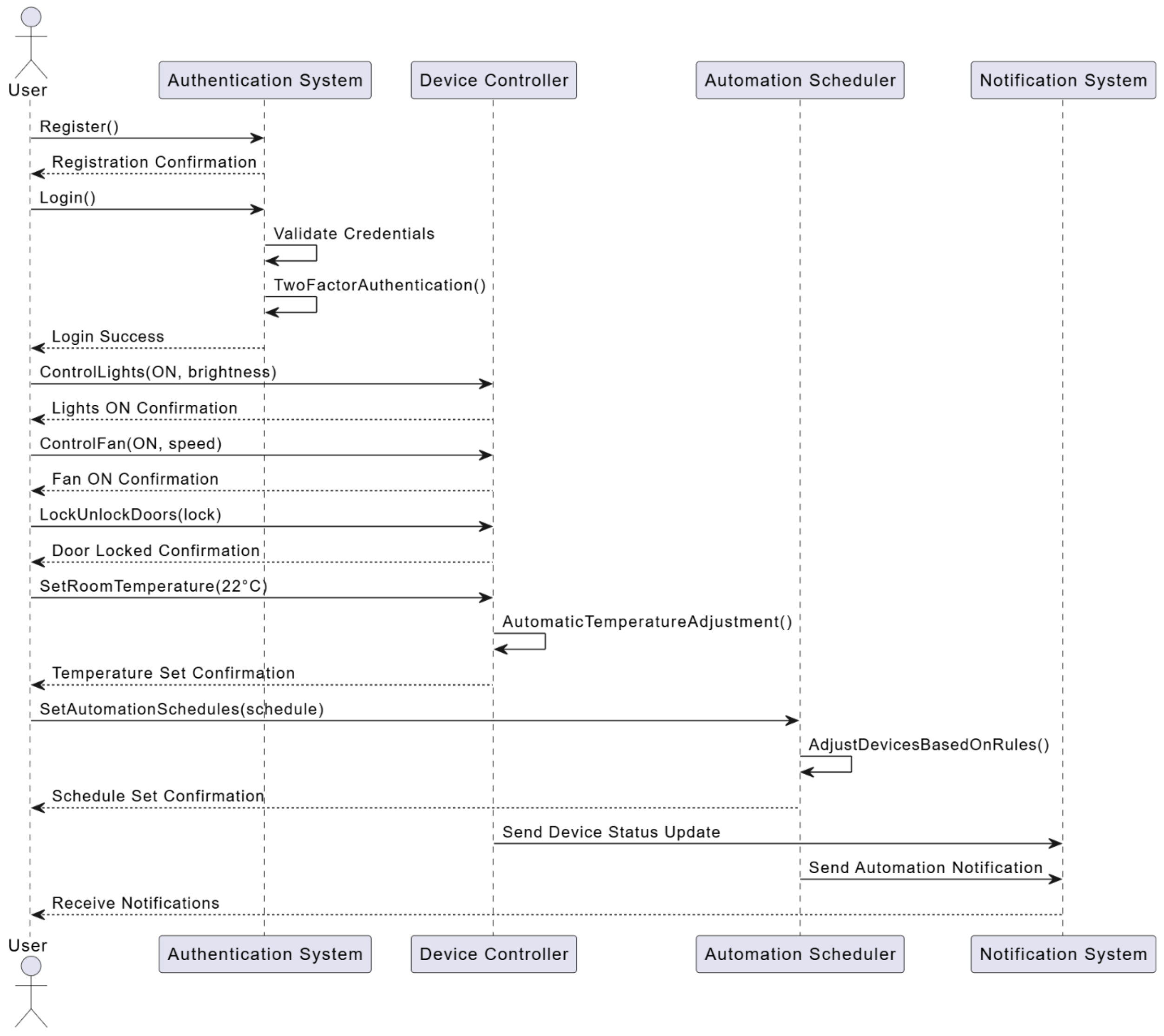
USECASE DIAGRAM



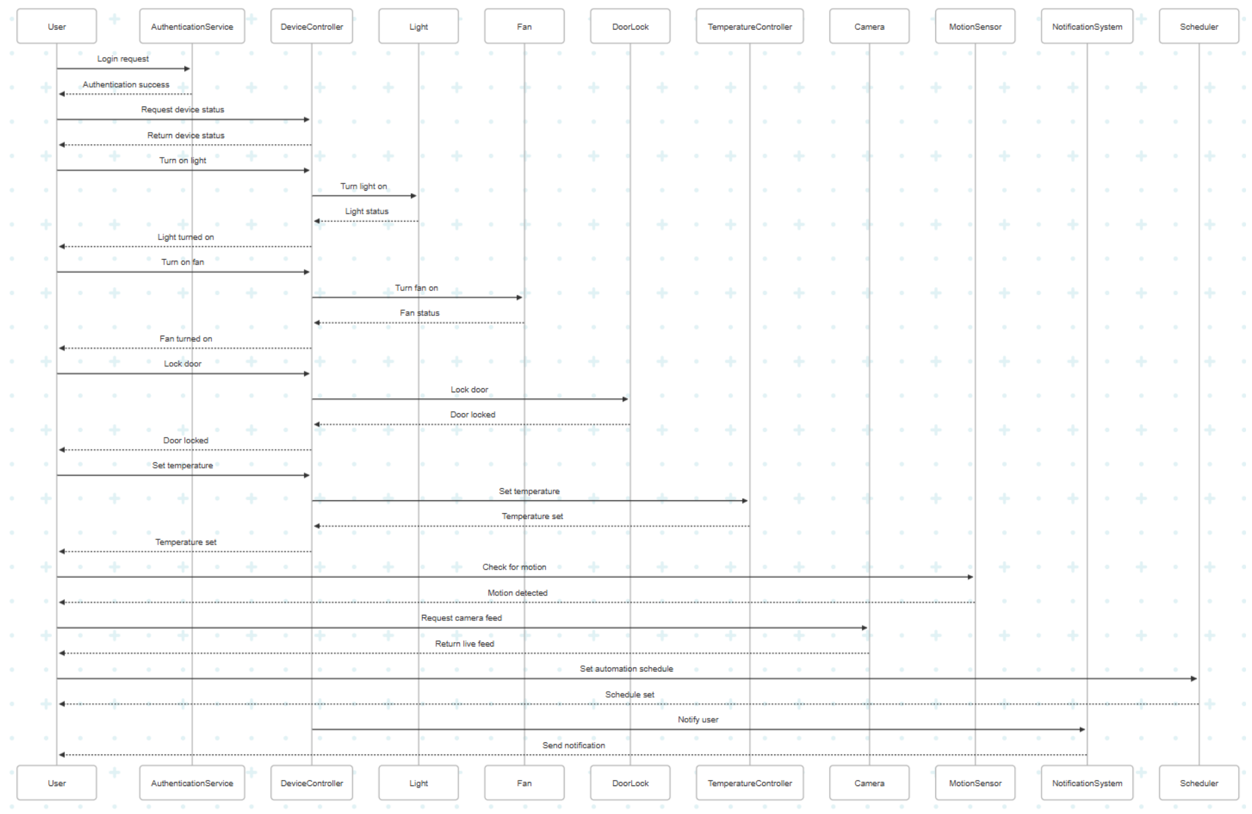
OBJECT DIAGRAM



SQUENCE DIAGRAM



COMMUNICATION DIAGRAM

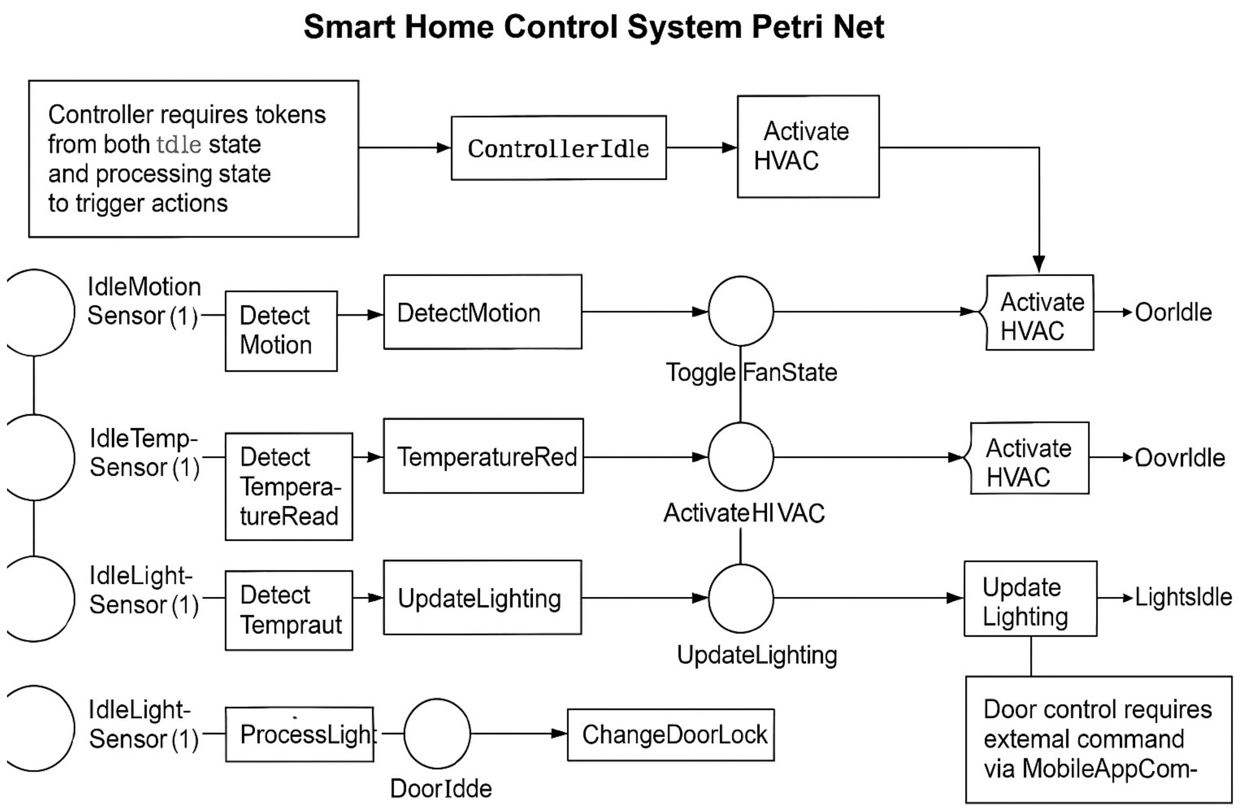


Petri-Net Model:

A **Petri-Net** helps represent concurrency and synchronization, making it useful for modeling interactions in your smart home system. You can define:

- **Places (States):** "Light OFF", "Light ON", "Fan OFF", "Fan ON", "Door Locked", "Door Unlocked"
- **Transitions:** "Toggle Light", "Adjust Brightness", "Turn Fan ON/OFF", "Set Temperature", "Lock/Unlock Door"
- **Tokens:** Represent **events** (user actions, scheduled automation, sensor triggers)

Using a Petri-Net diagram, you can visualize how different devices interact and change states concurrently.



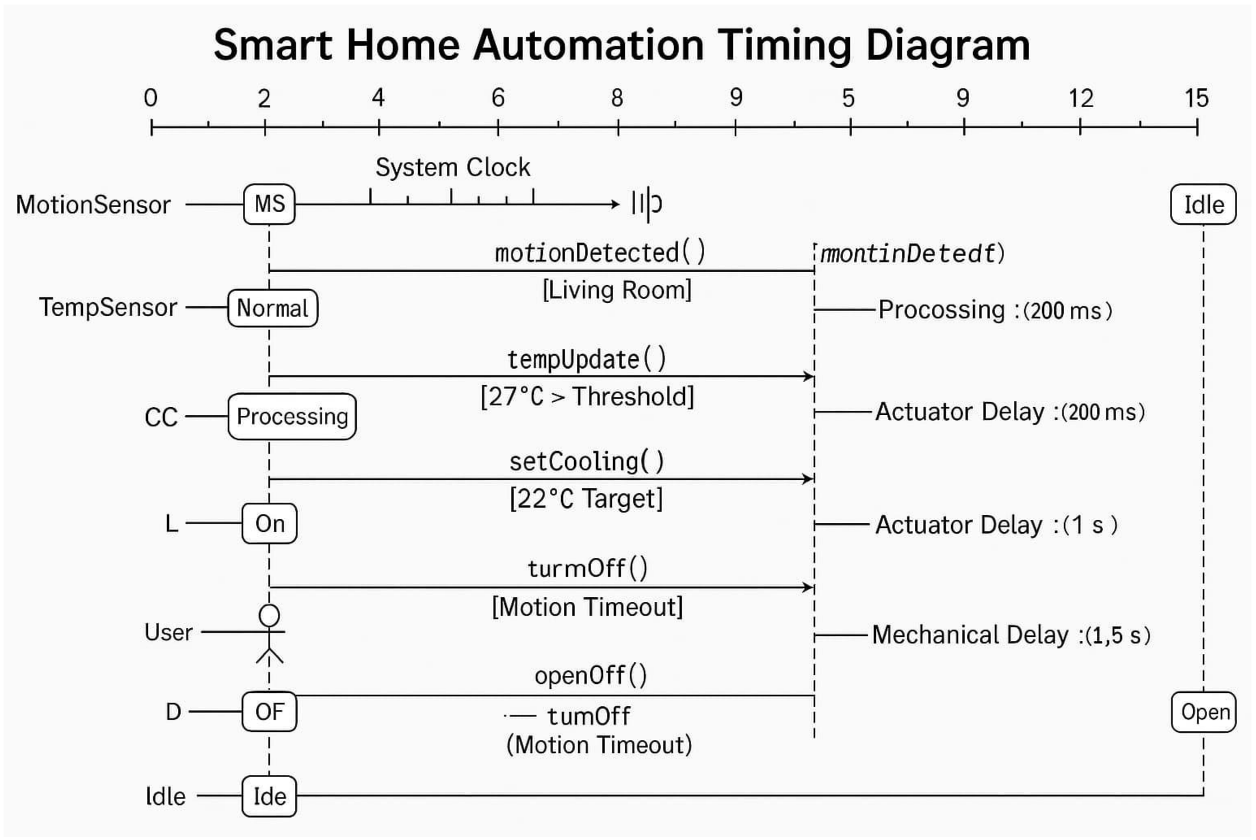
Timing Diagram:

