B.M.S. COLLEGE OF ENGINEERING BENGALURU
Autonomous Institute, Affiliated to VTU

Object Oriented Modelling Mini Project Report

Home Wave - A Smart Home Solution

Submitted in partial fulfillment for the award of degree of

Bachelor of Engineering
in
Computer Science and Engineering

Submitted by:

Manvi Sharma (1BM22C2149)
Mohith Jain (1BM22CS162)

Faculty in Charge

Saritha A N

Assistant Professor

Department of Computer Science and Engineering
B.M.S. College of Engineering
Bull Temple Road, Basavanagudi, Bangalore 560019
2024-2025

B.M.S. COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DECLARATION

We, Manvi Sharma (1BM22CS149) , Mohith Jain (1BM22CS162) students of 5th Semester, B.E, Department of Computer Science and Engineering, BMS College of Engineering, Bangalore, hereby declare that, this Object Oriented Modelling Mini Project entitled "Home Wave - A smart home solution" has been carried out in Department of CSE, B.M.S. College of Engineering, Bangalore during the academic semester Sep 2024- Jan 2025. I also declare that to the best of our knowledge and belief, the OOM mini Project report is not from part of any other report by any other students.

Signature of the Candidate

Manvi Sharma (1BM22CS149)

Mohith Jain (1BM22CS162)

B.M.S. COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Object Oriented Modelling Mini Project titled "**Home Wave - A smart home solution"** has been carried out by Manvi Sharma (1BM22CS149) , Mohith Jain (1BM22CS162) during the academic year 2024-2025.

Signature of the Faculty in Charge

Saritha A N

Assistant Professor

Department of Computer Science and Engineering
B.M.S. College of Engineering

Table of Contents

1. INTRODUCTION

With the rise of the Internet of Things (IoT), smart home technology has become increasingly popular, enabling remote and efficient control of household devices. This project aims to develop a **Smart Home Application** that provides a user-friendly interface for managing smart appliances like lights, TVs, air conditioners, and speakers. Key features include device control, scheduling, usage monitoring, and profile management, making home automation simple and accessible.

Problem Statement

Managing multiple smart devices in a household is difficult due to the lack of a unified control system, leading to reliance on multiple apps. Complex setup processes, inefficient energy management without scheduling tools, and poorly designed user interfaces further complicate device monitoring and control. This project aims to create a **centralized and user-friendly application** to simplify smart device management and improve overall efficiency.

Motivation

The inspiration for this project comes from the **Smart India Hackathon**, which highlighted the need for a unified solution to manage and control multiple smart devices in a home. The project aims to simplify smart home automation and enhance user convenience by addressing key challenges such as device fragmentation, complex setup, and inefficient energy management.

Key motivations include:

- **Ease of Use**: A user-friendly interface to control all devices from a single app.
- **Centralized Control**: A unified platform to reduce the complexity of using multiple apps.
- **Energy Efficiency**: Tools for scheduling and monitoring device usage to save energy.
- **Enhanced User Experience**: Features like device status visualization, scheduling, and notifications.
- **Technological Growth**: Leveraging IoT and cloud technologies for an innovative and scalable solution.

2. SOFTWARE REQUIREMENT SPECIFICATION (SRS)

1.Introduction

1.1Purpose of this document: This document outlines the software requirements for the Smart Home Application. It defines the system's functionalities, interfaces, and performance needs to ensure successful development and deployment.

1.2 Scope of this document: The scope includes the functional, non-functional, and interface requirements for the application, as well as constraints and performance criteria. It focuses on managing and controlling smart devices in a household through a user-friendly mobile interface.

1.3 Overview: This document provides the specifications required to develop a mobile application that controls smart home devices (lights, TVs, air conditioners, speakers, etc.) efficiently, with a unified control system and energy-saving features.

2. General Description

The **Smart Home Application** will offer users a centralized platform to manage various smart home devices from a single interface. It will allow device monitoring, scheduling, and status control, enabling users to easily manage devices like lights, air conditioners, and TVs. The app will integrate multiple IoT devices, ensuring a seamless user experience across different brands.

Features will include **real-time monitoring**, **energy-efficient scheduling**, and **status control** (e.g., turning devices on/off, adjusting settings). It will also provide **remote control**, **push notifications** for updates, and **profile management** to personalize settings. The goal is to enhance user convenience, energy efficiency, and control over home automation.

3. Functional Requirements

- **Login**: Users can log in with their credentials or via social media.
- **Device Management**: Control smart devices like lights, TVs, air conditioners, and speakers.

- **Scheduling**: Set device schedules for optimal energy consumption.
- **Notifications**: Push notifications for device status and reminders.
- **Profile Management**: Update user profile details and settings.
- **Room Management**: Organize devices into rooms and manage them separately.
- **Energy Monitoring**: Display device usage statistics and energy consumption.
- **Device Addition**: Add new smart devices with easy setup steps.

4. Interface Requirements

- **User Interface (UI)**: A mobile app with an intuitive interface for iOS and Android platforms.
- **Hardware Interfaces**: Communicate with IoT devices using protocols such as Wi-Fi, Bluetooth, or Zigbee.
- **Software Interfaces**: The application must integrate with third-party smart device APIs and cloud services.
- **User Interface Design**: The UI will include options to view, control, and schedule devices, with clear navigation and icons.

5. Performance Requirements

- **Response Time**: The app should respond to user actions (device control, switching) within 2 seconds.
- **Reliability**: 99% uptime for device management and communication.
- **Scalability**: The app should support adding up to 100 devices per user.
- **Efficiency**: Energy-efficient app operations, ensuring minimal battery drain during use.

6. Design Constraints

- **Platform**: The app must be compatible with both **Android** and **iOS** devices.
- **Security**: The app must comply with security standards to protect user data and privacy, including encryption of communication and data storage.
- **Compatibility**: It should support a range of smart devices with Wi-Fi, Bluetooth, or Zigbee connectivity.

- **Usability**: The UI must be intuitive and accessible for all users, including those without technical expertise.

7. Non-Functional Attributes

- **Usability**: The app must provide a user-friendly and responsive interface.
- **Security**: Secure authentication and data protection using encryption and secure APIs.
- **Maintainability**: The system should be easy to update and maintain with minimal downtime.
- **Portability**: The app should be easily portable to other platforms (e.g., from mobile to web).
- **Scalability**: It should support future integration with additional smart devices or new features.

