Smart Living Challenge:
Simulating the Future Home

Introduction:

The Smart Living Challenge problem requires us to explore and immerse ourselves in the world of cutting-edge smart home technologies. The problem statement is designed such that we need to simulate a smart home with one bedroom, a kitchen, and a hall. The aim is to install motion-detecting sensors and LEDs in every room, a robust door security system, and separate fire detectors in each room to ensure a safe and secure living environment in the smart home. Also, there is a common 20x4 LCD display that dynamically shows all the activities in the house, specifying the room where each activity is occurring.

Enhanced Door Security System Specifications:

It consists of a 16x2 LCD display, a keypad, a PIR sensor (as a motion detector sensor), a relay module and two servo motors. The PIR sensor ensures that the LCD screen turns on when someone comes close and displays the "Enter Password:" message. It will take a 4-digit number as input from the user and display "Hello dear, Welcome Home!" or "Incorrect Password" depending on whether or not the password entered by the user is correct or not. If the password entered is correct, the servo motors will turn 180 degrees to open the gate and will also automatically turn back after ten seconds to close the gate.

Smart Home System Specifications:

The smart home system is installed with three flame sensors and LEDs in each room. The kitchen and rooms are also equipped with separate relay modules and PIR sensors, which detect the presence of a person in the room and turn on the LED of the respective room automatically. There is a centralized 20x4 LCD that displays in which room the person is present. Additionally, there is a motor for simulating a water system and a GSM module that sends a help message to the nearby fire station.

For security measures, we have also installed a fire detection system in each room, which detects fire in the house. Once the fire is detected, a series of security measures are initiated in the smart home. The actions include:
- The activation of the buzzer denoting that the smart home is in an emergency situation.
- There is a central LED light that turns on when the home is in an emergency situation.
- The central LCD displays "Alert…Fire Fire Fire", "Putting out fire", and "Calling for help" while these operations are performed simultaneously.
- The GSM module sends an SOS message to the nearby fire station along with the necessary address details. Furthermore, it sends a personal message to the mobile phone of the user notifying him the presence of fire situation in his smart home.

- Activation of the water flow system to put off the fire in the house which is simulated with the help of a simple DC motor.

Actions On the Blynk Cloud:

There are 5 virtual pins on the cloud. Three of them are for turning on the lights of the bedroom(V1), kitchen(V2), hall(V3) respectively. Pin V4 is meant for turning on/off the fire alarm system. Virtual pin V0 is for entering the password from the phone itself and unlock the door.

Implementation Details:

We utilised Proteus for simulation and Arduino Mega microcontroller boards, along with the required sensors and modules.

Initially the door LCD is off, whenever a person comes near the door, PIR sensor detects it and then a relay module supplies the power to the LCD screen and it asks the person to enter the password.
For door unlocking we made two ways to unlock it either manually by entering the password from the keypad or entering it online. Whenever the correct password is entered it displays a greeting on the LCD screen and rotates the servo motor by an angle of 180 degrees and then waits for 10 sec for the person to enter the house. After 10 sec servo returns back to its position, locking the door.
In case the incorrect password is entered it displays a message of Incorrect Password and instructs to re-enter the password.

Now comes the indoor system in which a centralised LCD is used to display the activities going inside the house. Each room has a proximity sensor which detects the entry of a person into the room. As the sensor detects anyone, the relay module supplies the current in the led and lights glow up the room. At the same time LCD displays the presence of the person in the respective room.

Each room is equipped with fire detecting sensors which detect any fire in the room. In case the fire is detected in any part of the house, the fire extinguishing process starts. A red alerting LED starts glowing and a buzzer starts sounding indicating the signs of fire in the house. To extinguish the fire, a water motor starts and tries to reduce the fire.
We also connected a GSM module which sends an alerting message to the owner of the house and also to the fire-station with the address provided with it. In the meantime LCD displays the alerting messages about the fire and others.

We have used COMPIM to connect our Arduino board to the wifi.

Approximate Cost of the device:

- 16 x 2 LCD display: Rs 199 ([Click here to buy](#))
- Keypad : Rs 120 ([Click here to buy](#))

- PIR sensors: 4 x 62 = Rs 248 ([Click here to buy](#))
- Relay modules: 4 x 46 = Rs 184 ([Click here to buy](#))
- Servo: 2 x 149 = Rs 298 ([Click here to buy](#))
- Flame sensors: 3 x 36 = Rs 108 ([Click here to buy](#))
- LEDs : 4 x 5 = Rs 120 ([Click here to buy](#))
- 20 x 4 LCD : Rs 370 ([Click here to buy](#))
- DC motor: Rs 15 ([Click here to buy](#))
- Buzzer : Rs 24 ([Click here to buy](#))
- 9V Battery: Rs 20 ([Click here to buy](#))

Total Approximate cost = Rs 1,706

Conclusion:

In conclusion, our solution for the Smart Living Challenge showcases a comprehensive smart home system that prioritises security, automation, and safety. Our comprehensive details and logic ensures an easy real life implementation of the model. We believe our innovative approach and attention to detail will position us competitively for round 2 of the challenge.

This report serves as a testament to our genuine efforts and dedication to the project.

Team **Dhumketu**