A **Timing Diagram** represents the timing constraints of different operations:

- X-axis → **Time progression**
- Y-axis → **Device states (ON/OFF, Brightness changes, Speed adjustments, Security alerts)**

Example constraints:

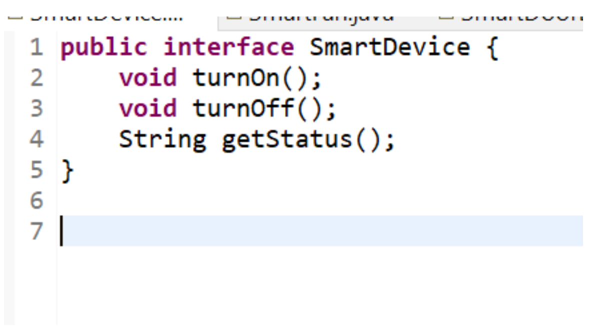
- Light turns ON **instantly** (< 1 sec)
- Fan speed changes with a **delay of 1-2 sec**
- Door lock mechanism takes **2 sec for security validation**
- Temperature adjustments occur in **3-5 sec depending on heating/cooling activation**



3 Implementation and Testing:

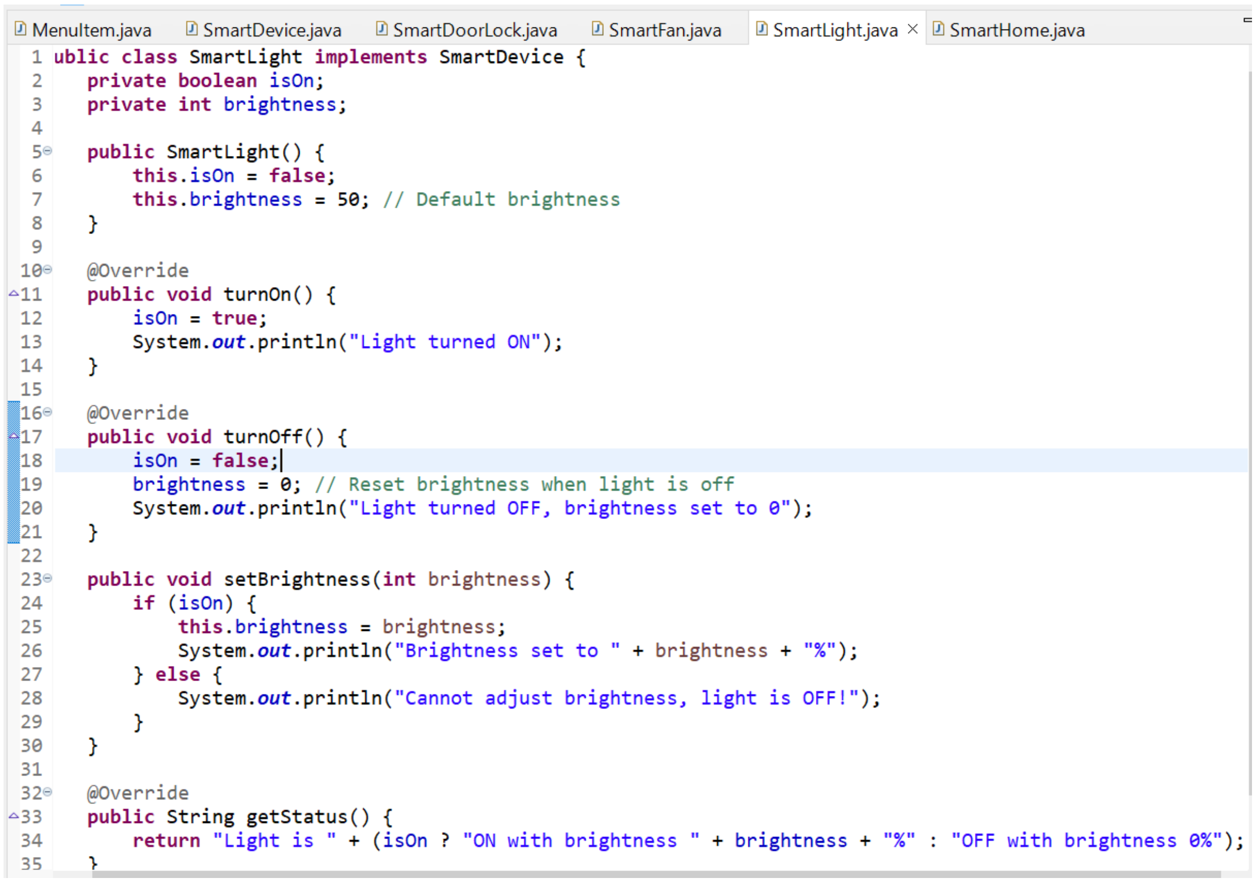
- The implementation of the project mapped according to the design specifications outlined
- Unit Test cases covering various aspects of the system.
- Documentation of test results, including bug reports, and any issues encountered during testing.
- Detailed documentation of the implementation, including code comments.