8. Preliminary Schedule and Budget

- **Schedule**:
  - **Requirements Gathering**: 1 month
  - **System Design**: 1 month
  - **Development & Testing**: 3 months
  - **Deployment & Maintenance**: Ongoing
- **Budget** (in INR):
  - **Development Costs**: ₹7,50,000
  - **Testing and Deployment**: ₹2,25,000
  - **Marketing and Maintenance**: ₹1,50,000 annually

3. CLASS DIAGRAM

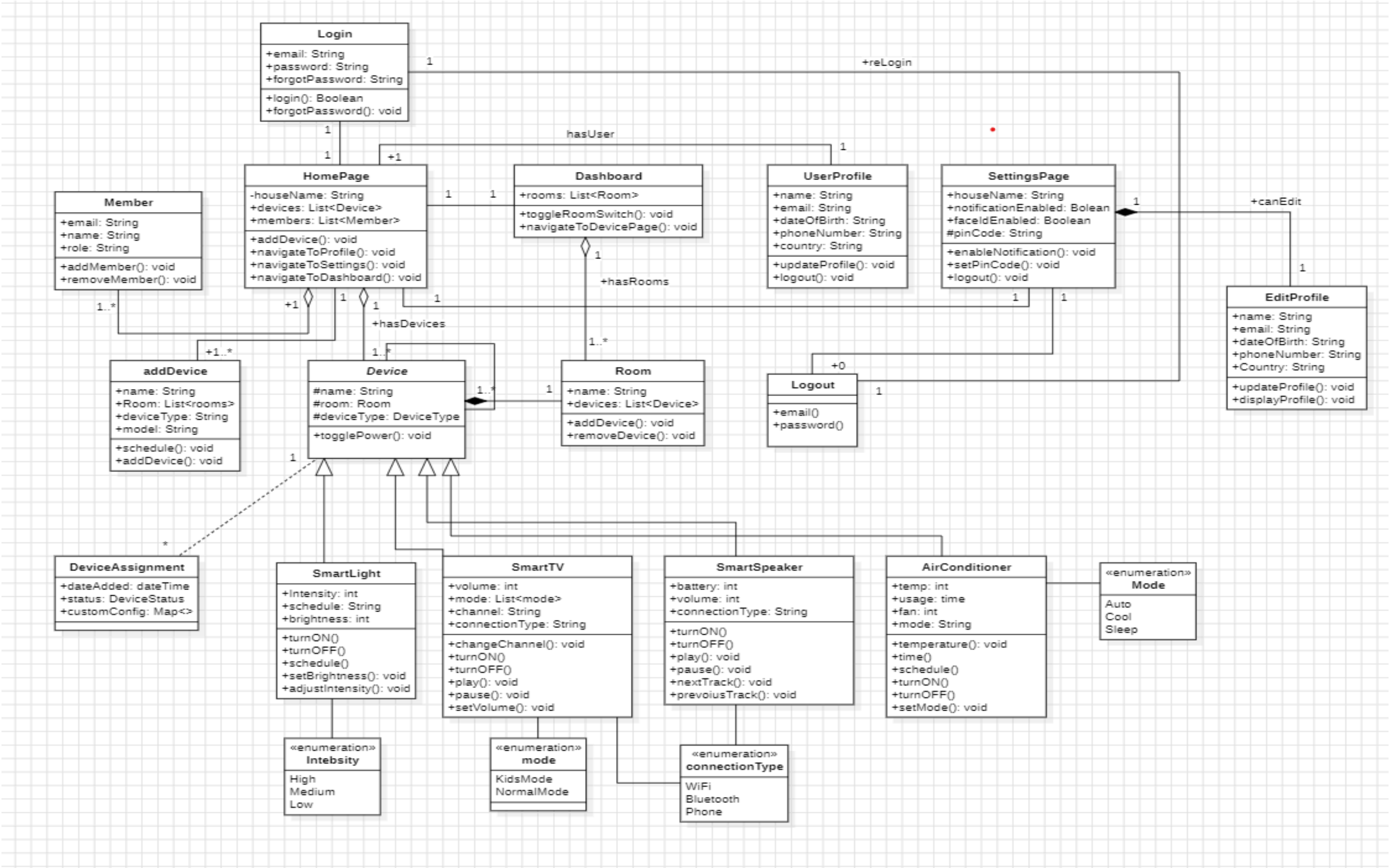


Fig.3.1 Class Diagram

Components and Descriptions

1. **Login**: Handles user authentication with methods for login and password recovery.
2. **UserProfile**: Manages user information like email, phone, and profile updates.
3. **HomePage**: Displays user devices and allows navigation to settings or dashboards.
4. **Dashboard**: Shows device statuses and enables device toggling.
5. **Device**: Represents generic devices with methods like togglePower.
6. **Room**: Groups devices in specific rooms for easier management.
7. **SmartLight**: Extends Device for lighting control with brightness and intensity settings.
8. **SmartTV**: Extends Device for TV controls like changing channels and volume.
9. **AirConditioner**: Extends Device with temperature and mode settings.
10. **DeviceAssignment**: Tracks device configurations and states.
11. **SettingsPage**: Manages user-specific configurations and notifications.
12. **EditProfile**: Allows editing user profile details.

