Project Executing Steps

Gesture-Based Smart Home Control Using IR Proximity Sensors

Step 1: Component Collection

Gather all the required hardware and software tools:

- **Hardware**: Arduino Uno, IR Proximity Sensors (2), 2-Channel Relay Module, LED Light, Fan, Breadboard, Jumper Wires, Power Supply.
- **Software**: Arduino IDE, Arduino Libraries, Serial Monitor.

Step 2: Circuit Design

- Design the circuit using a breadboard.
- Connect IR sensors to Arduino digital input pins (e.g., D2 and D3).
- Connect relay input pins to Arduino output pins (e.g., D8 and D9).
- Wire the fan and LED light through the relay's Normally Open (NO) and Common (COM) terminals.
- Ensure proper power and ground connections.

Step 3: Code Development

- Write the program using **C/C++** in the **Arduino IDE**.
- Include logic to detect sensor input and trigger relays accordingly.
- Use digitalRead(), digitalWrite(), pinMode(), and delay() functions.
- Implement debouncing logic to prevent false triggers.

Step 4: Uploading Code

- Connect the Arduino Uno to the PC using a USB cable.
- Upload the code to the Arduino board using the **Arduino IDE**.
- Open the **Serial Monitor** to view real-time system feedback and debug outputs.

Step 5: Testing Individual Components

- Test each IR sensor individually to ensure it detects gestures properly.
- Check relay switching using simple LEDs before connecting actual appliances.
- Validate that the fan and light turn ON/OFF based on the respective sensor inputs.

Step 6: System Integration

- Combine sensors, relays, and appliances into a complete circuit setup.
- Power the system and perform gesture-based control tests.
- Verify responsiveness and stability during repeated operations.

Step 7: Debugging and Optimization

- Use the Serial Monitor for live debugging.
- Fine-tune sensor sensitivity if needed.
- Adjust delay timing for optimal performance and responsiveness.
- Ensure stable operation without false triggering or lags.

Step 8: Final Deployment

- Place the system in a practical environment (e.g., home setup).
- Ensure proper insulation and safety precautions for electrical components.
- Demonstrate the system by controlling fan and light using gestures.