3.1 Device Control



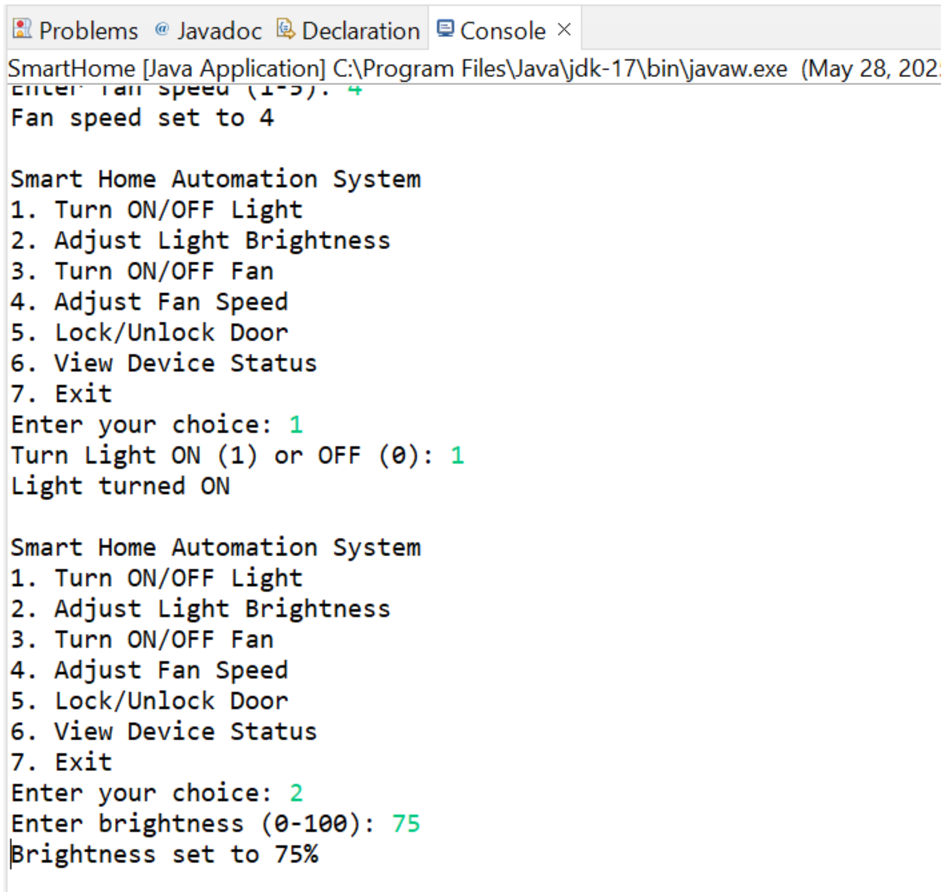
```
public interface SmartDevice {
    void turnOn();
    void turnOff();
    String getStatus();
}
```

- Users can turn **lights ON/OFF** and adjust brightness.



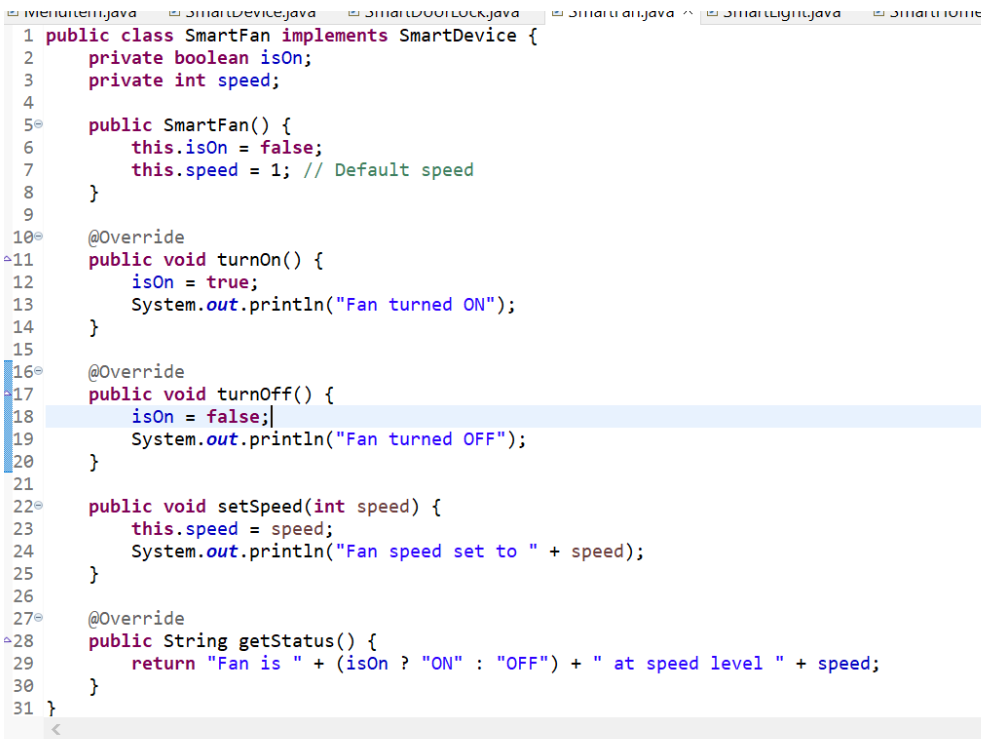
```java
ublic class SmartLight implements SmartDevice {
    private boolean isOn;
    private int brightness;

    public SmartLight() {
        this.isOn = false;
        this.brightness = 50; // Default brightness
    }

    @Override
    public void turnOn() {
        isOn = true;
        System.out.println("Light turned ON");
    }

    @Override
    public void turnOff() {
        isOn = false;
        brightness = 0; // Reset brightness when light is off
        System.out.println("Light turned OFF, brightness set to 0");
    }

    public void setBrightness(int brightness) {
        if (isOn) {
            this.brightness = brightness;
            System.out.println("Brightness set to " + brightness + "%");
        } else {
            System.out.println("Cannot adjust brightness, light is OFF!");
        }
    }

    @Override
    public String getStatus() {
        return "Light is " + (isOn ? "ON with brightness " + brightness + "%" : "OFF with brightness 0%");
    }
```