4. STATE DIAGRAM

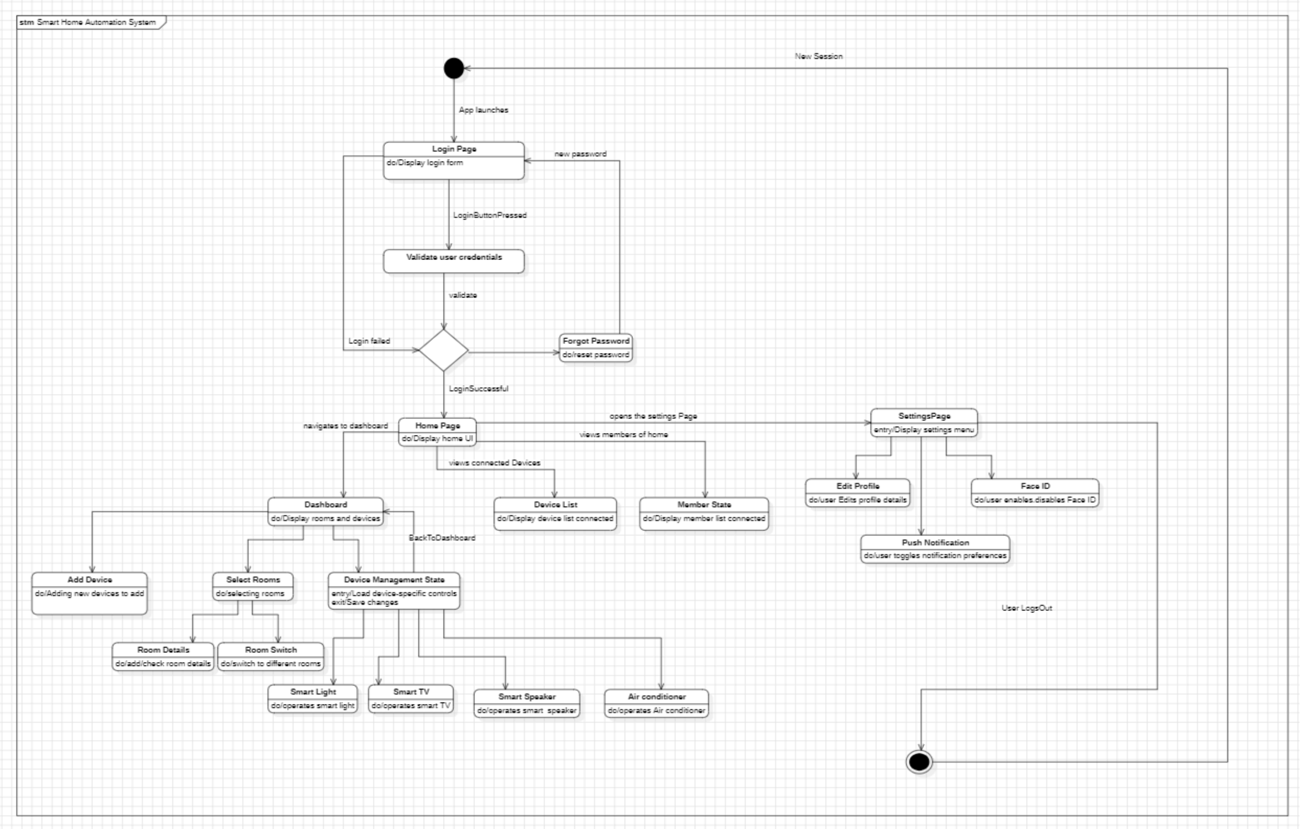


Fig.3.2. State Diagram

Functionality Overview

1. **App Launch**:
    - ○ The system initializes a new session for the user.
    - ○ Transition: Moves to the **Login Page**.
2. **Login Page**:
    - ○ Displays a login form for the user to enter credentials.
    - ○ Functions:
        - ■ Validate user credentials.
        - ■ Handle login success or failure.
        - ■ Provide a "Forgot Password" option for password recovery.
    - ○ Transitions:
        - ■ On successful login → **Home Page**.
        - ■ On failed login → Retry or Forgot Password.

3. **Home Page**:
    - Serves as the main interface for the user after logging in.
    - Functions:
        - Display connected devices.
        - Navigate to **Dashboard** or **Settings Page**.
    - Transition: Depending on user selection, move to **Dashboard** or **Settings Page**.
4. **Dashboard**:
    - Manages devices and rooms in the smart home system.
    - Functions:
        - Add new devices.
        - Select and view room details.
        - Access specific controls for devices like Smart Light, Smart TV, Smart Speaker, and Air Conditioner.
        - Save device-related changes.
    - Transition: Returns to **Home Page** on user action.
5. **Settings Page**:
    - Provides configuration options for the user.
    - Functions:
        - Edit user profile.
        - Manage Face ID.
        - Configure push notification preferences.
    - Transitions:
        - Return to **Home Page**.
        - Logs the user out of the system.
6. **User Logout**:
    - Ends the current session and transitions the system back to the initial **App Launch** state.

Component Overview

1. **Authentication Module**:
    - Handles user credential validation and session management.

2. **Home Page Interface**:
    - Displays the main UI for device control and navigation.
3. **Device Manager**:
    - Manages device interactions such as adding devices, updating statuses, and controlling device-specific features.
4. **Room Manager**:
    - Handles room-specific data, including switching rooms and viewing their details.
5. **Settings Manager**:
    - Allows users to modify their profile, enable Face ID, and configure notifications.
6. **State Controller**:
    - Governs the transitions between various states (e.g., Login, Dashboard, Settings, Logout).

5. INTERACTION DIAGRAM

5.1 USE-CASE MODEL

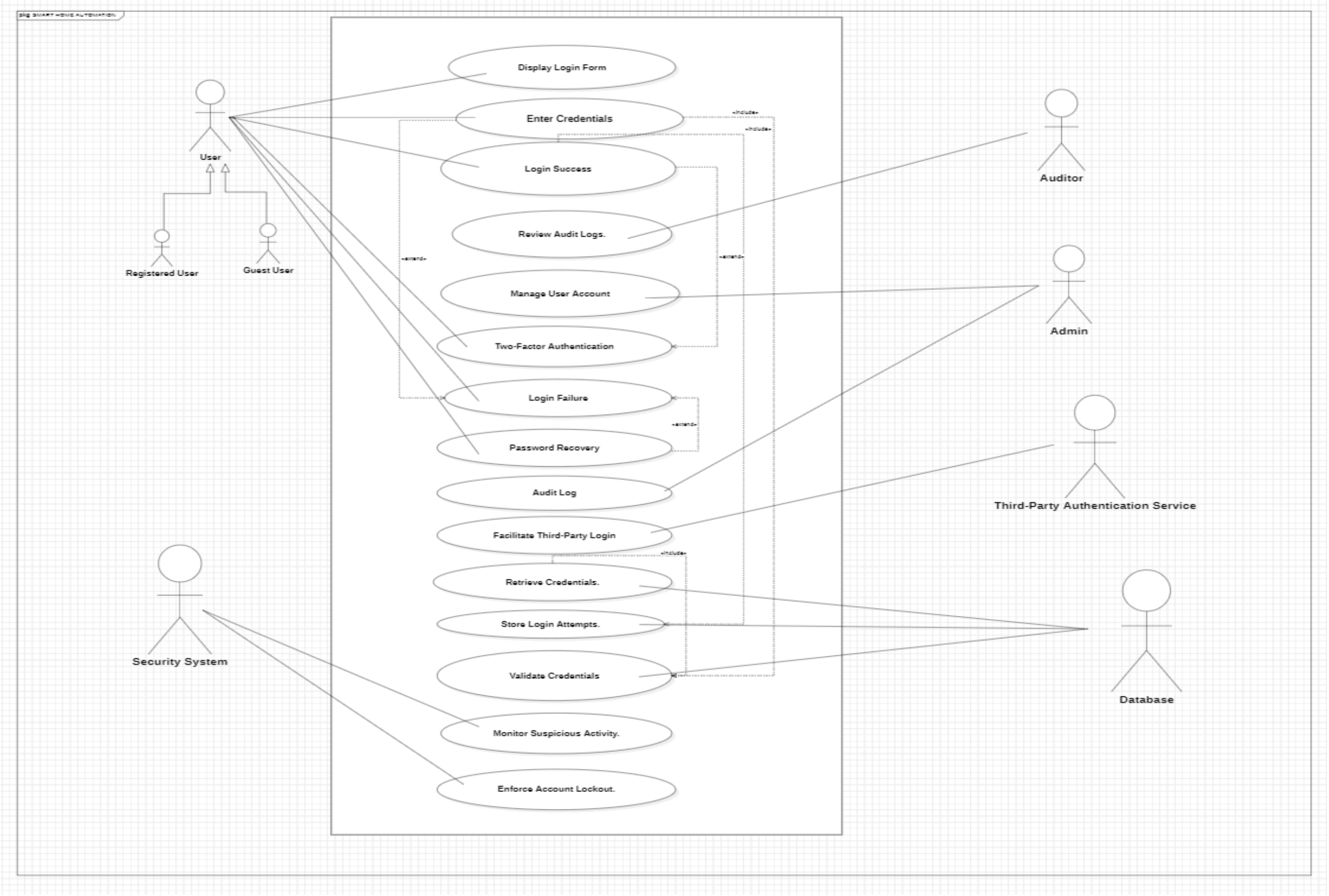


Fig.5.1. UseCase Diagram

Components and Descriptions

1. **User**: An actor responsible for interacting with the system for login, account management, and device control.
2. **Admin**: Manages overall system operations and reviews credentials.
3. **Auditor**: Handles system auditing and reviews security logs.
4. **Security System**: Integrates security features for device verification.
5. **Third-Party Authentication Service**: Provides external user authentication.
6. **Database**: Stores user credentials, device information, and logs.
7. **Use Cases**: Represent functionalities such as login, reviewing credentials, and auditing.

