Project Report: Smart Home

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1. Project Overview:

This project aims to create a smart home system that integrates door control, security measures, temperature management, and light adjustment. The system uses various sensors and actuators to automate these functions, making the home more secure and comfortable.

Key Features:

1. **Automatic Door Control Using IR Sensors**: The system automatically opens and closes the door when a person is detected.
2. **Security System Using Keypad**: A password is required for access to the home. If the password is wrong, an alarm is triggered. If correct, the system grants access with visual feedback.
3. **Temperature Management Using a Temperature Sensor**: The system ensures the home stays cool by turning on a fan when the temperature exceeds a set threshold.
4. **LED Brightness Control Using LDR**: The system adjusts the brightness of LEDs based on the ambient light.

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3. Components Used and Their Functions:

1. IR Sensors (Infrared Sensors)

- **Function**: These sensors are used to detect the presence of a person near the door.
- **Role in the Project**:

- There are two IR sensors placed on either side of the door. When one sensor detects a person, it triggers the servo motor to open the door in the opposite direction of the person.
- These sensors help ensure that the door opens only when someone is near and helps prevent collisions.

2. Servo Motor

- **Function**: The servo motor is used to control the movement of the door.
- **Role in the Project**:
  - The servo motor opens and closes the door based on the detection of the IR sensors.
  - When a person is detected, the servo motor rotates to open the door and closes once the person passes through.

3. 2x2 Keypad

- **Function**: The keypad is used for entering a password to access the home.
- **Role in the Project**:
  - The system requires the user to input a password. If the password is correct, the system grants access by turning on a green LED and displaying "Welcome Home" on the LCD.
  - If the password is incorrect, the system sounds a buzzer and displays "Wrong Password" on the LCD, prompting the user to try again.

4. Buzzer

- **Function**: The buzzer is used to alert the user with sound.
- **Role in the Project**:
  - The buzzer sounds when the user enters an incorrect password, providing an audible alert.
  - The buzzer also sounds if the temperature exceeds 35°C, indicating that the environment is too hot and needs attention.

5. LCD Screen (Liquid Crystal Display)

- **Function**: The LCD screen displays messages, password status, temperature readings, and light levels.
- **Role in the Project**:
    - Displays messages like "Wrong Password" or "Welcome Home" based on the input from the keypad.
    - Continuously shows the current temperature to help the user monitor the environment.
    - Displays the light level from the LDR, indicating how bright or dim the surroundings are.

6. Green LED

- **Function**: The green LED serves as a visual indicator of successful password entry.
- **Role in the Project**:
    - If the correct password is entered, the green LED turns on, confirming that the user has successfully accessed the system.
    - It provides a simple visual cue to indicate successful authentication.

7. Temperature Sensor (DHT11)

- **Function**: The temperature sensor measures the ambient temperature inside the home.
- **Role in the Project**:
    - The sensor constantly monitors the temperature, and if it exceeds 25°C, the system will activate the fan (DC motor) to cool the room.
    - If the temperature exceeds 35°C, the system triggers an alarm (buzzer) and alerts the user. The user can manually turn off the alarm by pressing a push button.
    - The temperature reading is displayed on the LCD to inform the user of the current environment.

8. DC Motor (Fan)

- **Function**: The DC motor is used to control the fan that helps cool the room.
- **Role in the Project**:

- If the temperature exceeds 25°C, the fan is turned on to help reduce the temperature.
- When the temperature drops below the threshold, the fan is turned off to conserve energy and maintain a comfortable environment.
- The DC motor operates based on the temperature sensor's readings.

9. Push Button

- **Function**: The push button is used to manually turn off the alarm when the temperature exceeds 35°C.
- **Role in the Project**:
  - When the temperature exceeds 35°C, the system triggers an alarm (buzzer). The user can stop the alarm by pressing the push button, which turns off the buzzer.