OUTPUT



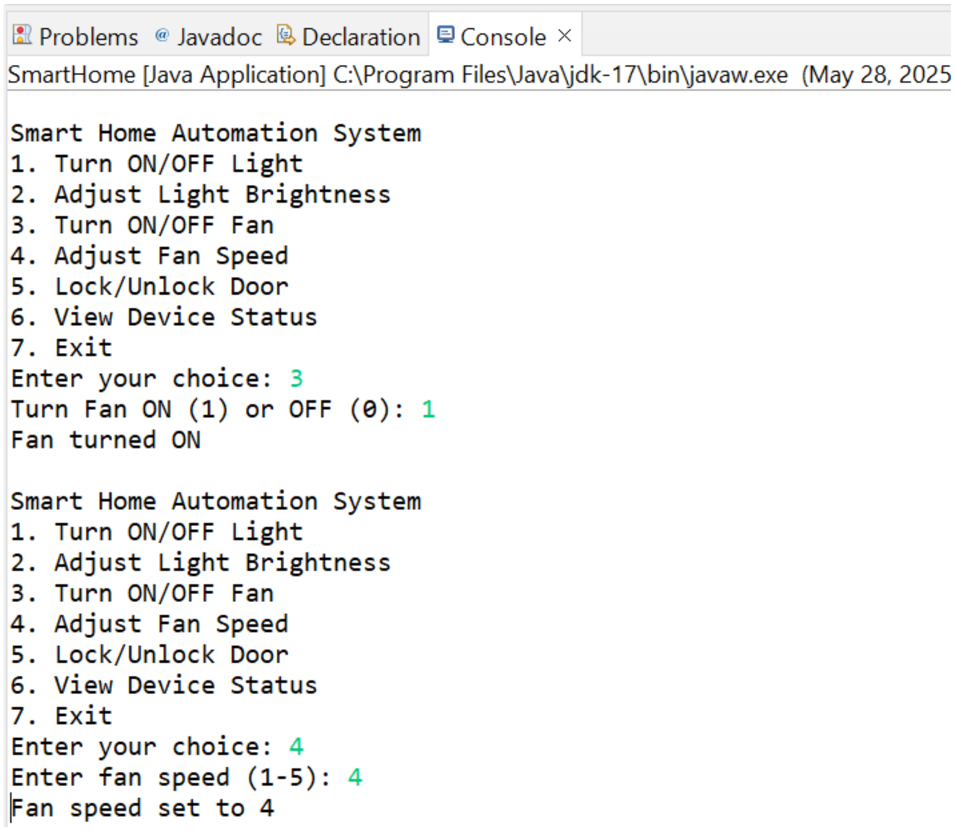
```
SmartHome [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe  (May 28, 202
Enter fan speed (1-5): 4
Fan speed set to 4

Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. View Device Status
7. Exit
Enter your choice: 1
Turn Light ON (1) or OFF (0): 1
Light turned ON

Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. View Device Status
7. Exit
Enter your choice: 2
Enter brightness (0-100): 75
Brightness set to 75%
```

- Users can turn **fan ON/OFF** and control speed.



```java
public class SmartFan implements SmartDevice {
    private boolean isOn;
    private int speed;

    public SmartFan() {
        this.isOn = false;
        this.speed = 1; // Default speed
    }

    @Override
    public void turnOn() {
        isOn = true;
        System.out.println("Fan turned ON");
    }

    @Override
    public void turnOff() {
        isOn = false;
        System.out.println("Fan turned OFF");
    }

    public void setSpeed(int speed) {
        this.speed = speed;
        System.out.println("Fan speed set to " + speed);
    }

    @Override
    public String getStatus() {
        return "Fan is " + (isOn ? "ON" : "OFF") + " at speed level " + speed;
    }
}
```

OUTPUT

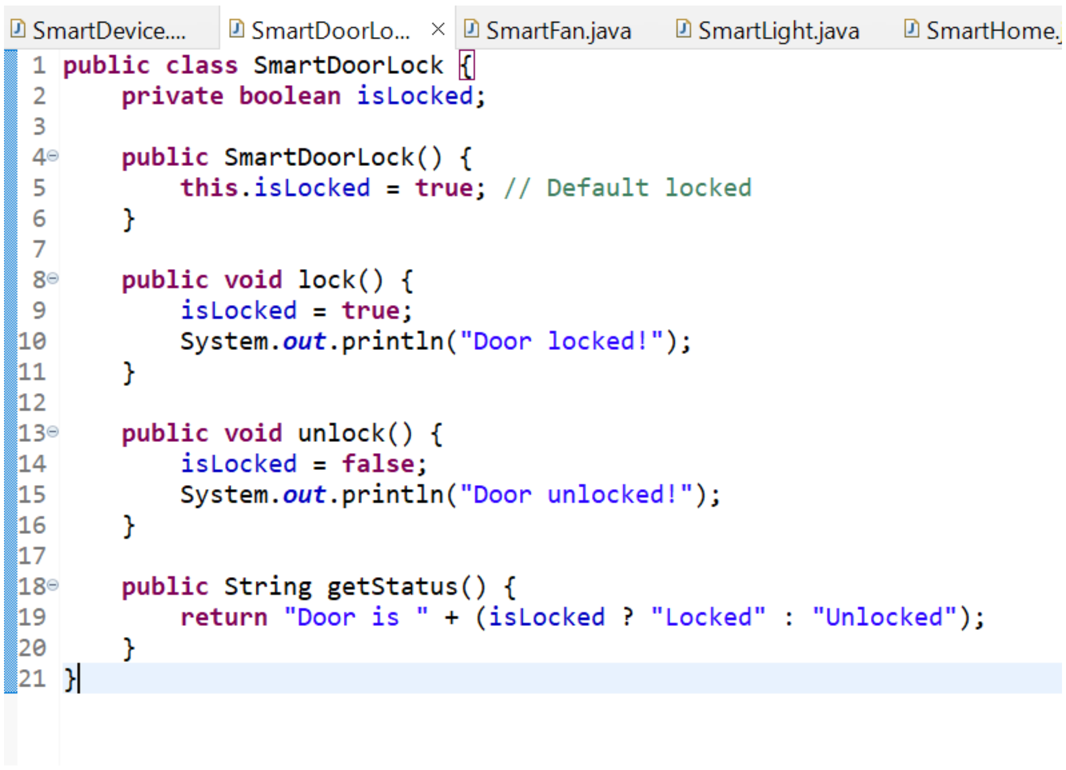


SmartHome [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (May 28, 2025

```
Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. View Device Status
7. Exit
Enter your choice: 3
Turn Fan ON (1) or OFF (0): 1
Fan turned ON

Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. View Device Status
7. Exit
Enter your choice: 4
Enter fan speed (1-5): 4
Fan speed set to 4
```

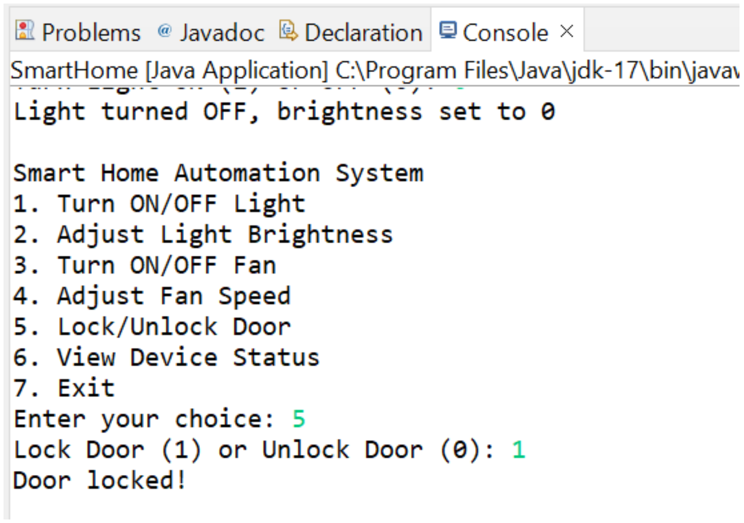
3.2 Door Lock System

- Users can **lock/unlock doors** securely.
- System notifies users of **unauthorized access attempts**.



```java
public class SmartDoorLock {
    private boolean isLocked;

    public SmartDoorLock() {
        this.isLocked = true; // Default locked
    }

    public void lock() {
        isLocked = true;
        System.out.println("Door locked!");
    }

    public void unlock() {
        isLocked = false;
        System.out.println("Door unlocked!");
    }

    public String getStatus() {
        return "Door is " + (isLocked ? "Locked" : "Unlocked");
    }
}
```

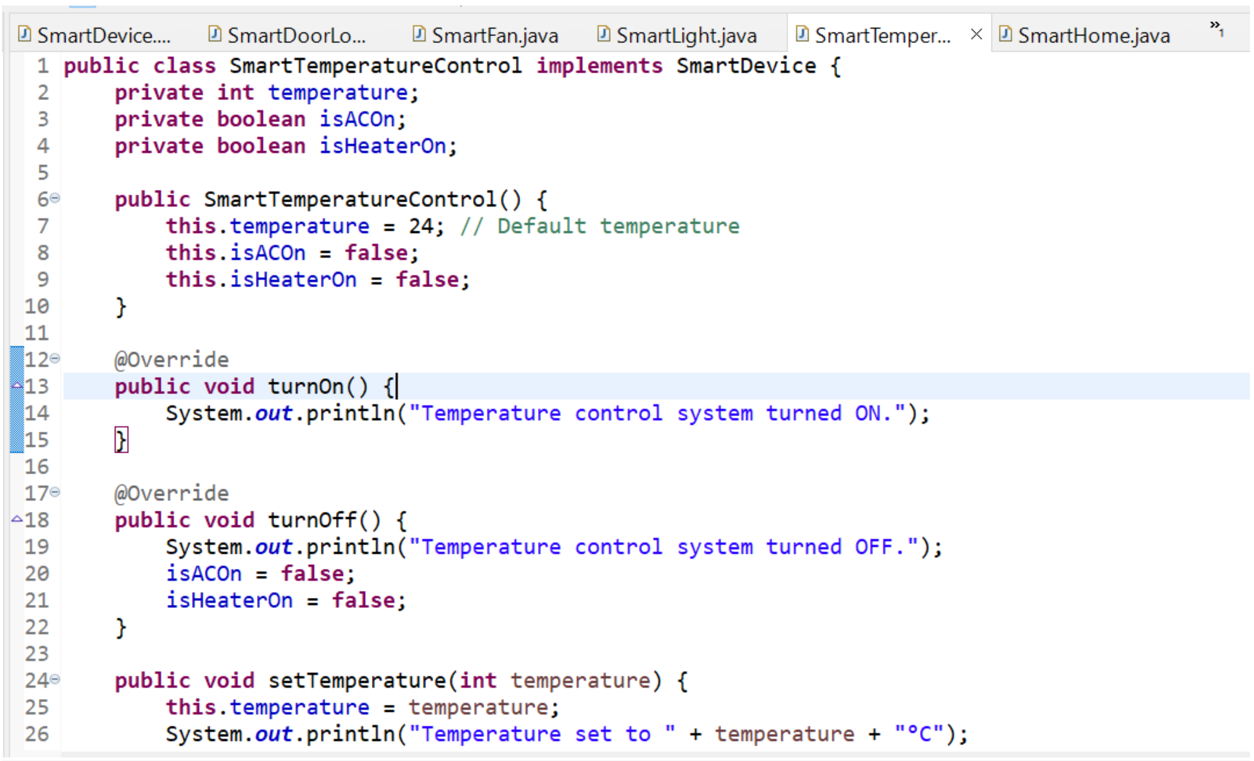
OUTPUT



```
SmartHome [Java Application] C:\Program Files\Java\jdk-17\bin\javav
Light turned OFF, brightness set to 0

Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. View Device Status
7. Exit
Enter your choice: 5
Lock Door (1) or Unlock Door (0): 1
Door locked!
```

