**Here's your complete code + wiring guide for the full project setup using:**

* **ESP32**
* **L293D motor driver module (with IN1, IN2, EN, M1, M2)**
* **MPU6050 for gesture detection**
* **LED (for light control)**
* **Buzzer (for emergency alert)**
* **Firebase (real-time update)**
* **DC Motor (as fan)**

**🔌 WIRING DIAGRAM (MODULE TO ESP32)**

| **Component** | **ESP32 Pin** | **Notes** |
| --- | --- | --- |
| **MPU6050 SDA** | **GPIO 21** | **I2C data line** |
| **MPU6050 SCL** | **GPIO 22** | **I2C clock line** |
| **MPU6050 VCC** | **3.3V** | **Power** |
| **MPU6050 GND** | **GND** | **Ground** |
| **LED** | **GPIO 14** | **Light control** |
| **Buzzer +** | **GPIO 27** | **Alert on emergency** |
| **Buzzer -** | **GND** | **Ground** |
| **L293D IN1** | **GPIO 12** | **Motor input 1** |
| **L293D IN2** | **GPIO 13** | **Motor input 2** |
| **L293D EN** | **5V (or jumper)** | **Enable pin (can also use GPIO)** |
| **L293D GND** | **GND** | **Ground (shared with ESP32)** |
| **L293D VCC** | **5V** | **Motor power** |
| **L293D M1/M2** | **DC Motor** | **Motor terminals** |

**🧠 LOGIC:**

* **Upward hand gesture (Y-axis) → Light ON**
* **Downward gesture → Light OFF**
* **Right tilt (X+) → Fan ON**
* **Left tilt (X−) → Fan OFF**
* **Strong Z-axis spike → Emergency → Firebase Alert + Buzzer**