5.2 Sequence Diagram

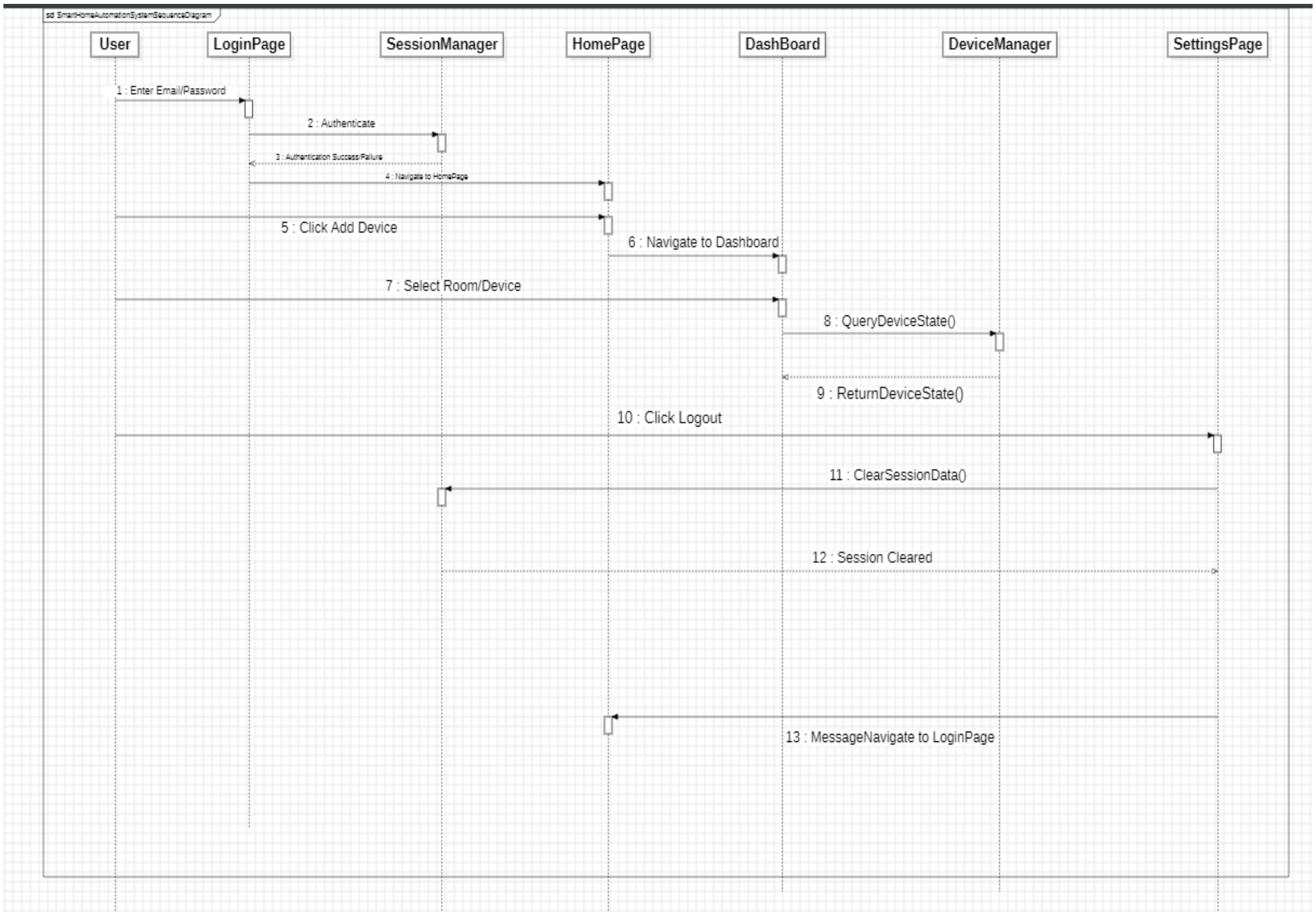


Fig.5.2.Sequence Diagram

Components and Descriptions:

1. **User**: Initiates actions like login, device addition, and logout.
2. **LoginPage**: Handles email/password input and authentication.
3. **SessionManager**: Manages session data for active users.
4. **HomePage**: Displays user devices and provides navigation options.
5. **Dashboard**: Queries and returns device statuses for display.
6. **DeviceManager**: Manages device interactions, including adding and updating devices.
7. **SettingsPage**: Handles configuration changes during the session.