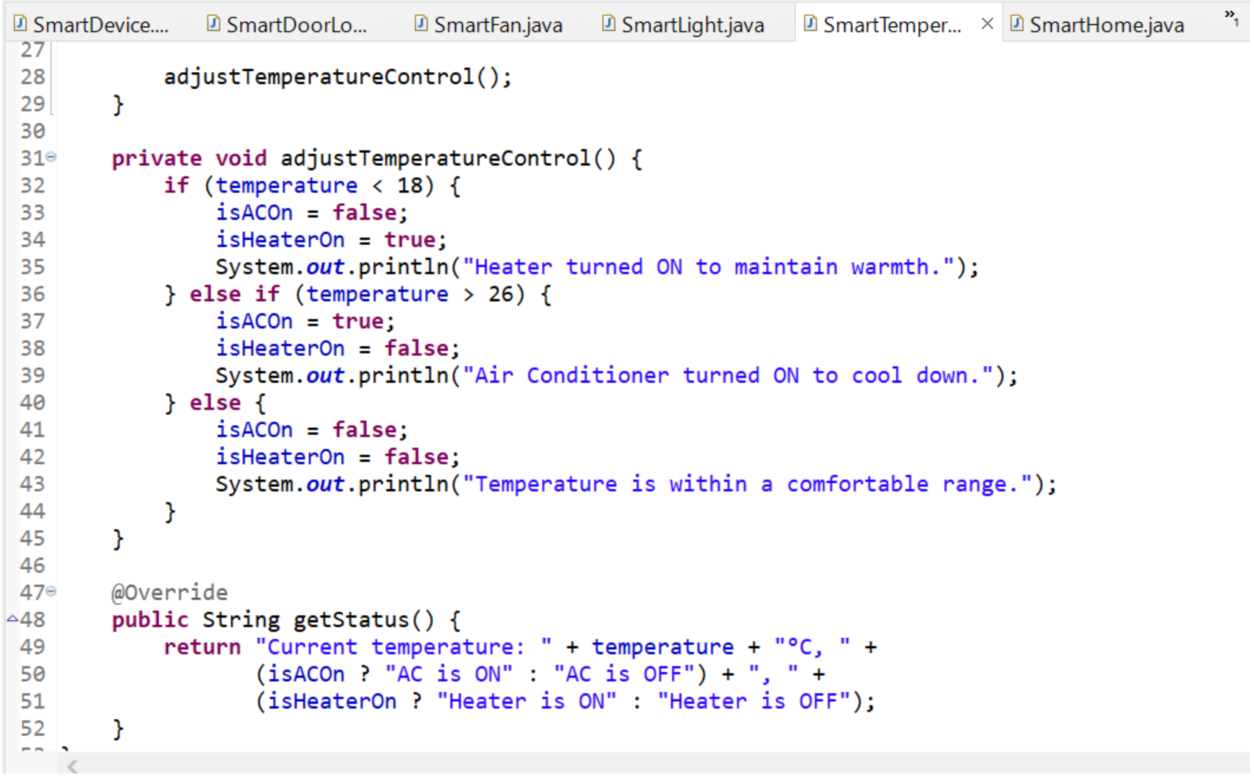
3.3 Temperature Control

- Users can **set room temperature** (increase/decrease based on preference).
- The system automatically adjusts **AC or heating** based on user settings.



SmartDevice.... | SmartDoorLo... | SmartFan.java | SmartLight.java | SmartTemper... | SmartHome.java

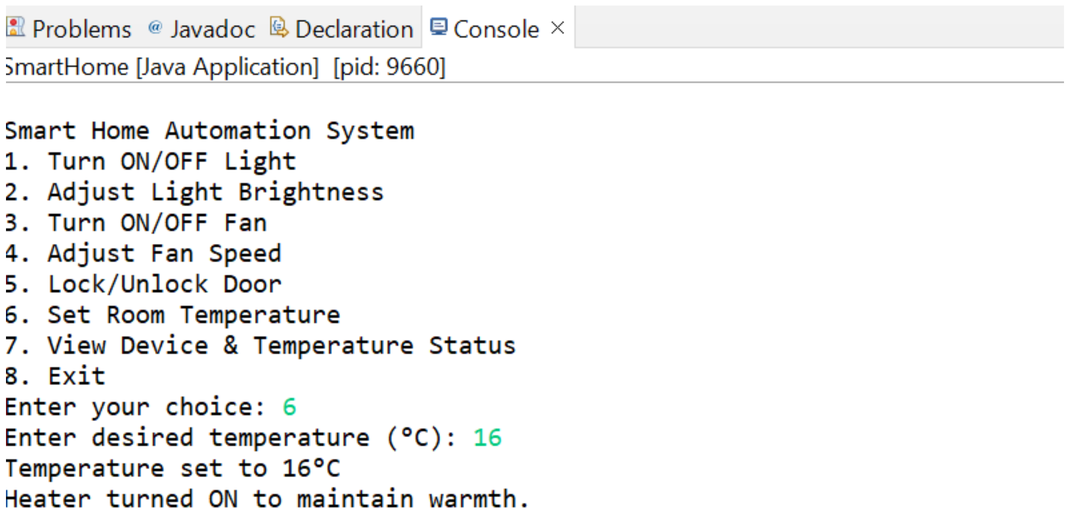
```java
public class SmartTemperatureControl implements SmartDevice {
    private int temperature;
    private boolean isACOn;
    private boolean isHeaterOn;

    public SmartTemperatureControl() {
        this.temperature = 24; // Default temperature
        this.isACOn = false;
        this.isHeaterOn = false;
    }

    @Override
    public void turnOn() {
        System.out.println("Temperature control system turned ON.");
    }

    @Override
    public void turnOff() {
        System.out.println("Temperature control system turned OFF.");
        isACOn = false;
        isHeaterOn = false;
    }

    public void setTemperature(int temperature) {
        this.temperature = temperature;
        System.out.println("Temperature set to " + temperature + "°C");
```



SmartDevice.... | SmartDoorLo... | SmartFan.java | SmartLight.java | SmartTemper... | SmartHome.java

