**HOW TO RUN THE PROJECT**

To run home automation system for disabled persons using gestures, you will need to follow these steps to set up the hardware and software components correctly. Below is a detailed guide on how to do this:

**1)Hardware Setup:**

Components Required:

Arduino or Raspberry Pi microcontroller

APDS-9960 Gesture Sensor

LCD Display (LiquidCrystal)

Relay modules or actuators for controlling devices (BULB1, BULB2, BULB3, TV)

Switch

Resistors, wires, and breadboard for connections

Circuit Connections:

APDS-9960 Gesture Sensor:

Connect the VCC pin to the 3.3V pin on the Arduino.

Connect the GND pin to the ground (GND).

Connect the SDA pin to the SDA pin on the Arduino (A4 on some models).

Connect the SCL pin to the SCL pin on the Arduino (A5 on some models).

Connect the INT pin to pin 2 on the Arduino.

LCD Display:

Connect RS, E, D4, D5, D6, D7 pins of the LCD to pins 13, 12, 6, 5, 4, and 3 on the Arduino respectively.

Connect the VCC pin to 5V and the GND pin to ground.

Connect the contrast pin (V0) to a potentiometer for adjusting the LCD contrast.

Relay Modules or Actuators:

Connect the control pins of the relays to A0, A1, A2, and A3 on the Arduino.

Connect the VCC and GND of the relay module to 5V and ground respectively.

Connect the NO (Normally Open) and COM (Common) terminals of the relays to the devices you want to control (BULB1, BULB2, BULB3, TV).

Switch:

Connect one terminal of the switch to pin 7 on the Arduino.

Connect the other terminal to the ground.

Custom Characters for LCD:

Left and right arrow custom characters need to be created using lcd.createChar() function.

**2)Software Setup:**

Install Arduino IDE:

Download and install the Arduino IDE from the official website.

Install Libraries:

Open the Arduino IDE and install the required libraries:

Wire.h for I2C communication.

SparkFun\_APDS9960.h for the gesture sensor.

LiquidCrystal.h for the LCD display.

You can install these libraries via the Arduino Library Manager (Sketch -> Include Library -> Manage Libraries).

Upload the Code:

Copy the provided code into the Arduino IDE.

Select the correct board and port from the Tools menu.

Click the upload button to upload the code to the Arduino.

**3)Running the Project:**

Power the System:

Connect the Arduino to a power source (either through USB or an external power supply).

Initial Setup:

The LCD will display initialization messages. Wait for the messages to complete.

The system will enter the main loop, displaying "Engineers Garage" and "Gesture HA".

Using the Gesture Control:

Use the gesture sensor to navigate and control the devices:

Swipe up or down to toggle the state of the selected device (ON/OFF).

Swipe left or right to navigate between different devices (BULB1, BULB2, BULB3, TV).

Use the switch to reset the position or enter a specific mode as coded.

Monitoring:

The system will print gesture recognition details to the Serial Monitor. Open the Serial Monitor in the Arduino IDE to view these details (set baud rate to 9600).

Explanation of Key Functions

interruptRoutine():

Sets the isr\_flag when a gesture is detected.

handleGesture():

Reads the detected gesture from the APDS-9960 sensor.

Updates the LCD display and the state of the system based on the gesture (UP, DOWN, LEFT, RIGHT, NEAR, FAR).

controlAppl():

Controls the relays connected to different devices (BULB1, BULB2, BULB3, TV) based on the gesture.

**Additional Tips:**

Ensure all connections are secure and correct.

Calibrate the gesture sensor if necessary to improve accuracy.

Test each component individually before integrating them into the system.

Refer to the datasheets and example codes of the sensors and components for additional troubleshooting.

By following these steps, you can successfully set up and run your gesture-based home automation system. If you encounter any issues, refer to the debug messages in the Serial Monitor and verify your circuit connections