COMSATS University Islamabad

(Dhamtor Campus)

NAME: **FATIMA AFTAB**

REGISTRATION NO: **FA21-BSE-088**

ASSIGNMENT: **LAB MID TERM EXAMINATION**

DATE OF SUBMITTION: **19th NOV 2024**

SUBMITTED TO: **FAIZA HAMEED**

Lab Mid-Term Exam:

Q1: Demonstrate your understanding of key design patterns by analyzing a problem, selecting appropriate patterns, and designing a robust solution.

Scenario: You are tasked with designing a **Smart Home Automation System**. The system should manage various smart devices and provide seamless interaction between them. The functionalities of the system include:

1. **Device Management:**
- Smart devices like lights, thermostats, security cameras, and speakers can be added, removed, and configured.
- Devices must be created dynamically depending on their type and brand (e.g., a SmartLight by BrandX or BrandY).

2. **Centralized Control:**
- Provide a single interface for users to interact with all devices (e.g., turn lights on/off, adjust temperature, etc.).

3. **Remote Access:**
- Users can control devices remotely. However, for security-sensitive devices like cameras, access should be restricted or proxied.

4. **Notifications:**
- Devices should notify users when certain events occur (e.g., motion detected by a camera or a light turned on).
5. **Singleton System:**
- The system's control hub must ensure that only one instance of the central controller exists at any time.

Tasks:

- Analyze the problem and identify the design patterns that suit different aspects of the system and justify your choices.
- Create a class diagram showing how the identified design patterns integrate into the system. Include relationships, key classes, and design pattern implementations.
- Write the code to demonstrate the implementation of the identified design patterns.

QUESTION#1:

Analyze the problem and identify the design patterns that suit different aspects of the system and justify your choices

ANSWER#1:

Following are the design patterns used in Smart Home Automation System

1. Singleton Pattern:

Singleton pattern is used to ensure that only one instance of central controller exist in the system.

2. Observer Pattern:

Observer pattern is used to notify the users when the states (any change or update) of devices change.

3. Proxy Pattern:

Proxy pattern is used to restrict user to access the camera. User can only access proxy camera.

4. Façade Pattern:

Façade is used in central controller class to provide user a simplified interface to interact with system.