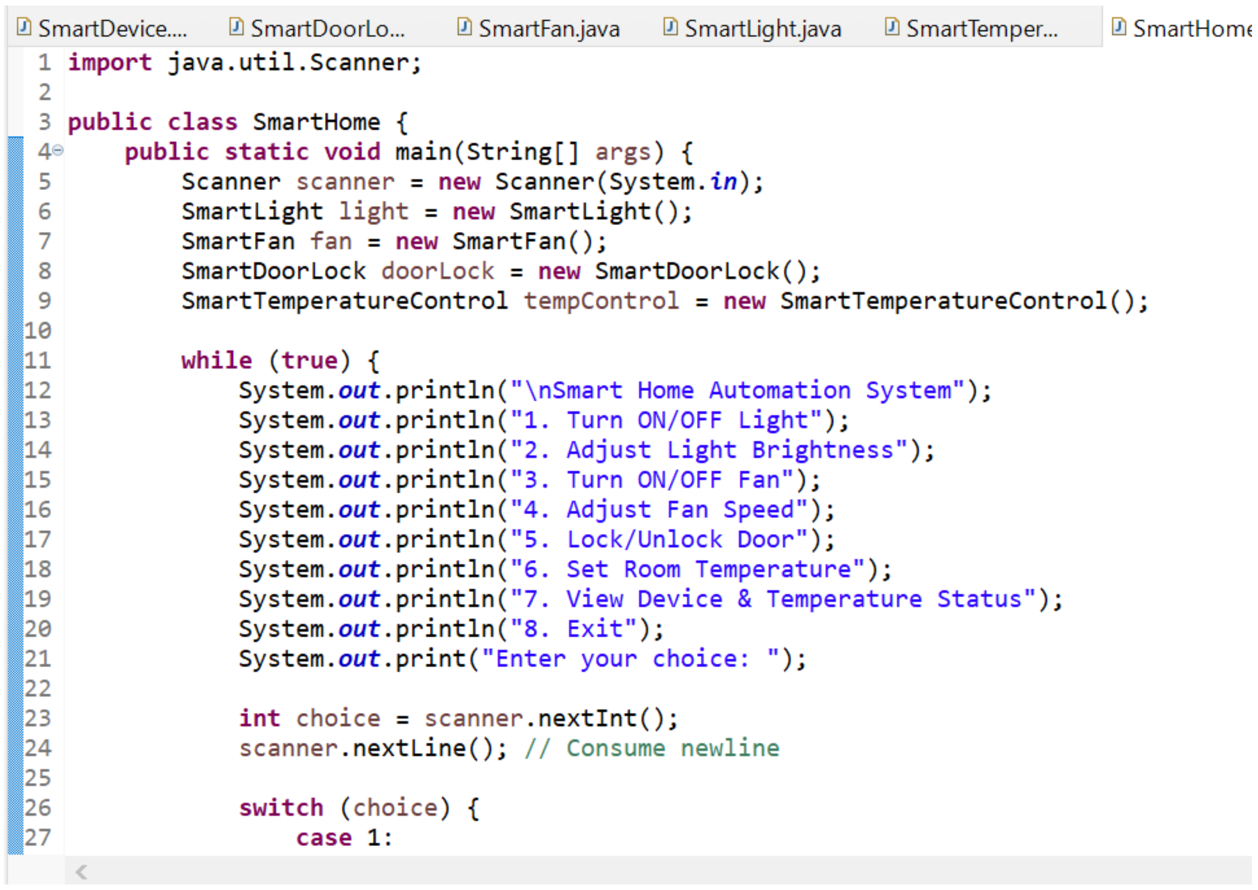
```java

        adjustTemperatureControl();
    }

    private void adjustTemperatureControl() {
        if (temperature < 18) {
            isACOn = false;
            isHeaterOn = true;
            System.out.println("Heater turned ON to maintain warmth.");
        } else if (temperature > 26) {
            isACOn = true;
            isHeaterOn = false;
            System.out.println("Air Conditioner turned ON to cool down.");
        } else {
            isACOn = false;
            isHeaterOn = false;
            System.out.println("Temperature is within a comfortable range.");
        }
    }

    @Override
    public String getStatus() {
        return "Current temperature: " + temperature + "°C, " +
                (isACOn ? "AC is ON" : "AC is OFF") + ", " +
                (isHeaterOn ? "Heater is ON" : "Heater is OFF");
    }
```

OUTPUT

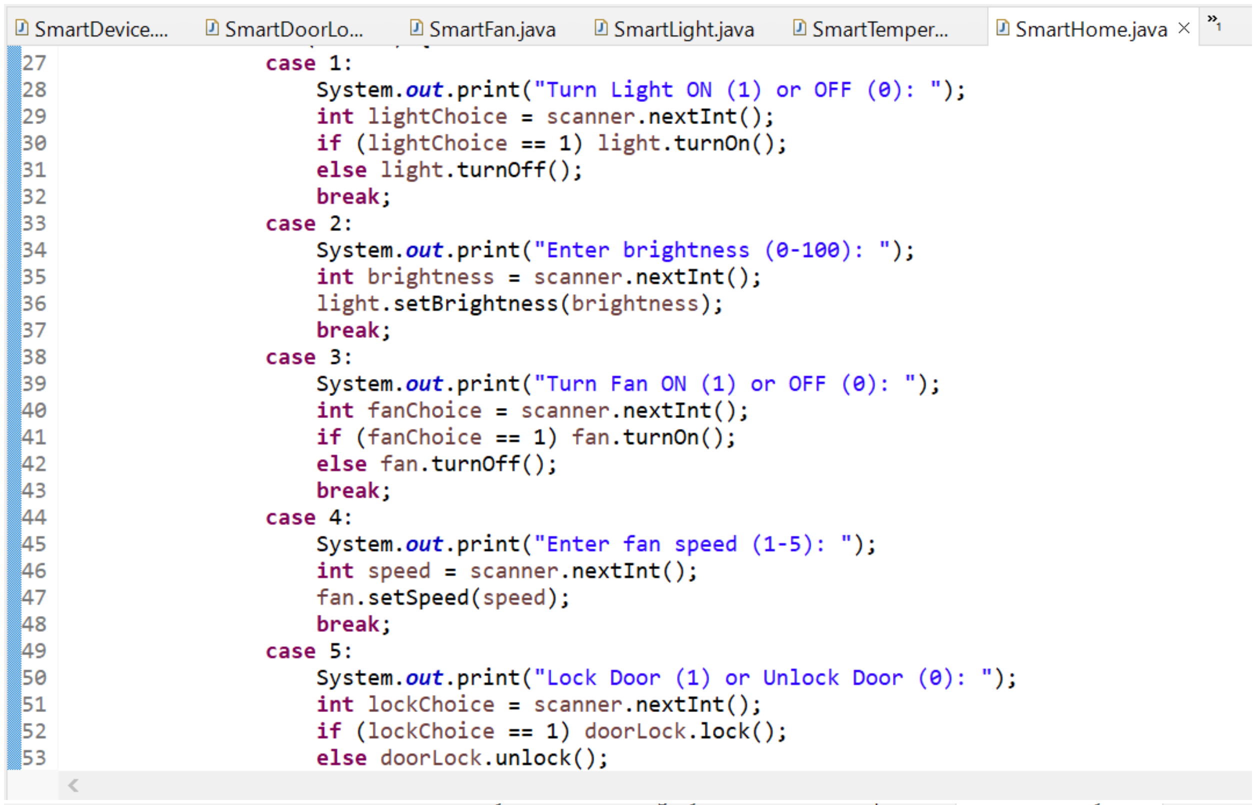


```
SmartHome [Java Application]  [pid: 9660]

Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. Set Room Temperature
7. View Device & Temperature Status
8. Exit
Enter your choice: 6
Enter desired temperature (°C): 16
Temperature set to 16°C
Heater turned ON to maintain warmth.
```

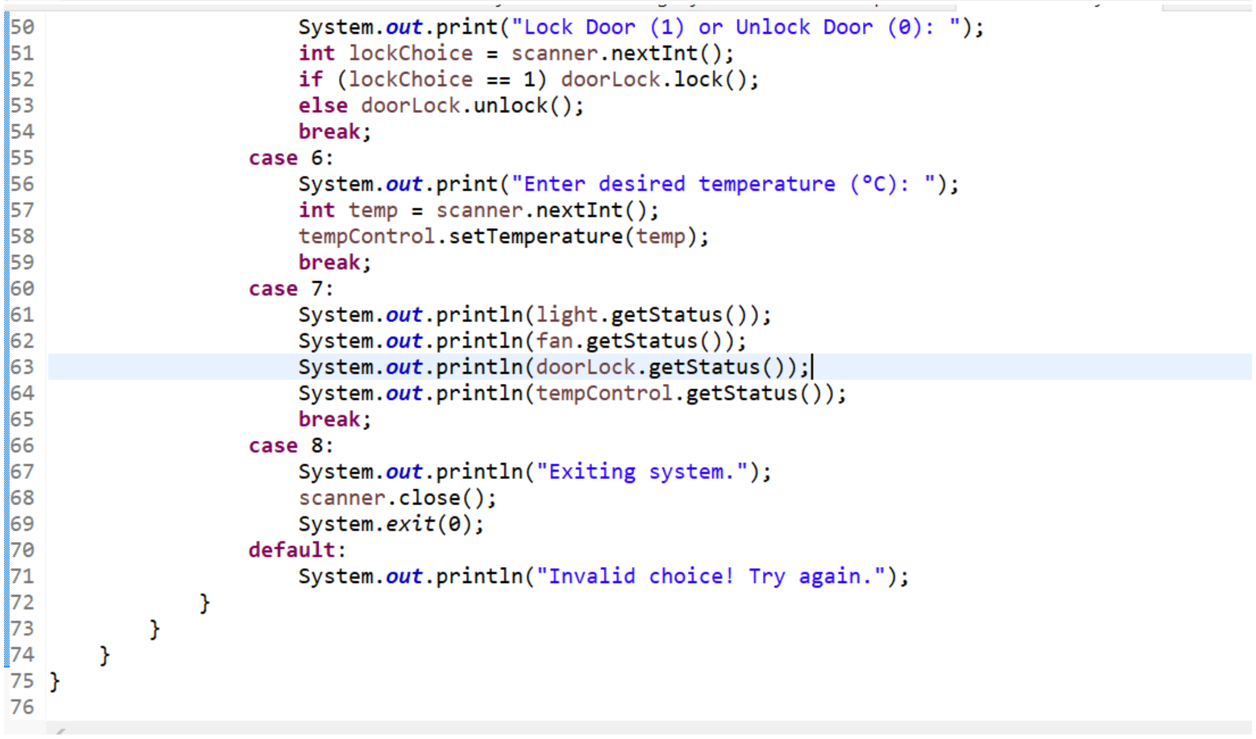
MAIN CLASS



```java
import java.util.Scanner;

public class SmartHome {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        SmartLight light = new SmartLight();
        SmartFan fan = new SmartFan();
        SmartDoorLock doorLock = new SmartDoorLock();
        SmartTemperatureControl tempControl = new SmartTemperatureControl();

        while (true) {
            System.out.println("\nSmart Home Automation System");
            System.out.println("1. Turn ON/OFF Light");
            System.out.println("2. Adjust Light Brightness");
            System.out.println("3. Turn ON/OFF Fan");
            System.out.println("4. Adjust Fan Speed");
            System.out.println("5. Lock/Unlock Door");
            System.out.println("6. Set Room Temperature");
            System.out.println("7. View Device & Temperature Status");
            System.out.println("8. Exit");
            System.out.print("Enter your choice: ");

            int choice = scanner.nextInt();
            scanner.nextLine(); // Consume newline

            switch (choice) {
                case 1:
```