**✅ COMPLETE CODE**

**cpp**

**CopyEdit**

**#include <WiFi.h>**

**#include <Wire.h>**

**#include <Adafruit\_MPU6050.h>**

**#include <Adafruit\_Sensor.h>**

**#include <Firebase\_ESP\_Client.h>**

**// WiFi credentials**

**#define WIFI\_SSID "Redmi 12 5G"**

**#define WIFI\_PASSWORD "akhil123456789"**

**// Firebase**

**#define API\_KEY "mDh3fIXedKkdVwlIxPf9Fqfm1kRarGlUOrlcNNNQ"**

**#define DATABASE\_URL "https://gestomate-779c2-default-rtdb.asia-southeast1.firebasedatabase.app/"**

**FirebaseData fbdo;**

**FirebaseAuth auth;**

**FirebaseConfig config;**

**// MPU6050**

**Adafruit\_MPU6050 mpu;**

**// Pin definitions**

**#define LED\_PIN 14**

**#define BUZZER\_PIN 27**

**#define FAN\_IN1 12**

**#define FAN\_IN2 13**

**// Gesture thresholds**

**#define ACC\_THRESHOLD 8**

**#define TILT\_THRESHOLD 4**

**#define FIST\_THRESHOLD 15**

**// State tracking**

**String lastLightState = "";**

**String lastFanState = "";**

**void setup() {**

**Serial.begin(115200);**

**pinMode(LED\_PIN, OUTPUT);**

**pinMode(BUZZER\_PIN, OUTPUT);**

**pinMode(FAN\_IN1, OUTPUT);**

**pinMode(FAN\_IN2, OUTPUT);**

**// Connect to Wi-Fi**

**WiFi.begin(WIFI\_SSID, WIFI\_PASSWORD);**

**Serial.print("Connecting to WiFi");**

**while (WiFi.status() != WL\_CONNECTED) {**

**delay(500);**

**Serial.print(".");**

**}**

**Serial.println(" Connected!");**

**// Firebase setup**

**config.api\_key = API\_KEY;**

**config.database\_url = DATABASE\_URL;**

**Firebase.begin(&config, &auth);**

**Firebase.reconnectWiFi(true);**

**// MPU6050 initialization**

**Wire.begin(21, 22); // SDA, SCL**

**if (!mpu.begin()) {**

**Serial.println("MPU6050 not found!");**

**while (1) delay(10);**

**}**

**mpu.setAccelerometerRange(MPU6050\_RANGE\_8\_G);**

**mpu.setGyroRange(MPU6050\_RANGE\_500\_DEG);**

**mpu.setFilterBandwidth(MPU6050\_BAND\_21\_HZ);**

**}**

**// Motor control functions**

**void turnFanOn() {**

**digitalWrite(FAN\_IN1, HIGH);**

**digitalWrite(FAN\_IN2, LOW);**

**}**

**void turnFanOff() {**

**digitalWrite(FAN\_IN1, LOW);**

**digitalWrite(FAN\_IN2, LOW);**

**}**

**void loop() {**

**sensors\_event\_t a, g, temp;**

**mpu.getEvent(&a, &g, &temp);**

**float ax = a.acceleration.x;**

**float ay = a.acceleration.y;**

**float az = a.acceleration.z;**

**// LIGHT CONTROL**

**String lightState = "";**

**if (ay > ACC\_THRESHOLD) lightState = "ON";**

**else if (ay < -ACC\_THRESHOLD) lightState = "OFF";**

**if (lightState != "" && lightState != lastLightState) {**

**digitalWrite(LED\_PIN, lightState == "ON" ? HIGH : LOW);**

**Firebase.RTDB.setString(&fbdo, "/home/light", lightState);**

**Serial.println("Light: " + lightState);**

**lastLightState = lightState;**

**}**

**// FAN CONTROL**

**String fanState = "";**

**if (ax > TILT\_THRESHOLD) fanState = "ON";**

**else if (ax < -TILT\_THRESHOLD) fanState = "OFF";**

**if (fanState != "" && fanState != lastFanState) {**

**if (fanState == "ON") turnFanOn();**

**else turnFanOff();**

**Firebase.RTDB.setString(&fbdo, "/home/fan", fanState);**

**Serial.println("Fan: " + fanState);**

**lastFanState = fanState;**

**}**

**// EMERGENCY FIST DETECTION**

**if (abs(az) > FIST\_THRESHOLD) {**

**Firebase.RTDB.setString(&fbdo, "/home/help", "FIST DETECTED: HELP!");**

**Serial.println("HELP Alert Sent");**

**digitalWrite(BUZZER\_PIN, HIGH);**

**delay(1000);**

**digitalWrite(BUZZER\_PIN, LOW);**

**}**

**delay(300);**

**}**

**📁 Firebase Data Format**

**json**

**CopyEdit**

**{**

**"home": {**

**"light": "ON",**

**"fan": "OFF",**

**"help": "FIST DETECTED: HELP!"**

**}**

**}**

**Want me to generate a Fritzing diagram with this exact setup for visual reference? Just say the word!**

**4o**

**You said:**

**can you please write code without buzzer and explain connections and steps**

**ChatGPT said:**

**Absolutely! Here's the clean version of your code (without buzzer) along with step-by-step wiring and explanation for your gesture-controlled home automation system using:**

* **ESP32**
* **L293D motor driver module (IN1, IN2, EN, M1, M2)**
* **MPU6050 sensor**
* **LED (for light)**
* **DC Motor (for fan)**

**🧠 PROJECT FUNCTIONALITY:**

* **Tilt Up (Y-axis positive) → Light ON**
* **Tilt Down (Y-axis negative) → Light OFF**
* **Tilt Right (X-axis positive) → Fan ON**
* **Tilt Left (X-axis negative) → Fan OFF**
* **Strong Z-axis movement (Fist) → Emergency alert to Firebase only**

**🔌 CONNECTIONS**

**1. MPU6050 to ESP32**

| **MPU6050** | **ESP32** | **Notes** |
| --- | --- | --- |
| **VCC** | **3.3V** | **Power supply** |
| **GND** | **GND** | **Ground** |
| **SDA** | **GPIO 21** | **I2C data line** |
| **SCL** | **GPIO 22** | **I2C clock line** |

**2. LED (Light)**

| **LED Pin** | **ESP32** |
| --- | --- |
| **Anode (+)** | **GPIO 14 (via 220Ω resistor)** |
| **Cathode (-)** | **GND** |