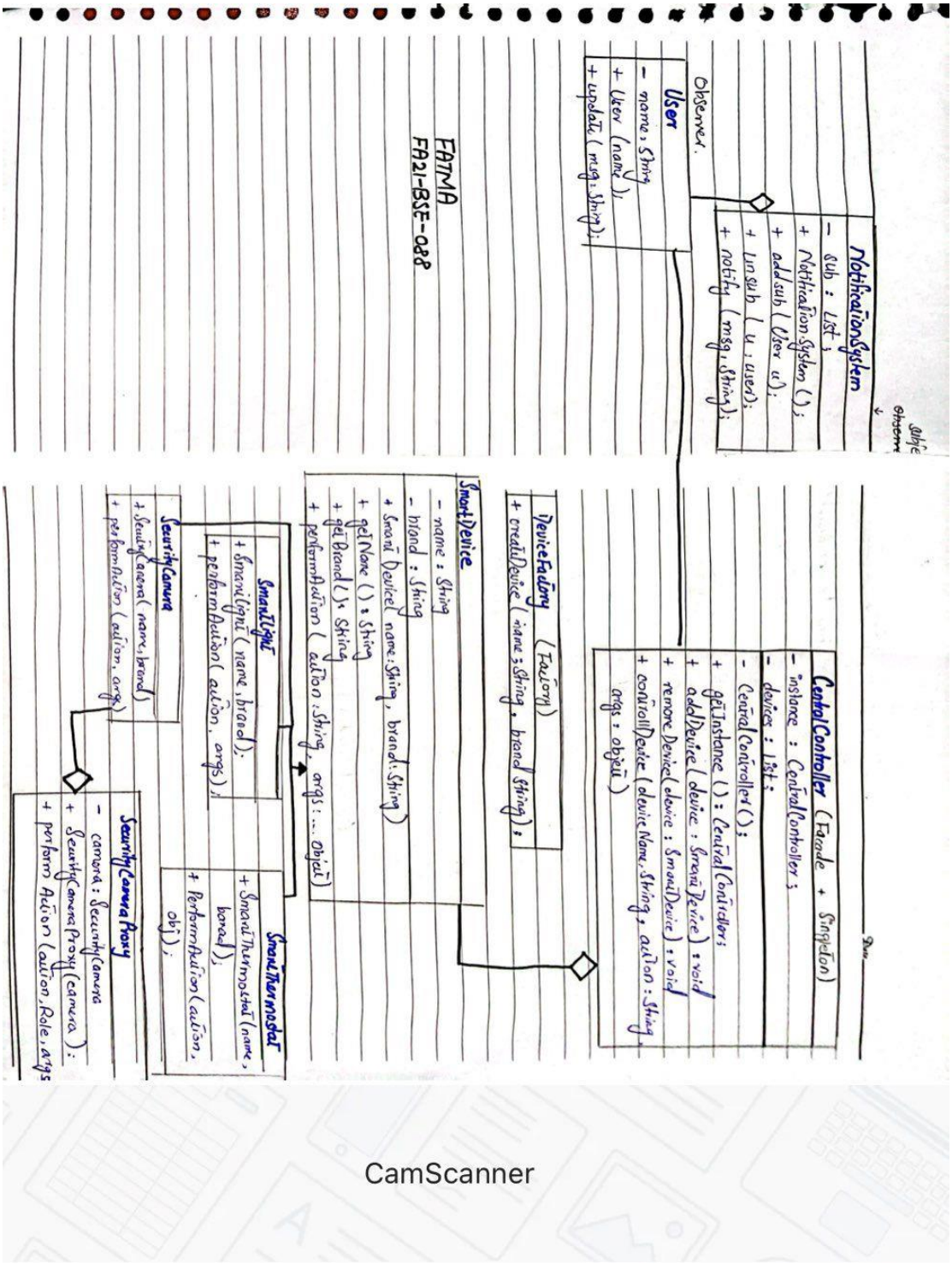
5. Factory Pattern:

Factory pattern is used to create the devices in home act as Device Factory.

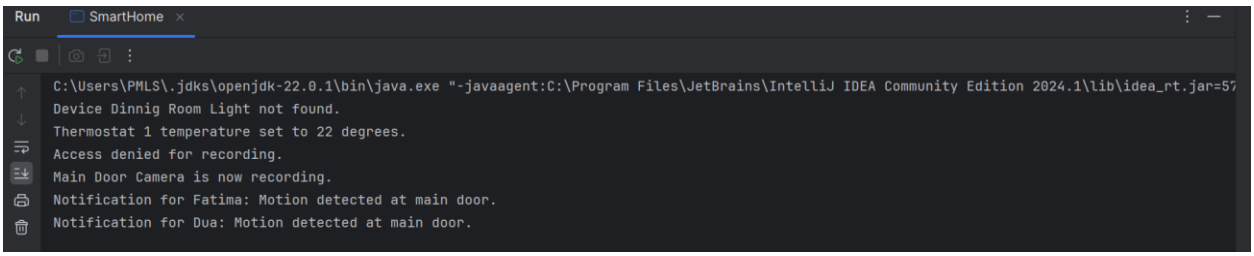
QUESTION#2:

Class diagram

ANSWER#2:



CODE (OUTPUT):


Run
SmartHome
C:\Users\PMLS\.jdks\openjdk-22.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.1\lib\idea_rt.jar=57
Device Dinnig Room Light not found.
Thermostat 1 temperature set to 22 degrees.
Access denied for recording.
Main Door Camera is now recording.
Notification for Fatima: Motion detected at main door.
Notification for Dua: Motion detected at main door.