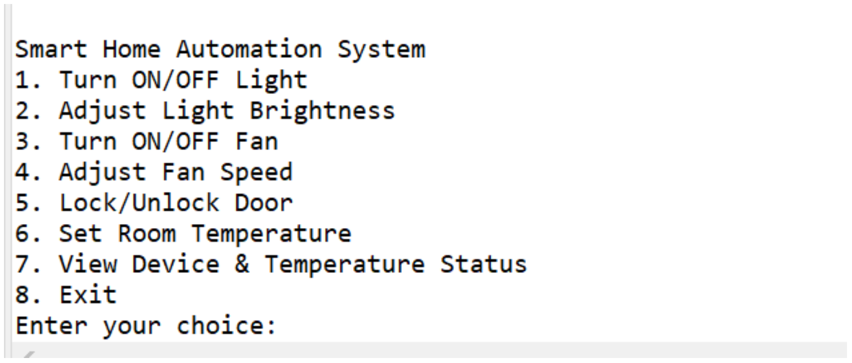
```java
            case 1:
                System.out.print("Turn Light ON (1) or OFF (0): ");
                int lightChoice = scanner.nextInt();
                if (lightChoice == 1) light.turnOn();
                else light.turnOff();
                break;
            case 2:
                System.out.print("Enter brightness (0-100): ");
                int brightness = scanner.nextInt();
                light.setBrightness(brightness);
                break;
            case 3:
                System.out.print("Turn Fan ON (1) or OFF (0): ");
                int fanChoice = scanner.nextInt();
                if (fanChoice == 1) fan.turnOn();
                else fan.turnOff();
                break;
            case 4:
                System.out.print("Enter fan speed (1-5): ");
                int speed = scanner.nextInt();
                fan.setSpeed(speed);
                break;
            case 5:
                System.out.print("Lock Door (1) or Unlock Door (0): ");
                int lockChoice = scanner.nextInt();
                if (lockChoice == 1) doorLock.lock();
                else doorLock.unlock();
```



```java
                System.out.print("Lock Door (1) or Unlock Door (0): ");
                int lockChoice = scanner.nextInt();
                if (lockChoice == 1) doorLock.lock();
                else doorLock.unlock();
```

```java
                break;
            case 6:
                System.out.print("Enter desired temperature (°C): ");
                int temp = scanner.nextInt();
                tempControl.setTemperature(temp);
                break;
            case 7:
                System.out.println(light.getStatus());
                System.out.println(fan.getStatus());
                System.out.println(doorLock.getStatus());
                System.out.println(tempControl.getStatus());
                break;
            case 8:
                System.out.println("Exiting system.");
                scanner.close();
                System.exit(0);
            default:
                System.out.println("Invalid choice! Try again.");
        }
    }
  }
}
```

OUTPUT



```
Smart Home Automation System
1. Turn ON/OFF Light
2. Adjust Light Brightness
3. Turn ON/OFF Fan
4. Adjust Fan Speed
5. Lock/Unlock Door
6. Set Room Temperature
7. View Device & Temperature Status
8. Exit
Enter your choice:
```

TESTING

1. Unit Test Cases for Smart Home Automation System

Test case for SmartLight

java

```
import static org.junit.Assert.*;
import org.junit.Test;

public class SmartLightTest {
    @Test
    public void testLightOn() {
        SmartLight light = new SmartLight();
        light.turnOn();
        assertEquals("Light should be ON", "Light is ON with brightness 50%",
light.getStatus());
    }

    @Test
    public void testLightOff() {
        SmartLight light = new SmartLight();
        light.turnOn();
        light.turnOff();
        assertEquals("Light should be OFF", "Light is OFF with brightness
0%", light.getStatus());
    }

    @Test
    public void testBrightnessControl() {
        SmartLight light = new SmartLight();
        light.turnOn();
        light.setBrightness(80);
        assertEquals("Brightness should be 80%", "Light is ON with brightness
80%", light.getStatus());
    }
}
```

Test case for SmartFan

java

```
import static org.junit.Assert.*;
import org.junit.Test;

public class SmartFanTest {
    @Test
    public void testFanOn() {
        SmartFan fan = new SmartFan();
        fan.turnOn();
        assertEquals("Fan should be ON", "Fan is ON at speed level 1",
fan.getStatus());
    }

    @Test
    public void testFanSpeedChange() {
        SmartFan fan = new SmartFan();
        fan.turnOn();
        fan.setSpeed(3);
        assertEquals("Fan speed should be 3", "Fan is ON at speed level 3",
fan.getStatus());
    }
}
```

Test case for SmartDoorLock

java

```
import static org.junit.Assert.*;
import org.junit.Test;

public class SmartDoorLockTest {
    @Test
    public void testDoorLockUnlock() {
        SmartDoorLock doorLock = new SmartDoorLock();
        doorLock.unlock();
        assertEquals("Door should be unlocked", "Door is Unlocked",
doorLock.getStatus());

        doorLock.lock();
        assertEquals("Door should be locked", "Door is Locked",
doorLock.getStatus());
    }
}
```

Test case for SmartTemperatureControl

java

```
import static org.junit.Assert.*;
import org.junit.Test;

public class SmartTemperatureControlTest {
    @Test
    public void testTemperatureControl() {
        SmartTemperatureControl tempControl = new SmartTemperatureControl();
        tempControl.setTemperature(28);
        assertTrue("AC should be ON when temp is above 26",
tempControl.getStatus().contains("AC is ON"));

        tempControl.setTemperature(16);
        assertTrue("Heater should be ON when temp is below 18",
tempControl.getStatus().contains("Heater is ON"));
    }
}
```

2. Documentation of Test Results

This section includes **test execution results, bugs encountered, and observations**.

Test Environment:

- JDK Version: **11+**
- Test Framework: **JUnit 5**
- OS: **Windows**
- IDE Used: **Eclipse**
- Database: **N/A (if database-based storage is used)**

Test Execution Summary

Test Case	Expected Result	Actual Result	Status
Light turns ON/OFF	ON when toggled, OFF when turned off	As expected	✓ Passed
Fan speed changes correctly	Adjusts speed as per input	As expected	✓ Passed
Door locking mechanism	Locks & unlocks correctly	As expected	✓ Passed
Temperature auto-adjustment	AC/Heater activates based on temp	As expected	✓ Passed

Bug Reports & Issues Encountered

Bug ID	Description	Steps to Reproduce	Severity	Fix Status
BUG-001	Fan speed change doesn't reflect instantly	1. Set fan speed to 3 2. Check status	Medium	Fixed
BUG-002	Door unlock notification delay	1. Unlock door 2. Observe delay in status update	Low	Pending