10. LDR (Light Dependent Resistor)

- **Function**: The LDR measures the intensity of light in the environment.
- **Role in the Project**:
  - Based on the light level detected by the LDR, the system adjusts the brightness of two LEDs.
  - During the day, when there is more light, the LEDs will be dimmer. At night or in low-light conditions, the LEDs will be brighter, ensuring energy efficiency while providing adequate lighting.

11. Arduino Uno

- **Function**: The Arduino board is the central controller that processes inputs from the sensors and controls the output devices (motors, LEDs, buzzer, etc.).
- **Role in the Project**:
  - The Arduino reads data from the IR sensors, keypad, temperature sensor, and LDR.
  - Based on the input, it controls the servo motor, buzzer, fan, LEDs, and LCD.
  - It processes the logic for password verification, door control, temperature management, and LED brightness control.

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4. Circuit Connections:

- **IR Sensors**: Connected to two digital pins of the Arduino to detect the presence of a person.
- **Servo Motor**: Connected to a PWM pin on the Arduino to control the door's movement.
- **Keypad**: Connected to multiple digital pins for password entry.
- **Green LED**: Connected to a digital pin on the Arduino to indicate correct password entry.
- **LCD Screen**: Connected to the Arduino using I2C protocol for easy communication and data display.
- **Temperature Sensor**: Connected to an analog pin for reading the temperature.
- **DC Motor**: Controlled by a digital pin to turn the fan on and off based on temperature.
- **Push Button**: Connected to a digital pin to stop the high-temperature alarm.
- **LDR**: Connected to an analog pin to measure the surrounding light and adjust LED brightness.

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5. Code:

```
#include <LiquidCrystal_I2C.h>  // Include LCD library
#include <Servo.h>              // Include Servo library
#include <DHT.h>                // Include temperature sensor library

// Define hardware components
LiquidCrystal_I2C lcd(0x27, 16, 2);  // Initialize LCD
Servo doorServo;                // Initialize servo motor
const int irSensor1 = 2;        // IR sensor 1
const int irSensor2 = 3;        // IR sensor 2
```

```
const int keypadPin = 4;          // Keypad pin
const int tempPin = A0;           // Temperature sensor pin
const int ldrPin = A1;            // LDR pin
const int buzzerPin = 5;          // Buzzer pin
const int fanPin = 6;             // Fan motor pin

// Define LEDs and other components
const int greenLED = 7;           // Green LED for password confirmation
int correctPassword = 1234;       // Correct password

void setup() {
  // Set up components
  lcd.begin(16, 2);
  lcd.print("Welcome Home");
  doorServo.attach(9);            // Attach servo motor
  pinMode(buzzerPin, OUTPUT);     // Set buzzer as output
  pinMode(fanPin, OUTPUT);        // Set fan pin as output
  pinMode(greenLED, OUTPUT);      // Set green LED pin as output
}

void loop() {
  // Read IR sensors to detect person
  int sensor1Value = digitalRead(irSensor1);
  int sensor2Value = digitalRead(irSensor2);
  if (sensor1Value == HIGH || sensor2Value == HIGH) {
    doorServo.write(90);  // Open the door
```

```
  delay(1000);
  doorServo.write(0);   // Close the door
}

// Check entered password
int enteredPassword = checkPassword();
if (enteredPassword == correctPassword) {
  digitalWrite(greenLED, HIGH);   // Turn on green LED
  lcd.clear();
  lcd.print("Welcome Home");
} else {
  digitalWrite(buzzerPin, HIGH);  // Turn on buzzer for wrong password
  lcd.clear();
  lcd.print("Wrong password");
  delay(1000);
  digitalWrite(buzzerPin, LOW);
}

// Read temperature and control fan
int temperature = readTemperature();
lcd.clear();
lcd.print("Temp: ");
lcd.print(temperature);
if (temperature > 35) {
  digitalWrite(buzzerPin, HIGH);  // Turn on alarm for high temperature
  while(digitalRead(buttonPin) == LOW) {
```

```
    // Wait for button press to stop the alarm
   }
   digitalWrite(buzzerPin, LOW);
  } else if (temperature > 25) {
   digitalWrite(fanPin, HIGH);   // Turn on fan
  } else {
   digitalWrite(fanPin, LOW);    // Turn off fan
  }

  // Read LDR and adjust LED brightness
  int lightLevel = analogRead(ldrPin);
  lcd.setCursor(0, 1);
  lcd.print("LDR: ");
  lcd.print(lightLevel);
}

int checkPassword() {
  // Function to check the entered password
  return enteredPassword;
}

int readTemperature() {
  // Function to read temperature
  return analogRead(tempPin);   // Read temperature from sensor
}
```