**3. L293D Motor Driver Module**

| **L293D Pin** | **ESP32 / Power** | **Notes** |
| --- | --- | --- |
| **IN1** | **GPIO 12** | **Motor control** |
| **IN2** | **GPIO 13** | **Motor control** |
| **EN** | **5V or leave jumper** | **Enable motor** |
| **M1/M2** | **DC Motor Wires** | **Any order** |
| **VCC** | **5V** | **Motor power (from ESP32 or external)** |
| **GND** | **GND (ESP32)** | **Common ground** |

**✅ CLEAN ESP32 CODE (NO BUZZER)**

**cpp**

**CopyEdit**

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**#include <Wire.h>**

**#include <Adafruit\_MPU6050.h>**

**#include <Adafruit\_Sensor.h>**

**#include <Firebase\_ESP\_Client.h>**

**// WiFi credentials**

**#define WIFI\_SSID "Redmi 12 5G"**

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**#define API\_KEY "mDh3fIXedKkdVwlIxPf9Fqfm1kRarGlUOrlcNNNQ"**

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**FirebaseData fbdo;**

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**// MPU6050**

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**// Pin definitions**

**#define LED\_PIN 14**

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**#define FIST\_THRESHOLD 15**

**String lastLightState = "";**

**String lastFanState = "";**

**void setup() {**

**Serial.begin(115200);**

**pinMode(LED\_PIN, OUTPUT);**

**pinMode(FAN\_IN1, OUTPUT);**

**pinMode(FAN\_IN2, OUTPUT);**

**// Wi-Fi**

**WiFi.begin(WIFI\_SSID, WIFI\_PASSWORD);**

**Serial.print("Connecting to WiFi");**

**while (WiFi.status() != WL\_CONNECTED) {**

**delay(500);**

**Serial.print(".");**

**}**

**Serial.println(" Connected!");**

**// Firebase**

**config.api\_key = API\_KEY;**

**config.database\_url = DATABASE\_URL;**

**Firebase.begin(&config, &auth);**

**Firebase.reconnectWiFi(true);**

**// MPU6050 Init**

**Wire.begin(21, 22);**

**if (!mpu.begin()) {**

**Serial.println("MPU6050 not found!");**

**while (1) delay(10);**

**}**

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**mpu.setGyroRange(MPU6050\_RANGE\_500\_DEG);**

**mpu.setFilterBandwidth(MPU6050\_BAND\_21\_HZ);**

**}**

**// Motor control functions**

**void turnFanOn() {**

**digitalWrite(FAN\_IN1, HIGH);**

**digitalWrite(FAN\_IN2, LOW);**

**}**

**void turnFanOff() {**

**digitalWrite(FAN\_IN1, LOW);**

**digitalWrite(FAN\_IN2, LOW);**

**}**

**void loop() {**

**sensors\_event\_t a, g, temp;**

**mpu.getEvent(&a, &g, &temp);**

**float ax = a.acceleration.x;**

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**digitalWrite(LED\_PIN, lightState == "ON" ? HIGH : LOW);**

**Firebase.RTDB.setString(&fbdo, "/home/light", lightState);**

**Serial.println("Light: " + lightState);**

**lastLightState = lightState;**

**}**

**// FAN CONTROL**

**String fanState = "";**

**if (ax > TILT\_THRESHOLD) fanState = "ON";**

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**if (fanState != "" && fanState != lastFanState) {**

**if (fanState == "ON") turnFanOn();**

**else turnFanOff();**

**Firebase.RTDB.setString(&fbdo, "/home/fan", fanState);**

**Serial.println("Fan: " + fanState);**

**lastFanState = fanState;**

**}**

**// FIST DETECTION - HELP ALERT ONLY**

**if (abs(az) > FIST\_THRESHOLD) {**

**Firebase.RTDB.setString(&fbdo, "/home/help", "FIST DETECTED: HELP!");**

**Serial.println("HELP Alert Sent");**

**delay(1000); // debounce**

**}**

**delay(300);**

**}**

**✅ STEPS TO RUN:**

1. **Connect hardware according to the table above.**
2. **Install Libraries in Arduino IDE:**
   * **Adafruit MPU6050**
   * **Adafruit Unified Sensor**
   * **Firebase ESP Client**
3. **Update WiFi & Firebase credentials in code.**
4. **Upload to ESP32 using Arduino IDE.**
5. **Open Serial Monitor to view gesture actions and Firebase updates.**