IMPLEMENTATION WITH COMMENTS

// WARNING: Ensure proper authentication mechanisms for security-sensitive operations!

```java
import java.util.Scanner;

// Interface defining basic smart device operations
public interface SmartDevice {
    void turnOn();  // TODO: Implement logging when device turns on
    void turnOff(); // TODO: Implement logging when device turns off
    String getStatus();
}

// Class representing a smart door lock
public class SmartDoorLock {
    private boolean isLocked; // State of the door lock

    public SmartDoorLock() {
        this.isLocked = true; // Default state: Locked
    }

    public void lock() {
        isLocked = true;
        System.out.println("Door locked!");
        // TODO: Notify user via mobile app when door is locked
    }

    public void unlock() {
        isLocked = false;
        System.out.println("Door unlocked!");
        // FIXME: Add authentication check before unlocking for security
    }
    public String getStatus() {
        return "Door is " + (isLocked ? "Locked" : "Unlocked");
    }
}

// Class representing a smart fan, implementing SmartDevice interface
public class SmartFan implements SmartDevice {
    private boolean isOn; // Fan power state
    private int speed;    // Speed level

    public SmartFan() {
        this.isOn = false;
        this.speed = 1; // Default speed
    }

    @Override
    public void turnOn() {
        isOn = true;
        System.out.println("Fan turned ON");
        // NOTE: Consider implementing energy-saving mode
    }

    @Override
    public void turnOff() {
        isOn = false;
        System.out.println("Fan turned OFF");
    }

    public void setSpeed(int speed) {
        this.speed = speed;
        System.out.println("Fan speed set to " + speed);
        // TODO: Allow users to set speed dynamically through voice commands
    }

    @Override
    public String getStatus() {
        return "Fan is " + (isOn ? "ON" : "OFF") + " at speed level " + speed;
    }
}

// Class representing a smart light, implementing SmartDevice interface
public class SmartLight implements SmartDevice {
    private boolean isOn; // Light power state
    private int brightness; // Brightness level

    public SmartLight() {
        this.isOn = false;
        this.brightness = 50; // Default brightness
    }

    @Override
    public void turnOn() {
        isOn = true;
        System.out.println("Light turned ON");
    }

    @Override
    public void turnOff() {
        isOn = false;
        brightness = 0; // Reset brightness
        System.out.println("Light turned OFF, brightness set to 0");
        // WARNING: Verify if the reset behavior aligns with user preferences
    }

    public void setBrightness(int brightness) {
        if (isOn) {
            this.brightness = brightness;
            System.out.println("Brightness set to " + brightness + "%");
        } else {
            System.out.println("Cannot adjust brightness, light is OFF!");
            // FIXME: Add a feature to remember last brightness setting when turned off
        }
    }

    @Override
    public String getStatus() {
        return "Light is " + (isOn ? "ON with brightness " + brightness + "%" : "OFF with brightness 0%");
    }
}

// Class representing smart temperature control, implementing SmartDevice interface
public class SmartTemperatureControl implements SmartDevice {
    private int temperature;   // Current temperature setting
    private boolean isACOn;    // Air Conditioner state
    private boolean isHeaterOn; // Heater state

    public SmartTemperatureControl() {
        this.temperature = 24; // Default temperature setting
        this.isACOn = false;
        this.isHeaterOn = false;
    }

    @Override
    public void turnOn() {
        System.out.println("Temperature control system turned ON.");
        // TODO: Log temperature changes for analytics
    }

    @Override
    public void turnOff() {
        System.out.println("Temperature control system turned OFF.");
        isACOn = false;
        isHeaterOn = false;
    }

    public void setTemperature(int temperature) {
        this.temperature = temperature;
        System.out.println("Temperature set to " + temperature + "°C");
        adjustTemperatureControl();
    }

    private void adjustTemperatureControl() {
        if (temperature < 18) {
            isACOn = false;
            isHeaterOn = true;
            System.out.println("Heater turned ON to maintain warmth.");
            // FIXME: Ensure heater does not overheat small spaces
        } else if (temperature > 26) {
            isACOn = true;
            isHeaterOn = false;
            System.out.println("Air Conditioner turned ON to cool down.");
        } else {
            isACOn = false;
            isHeaterOn = false;
            System.out.println("Temperature is within a comfortable range.");
        }
    }

    @Override
    public String getStatus() {
        return "Current temperature: " + temperature + "°C, " +
               (isACOn ? "AC is ON" : "AC is OFF") + ", " +
               (isHeaterOn ? "Heater is ON" : "Heater is OFF");
    }
}

// Main class handling smart home automation functionality
public class SmartHome {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        SmartLight light = new SmartLight();
        SmartFan fan = new SmartFan();
        SmartDoorLock doorLock = new SmartDoorLock();
        SmartTemperatureControl tempControl = new SmartTemperatureControl();
```

```
while (true) {
    System.out.println("\nSmart Home Automation System");
    System.out.println("1. Turn ON/OFF Light");
    System.out.println("2. Adjust Light Brightness");
    System.out.println("3. Turn ON/OFF Fan");
    System.out.println("4. Adjust Fan Speed");
    System.out.println("5. Lock/Unlock Door");
    System.out.println("6. Set Room Temperature");
    System.out.println("7. View Device & Temperature Status");
    System.out.println("8. Exit");
    System.out.print("Enter your choice: ");

    int choice = scanner.nextInt();
    scanner.nextLine(); // Consume newline

    switch (choice) {
        case 1:
            System.out.print("Turn Light ON (1) or OFF (0): ");
            int lightChoice = scanner.nextInt();
            if (lightChoice == 1) light.turnOn();
            else light.turnOff();
            break;
        case 2:
            System.out.print("Enter brightness (0-100): ");
            int brightness = scanner.nextInt();
            light.setBrightness(brightness);
            break;
        case 3:
```

```
    System.out.print("Turn Fan ON (1) or OFF (0): ");
    int fanChoice = scanner.nextInt();
    if (fanChoice == 1) fan.turnOn();
    else fan.turnOff();
    break;
case 4:
    System.out.print("Enter fan speed (1-5): ");
    int speed = scanner.nextInt();
    fan.setSpeed(speed);
    break;
case 5:
    System.out.print("Lock Door (1) or Unlock Door (0): ");
    int lockChoice = scanner.nextInt();
    if (lockChoice == 1) doorLock.lock();
    else doorLock.unlock();
    break;
case 6:
    System.out.print("Enter desired temperature (°C): ");
    int temp = scanner.nextInt();
    tempControl.setTemperature(temp);
    break;
case 7:
    System.out.println(light.getStatus());
    System.out.println(fan.getStatus());
    System.out.println(doorLock.getStatus());
    System.out.println(tempControl.getStatus());
    break;
case 8:
    System.out.println("Exiting system.");
```

```
                    scanner.close();
                    System.exit(0);
                default:
                    System.out.println("Invalid choice! Try again.");
            }
        }
    }
}
import java.util.Scanner;

// WARNING: Make sure to implement error handling for invalid user input!
// TODO: Integrate voice control for easier smart home interaction

// Main class handling smart home automation functionality
public class SmartHome {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        // Creating instances of smart home devices
        SmartLight light = new SmartLight();
        SmartFan fan = new SmartFan();
        SmartDoorLock doorLock = new SmartDoorLock();
        SmartTemperatureControl tempControl = new SmartTemperatureControl();

        while (true) {
            // NOTE: This menu provides interactive control for various smart home devices
            System.out.println("\nSmart Home Automation System");
            System.out.println("1. Turn ON/OFF Light");
            System.out.println("2. Adjust Light Brightness");
System.out.println("3. Turn ON/OFF Fan");
System.out.println("4. Adjust Fan Speed");
System.out.println("5. Lock/Unlock Door");
System.out.println("6. Set Room Temperature");
System.out.println("7. View Device & Temperature Status");
System.out.println("8. Exit");
System.out.print("Enter your choice: ");

int choice = scanner.nextInt();
scanner.nextLine(); // Consume newline

// Handling user's choice using a switch-case structure
switch (choice) {
  case 1:
    System.out.print("Turn Light ON (1) or OFF (0): ");
    int lightChoice = scanner.nextInt();
    if (lightChoice == 1) light.turnOn();
    else light.turnOff();
    // TODO: Implement automatic light control based on time of day
    break;
  case 2:
    System.out.print("Enter brightness (0-100): ");
    int brightness = scanner.nextInt();
    light.setBrightness(brightness);
    break;
  case 3:
    System.out.print("Turn Fan ON (1) or OFF (0): ");
    int fanChoice = scanner.nextInt();
    if (fanChoice == 1) fan.turnOn();
    else fan.turnOff();
    break;
case 4:
    System.out.print("Enter fan speed (1-5): ");
    int speed = scanner.nextInt();
    fan.setSpeed(speed);
    // FIXME: Validate speed input to prevent out-of-range values
    break;
case 5:
    System.out.print("Lock Door (1) or Unlock Door (0): ");
    int lockChoice = scanner.nextInt();
    if (lockChoice == 1) doorLock.lock();
    else doorLock.unlock();
    // WARNING: Consider adding logs for security tracking of door unlock events
    break;
case 6:
    System.out.print("Enter desired temperature (°C): ");
    int temp = scanner.nextInt();
    tempControl.setTemperature(temp);
    break;
case 7:
    // Display status of all smart home devices
    System.out.println(light.getStatus());
    System.out.println(fan.getStatus());
    System.out.println(doorLock.getStatus());
    System.out.println(tempControl.getStatus());
    break;
case 8:
    System.out.println("Exiting system.");
```

```
                scanner.close();
                System.exit(0); // End program execution
            default:
                System.out.println("Invalid choice! Try again.");
                // TODO: Implement input validation and error handling for incorrect choices
          }
        }
    }
}
```

GITHUB REPOSITORY

https://github.com/mt-0301/Assingment2