5.3 Activity Diagram

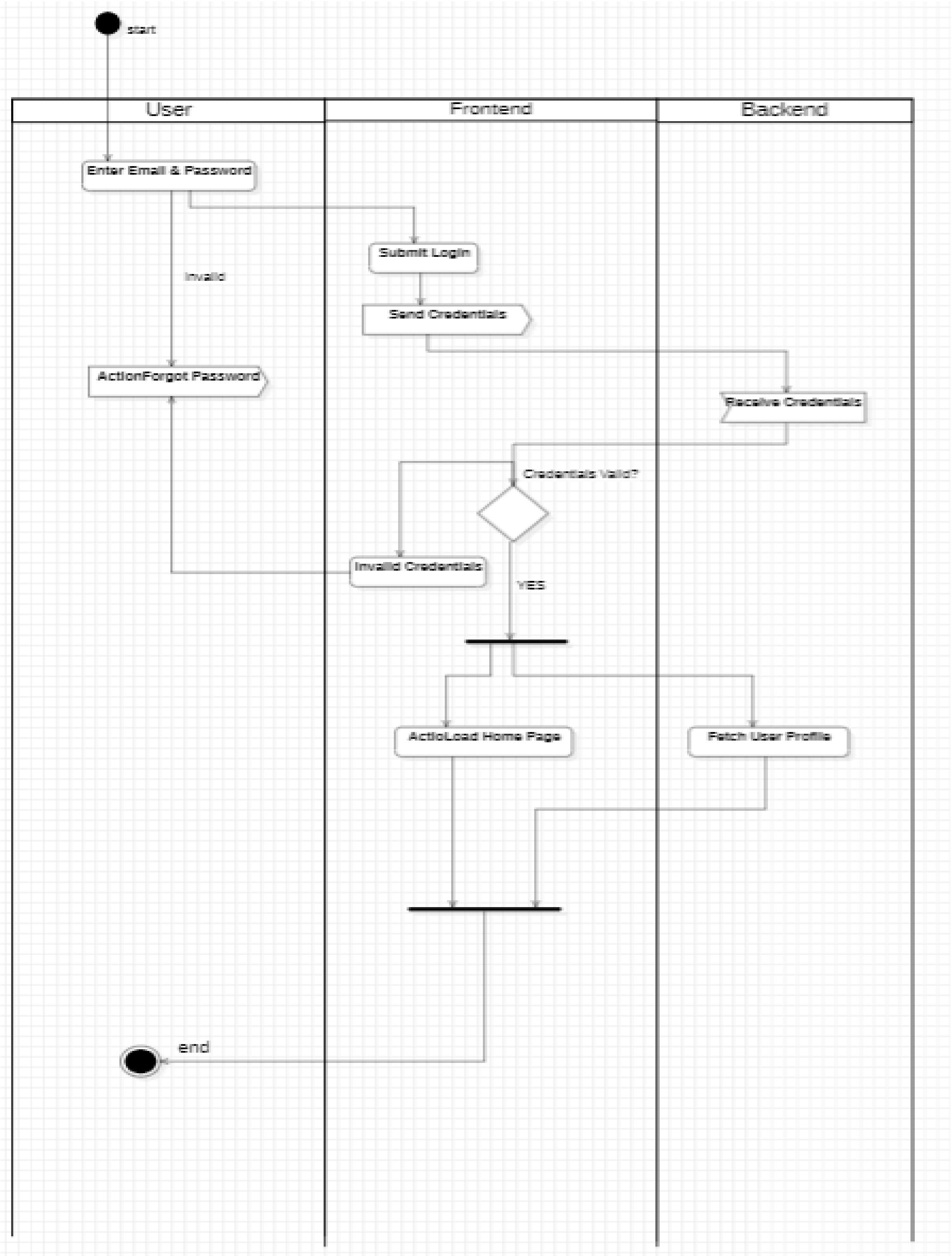
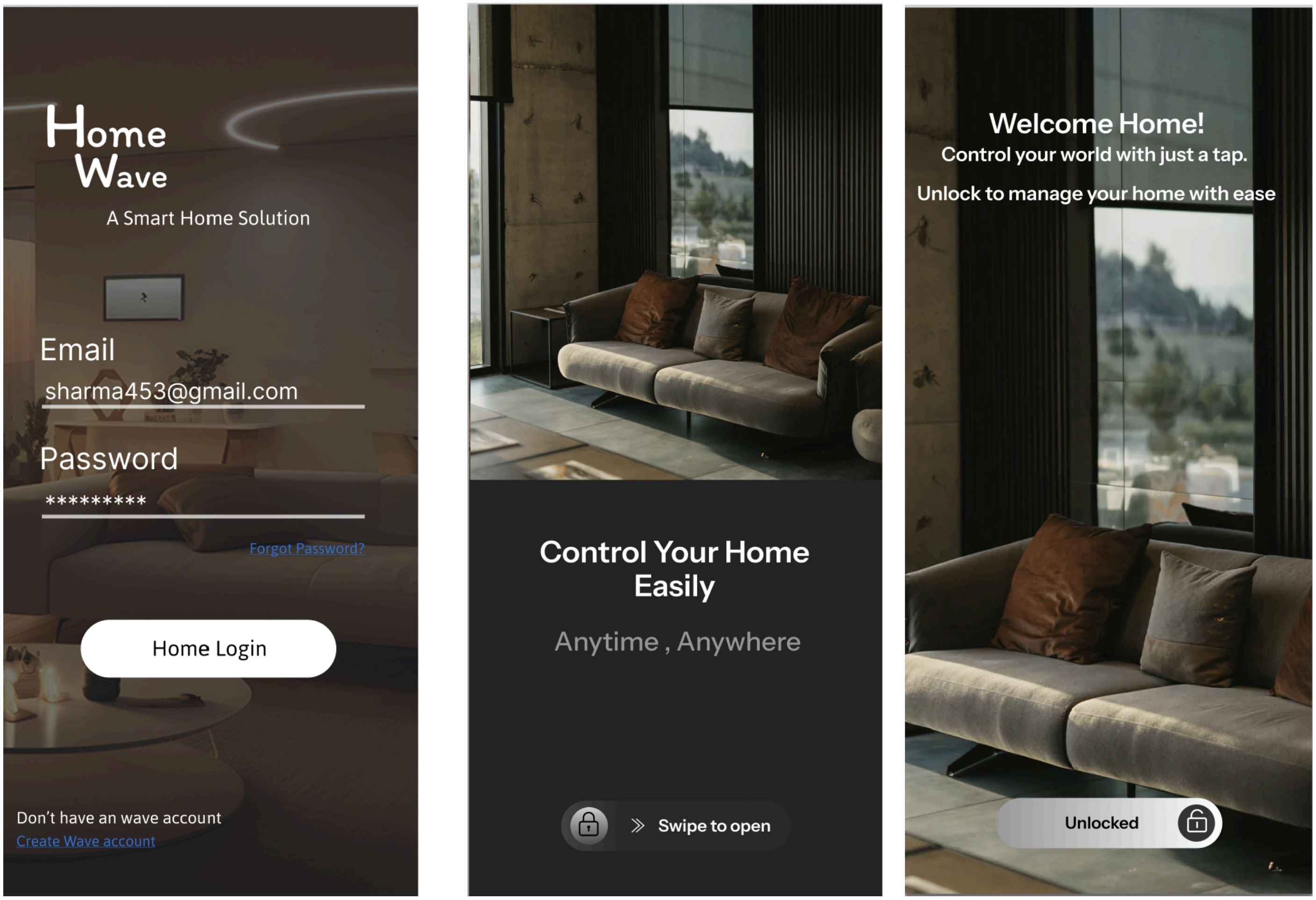


Fig.5.3.Activity Diagram

Components Overview:

1. **User**: Initiates login, navigates the app, and recovers the password if necessary.
2. **Frontend**: Collects user input and facilitates interaction with the backend.
3. **Backend**: Validates credentials and determines whether the user can proceed.
4. **ActionLoad Home Page**: The landing page after successful login, displaying user-specific data.
5. **User Profile Fetch**: Populates the homepage with relevant user data.

6. UI DESIGN



Home Wave

A Smart Home Solution

Email

sharma453@gmail.com

Password

****

Forgot Password?

Home Login

Don't have an wave account

Create Wave account

Control Your Home Easily

Anytime , Anywhere

Swipe to open

Welcome Home!