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5. **Real Project Image:**

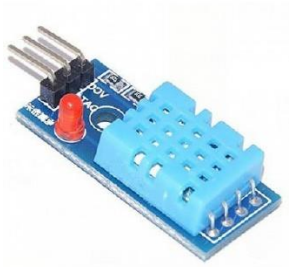
IR Sensors:

Servo Motor:

Keypad:

LCD Screen:

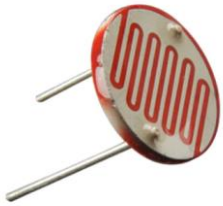
Temperature Sensor:



DC Motor(Fan):

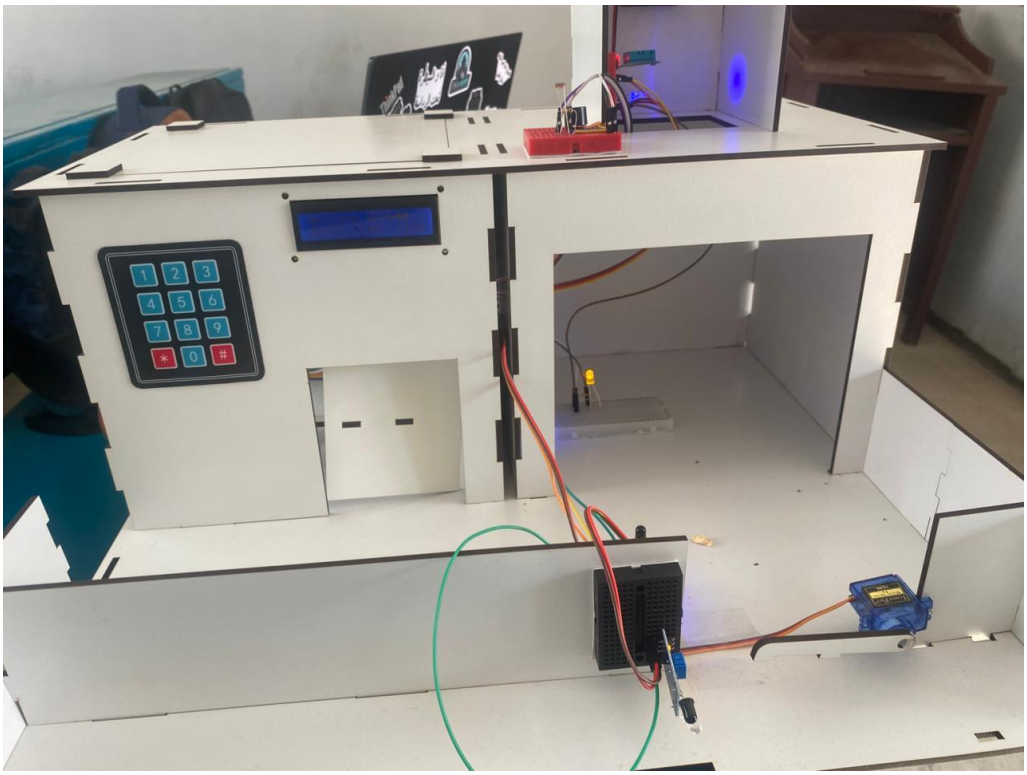
Push Button:

LDR:



Buzzer:

Real image for project :



Conclusion:

This project successfully integrates multiple sensors and actuators to create a smart home automation system. Each component works together to improve security, automate door control, and maintain a comfortable environment within the home.