Control your world with just a tap.

Unlock to manage your home with ease

Unlocked

Fig 6.1: Login Interfaces

Login Interface

The **Login Page** allows users to securely access the application by entering their registered email and password. Once logged in, users can seamlessly use the app's features. If a user forgets their password, an option is provided to reset it, ensuring easy account recovery.

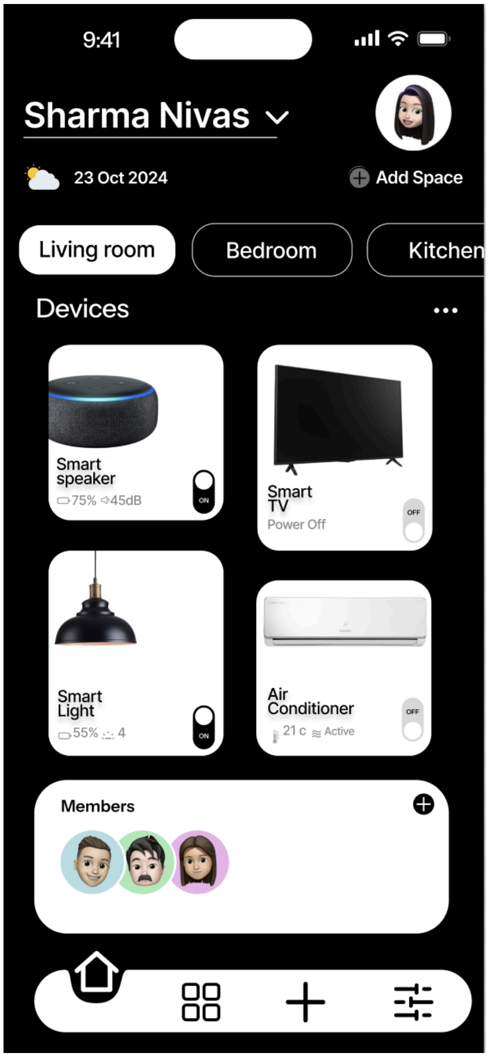


Fig 6.2: Home Interface

Home Interface

The **Home Page** displays the current home name and allows users to switch between multiple homes or offices. It shows the user's profile and provides options to add or switch between various spaces like the living room, kitchen, or bathroom. Users can interact with pinned devices directly from the home page for quick control. Additionally, there is an option to view **real-time member connections**, showing who is currently connected to the home. A **bottom navigation bar** lets users easily switch between different pages, such as Home, Dashboard, Add Device, and Settings, providing seamless navigation throughout the app.

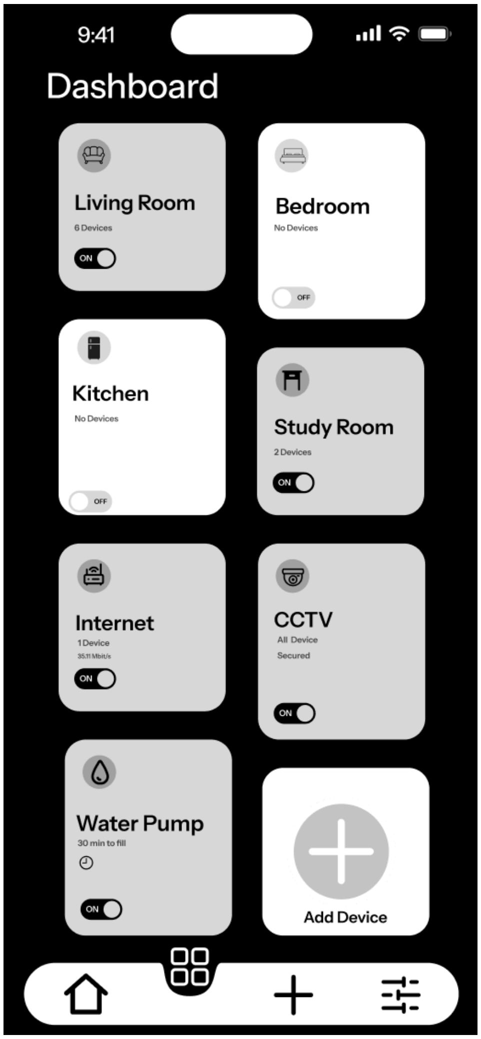
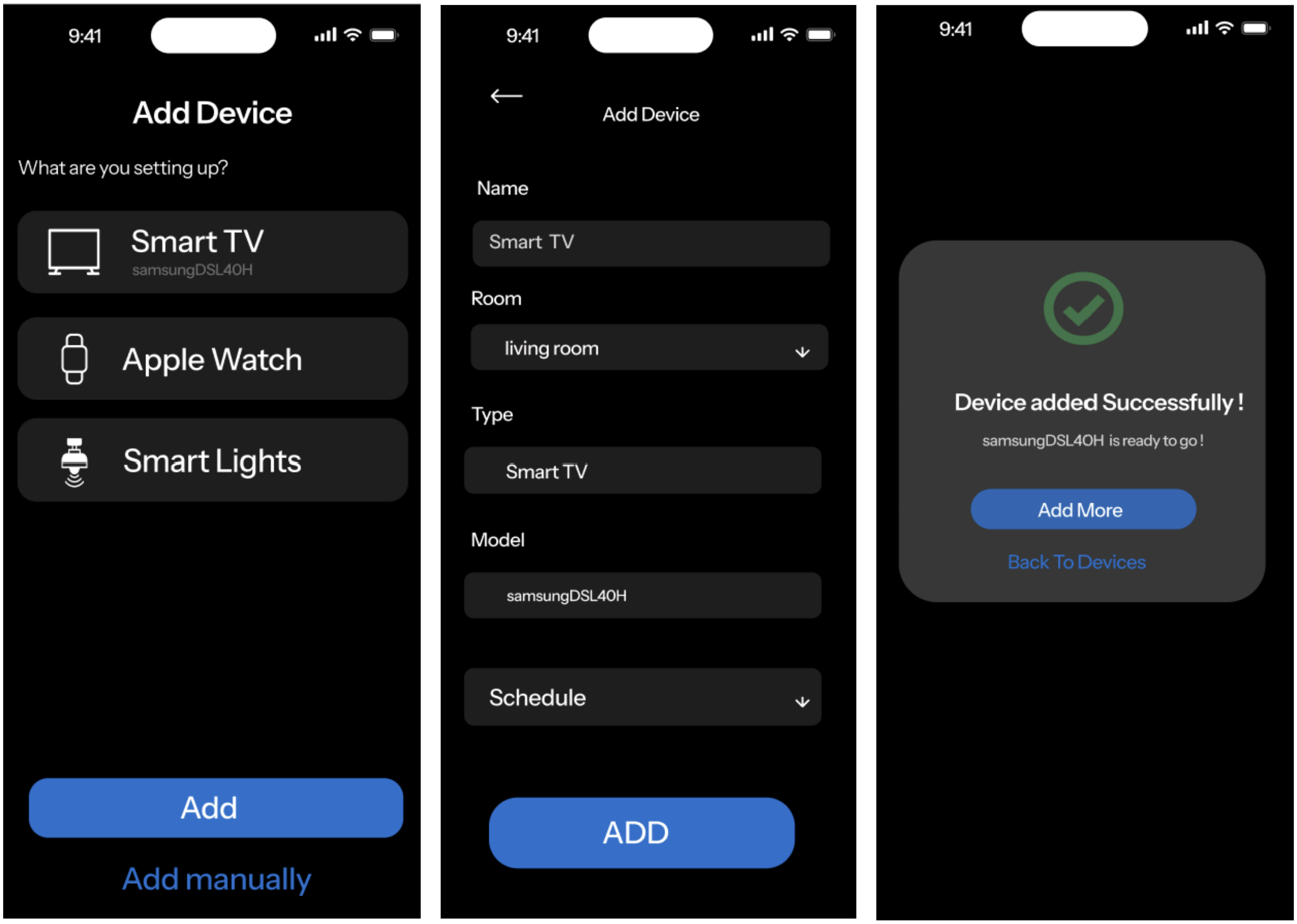


Fig 6.3: DashBoard InterFace

Dashboard Interface

The **Dashboard Page** displays all the devices currently connected to the selected home. It provides an overview of each device's status and allows users to easily manage them. Users can also add new devices through an **Add Device** option on the page. The **bottom navigation bar**, identical to the one on the Home Page, allows users to navigate seamlessly between the Home, Dashboard, Add Device, and Settings pages for quick access to all app features.



Name
Smart TV

Room
living room

Type
Smart TV

Model
samsungDSL40H

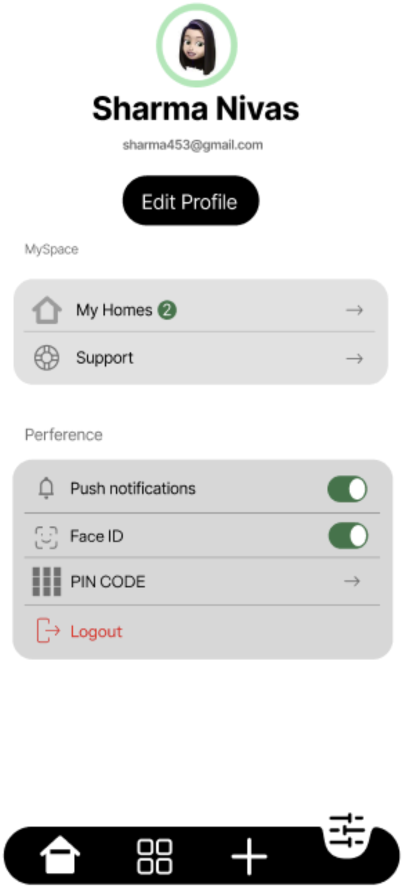
Device added Successfully !

samsungDSL40H is ready to go !

Fig 6.4: Add Device Interfaces

Add Device Interface

The **Add Device Page** allows users to easily add new smart devices to their home. Users can input essential details such as the device **Name**, **Room**, **Device Type**, and **Model ID** (if available or required). If needed, users can also set a **schedule** for the device to operate at specific times. Once the device is added, it is displayed on the page, allowing users to view and manage newly connected devices. This page provides a simple and intuitive interface for expanding the smart home setup.



Sharma Nivas

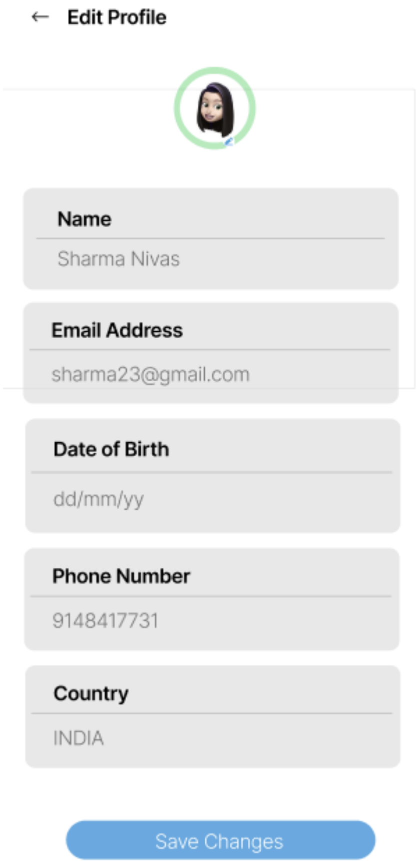
sharma453@gmail.com

MySpace

Perference

Push notifications: ●

Face ID: ●



Name: Sharma Nivas

Email Address: sharma23@gmail.com

Date of Birth: dd/mm/yy

Phone Number: 9148417731

Country: INDIA

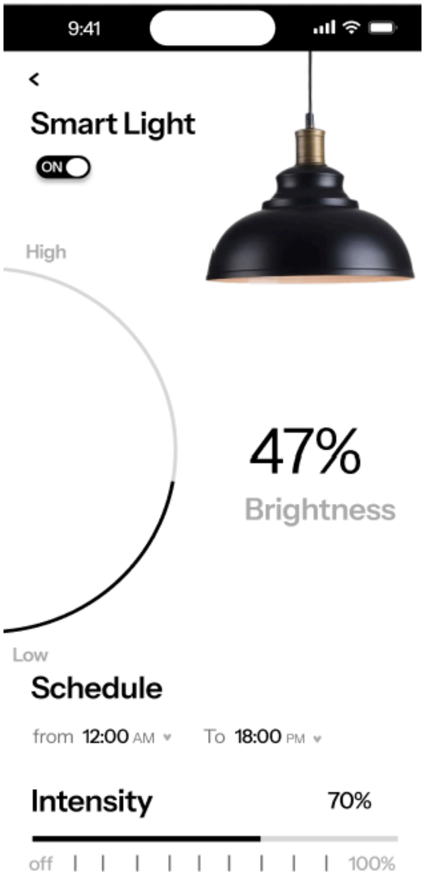
Fig 6.5: Settings Interface

Fig 6.6: Edit Profile Interface

Settings and Edit Profile Interface

The **Settings Page** displays the user's **profile image** and **house name**, along with an option to **edit the profile**. Users can view all homes connected to their account and manage settings like **push notifications**, **Face ID enable/disable**, and **PIN code settings** for additional security. The page also includes an option to **log out** from the account.

The **Edit Profile** section allows users to update their **name**, **email**, **phone number**, and other personal details to keep their profile current and accurate. This page provides both account and home management options in a streamlined, easy-to-use interface.



Smart Light

ON

47%
Brightness

Schedule

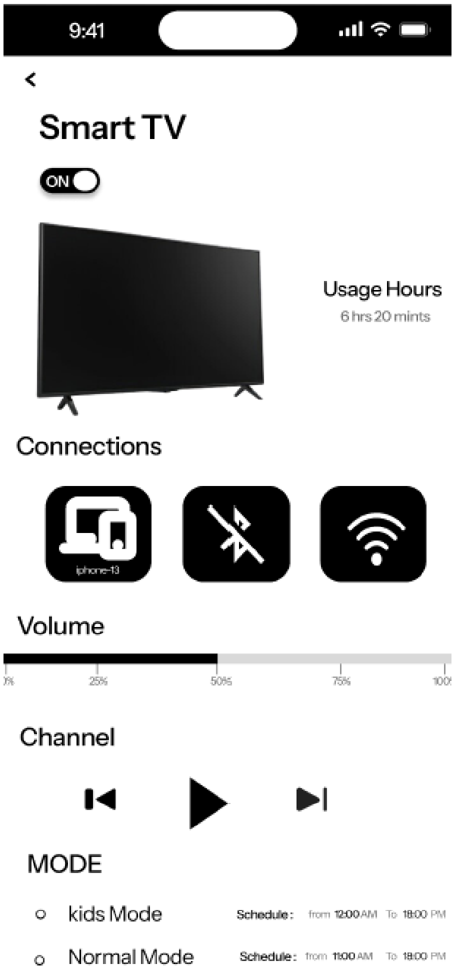
from 12:00 AM To 18:00 PM

Intensity 70%

Fig 6.7 Smart Light Device Interface

Smart Light Interface

The **Smart Light Page** allows users to **toggle** the light **on/off** with a simple switch. Users can adjust the **brightness** level using a slider and view the current **brightness percentage** on the screen. Additionally, the page provides an option to **set a schedule**, allowing the light to turn on or off automatically at specific times. Users can also adjust the **intensity level** of the light with a slider, ranging from off to 100%, for customizable lighting preferences.



Usage Hours
6 hrs 20 mints

○ kids Mode Schedule : from 12:00 AM To 18:00 PM

○ Normal Mode Schedule : from 11:00 AM To 18:00 PM

Fig 6.8: Smart TV Device Interface

Smart TV Interface

The **Smart TV Page** allows users to **toggle** the TV **on/off** with a simple switch. Users can view the **usage hours** of the TV and turn **connections on or off**, such as **mobile**, **Bluetooth**, or **Wi-Fi**, by clicking on each connection option. The page also includes controls for adjusting the **volume**, and users can **play**, **pause**, **forward**, or **backward** media content. Additionally, users can switch between different modes, such as **Kids Mode** and **Normal Mode**, and set a **schedule** to automate TV usage.

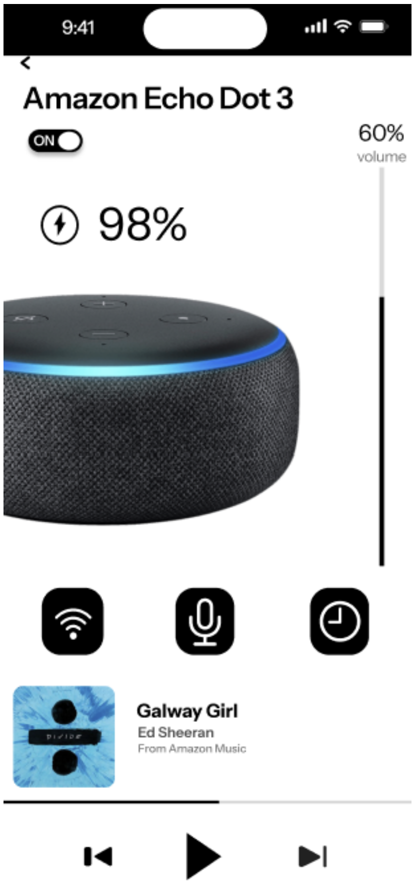


Fig 6.9: Alexa Smart Speaker Interface

Alexa Smart Speaker Page

The **Alexa Smart Speaker Page** allows users to **toggle** the speaker **on/off**. Users can view the **battery percentage** and the **charging status** of the device. The page includes a **volume control** slider to adjust the sound level. Users can also check the **connection status** for **Wi-Fi**, **microphone**, and see if any **schedules** are set for the device. Additionally, the page provides controls to **play**, **pause**, **forward**, or **backward** any music or songs currently playing on the speaker.

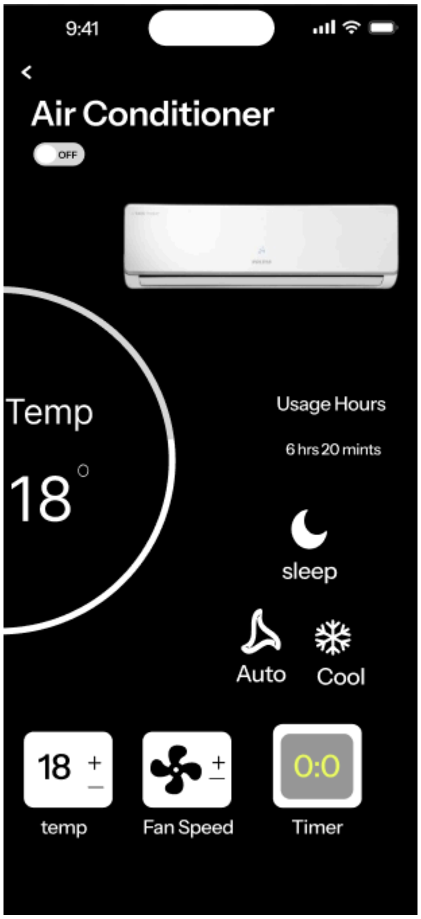


Fig 6.10: Air Conditioner Interface

Air Conditioner Page

The **Air Conditioner Page** allows users to **toggle** the AC **on/off**. Users can **view the current temperature** and track the **usage hours** of the device. The page includes options to **set the mode**, such as **Sleep**, **Auto**, or **Cool**. Users can also **adjust the temperature**, set the **fan speed**, and configure the **timer** to schedule when the AC should turn on or off. These controls provide a customized and efficient way to manage the air conditioning system.

7. CONCLUSION

The Smart Home Application provides an integrated and user-friendly platform to manage multiple smart devices efficiently. By addressing key challenges such as device fragmentation, complex setups, and energy inefficiency, the application streamlines smart home management with centralized control and advanced features like scheduling, device monitoring, and profile customization. The intuitive user interface enhances accessibility, allowing users to interact seamlessly with various smart devices, including lights, air conditioners, TVs, and smart speakers.

Leveraging IoT advancements and modern technologies, this solution not only simplifies home automation but also contributes to energy optimization and improved user convenience. Overall, the project demonstrates a practical and scalable approach to managing smart devices, making modern households more efficient, connected, and future-ready.