MOTION AND POSITION TRACKING SYSTEM USING MPU6050 SENSOR

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AIM:

"To design and implement a motion and position tracking system using the MPU6050 sensor that measures acceleration and angular velocity, processes the data to determine orientation (pitch, roll, yaw), and provides real-time tracking for applications in robotics, navigation, and wearable devices."

COMPONENTS REQUIRED:

1. ESP32 Development Board
2. MPU6050 Sensor Module
3. OLED Display
4. Active Buzzer Module
5. Breadboard & Jumper Wires.
6. USB Cable

1. ESP32 Development Board

- **Range:**
  - Operating Voltage: **3.0 – 3.6V (typically 3.3V)**
  - Clock Speed: up to **240 MHz**
  - Wi-Fi Range: **~50–100 meters indoors, 300m outdoors (line of sight)**
- **Applications:**
  1. IoT devices and wireless sensor networks.
  2. Smart home automation (lights, fans, security).
  3. Robotics, drones, and embedded systems.

2. MPU6050 Sensor (Accelerometer + Gyroscope)

- **Range:**
  - Accelerometer: **±2g, ±4g, ±8g, ±16g**
  - Gyroscope: **±250, ±500, ±1000, ±2000 °/s**
  - Communication: I²C (100kHz – 400kHz)
- **Applications:**
  1. Motion tracking in smartphones and wearables.
  2. Self-balancing robots and drones.

3. Gaming controllers and gesture recognition.

3. OLED Display (SSD1306, 128×64, I²C)

- **Range:**
  - Resolution: **128×64 pixels**
  - Operating Voltage: **3.3V – 5V**
  - Viewing angle: **~160°**
- **Applications:**
  1. Displaying sensor data in embedded projects.
  2. Wearable devices (like smartwatches).
  3. Industrial monitoring panels.

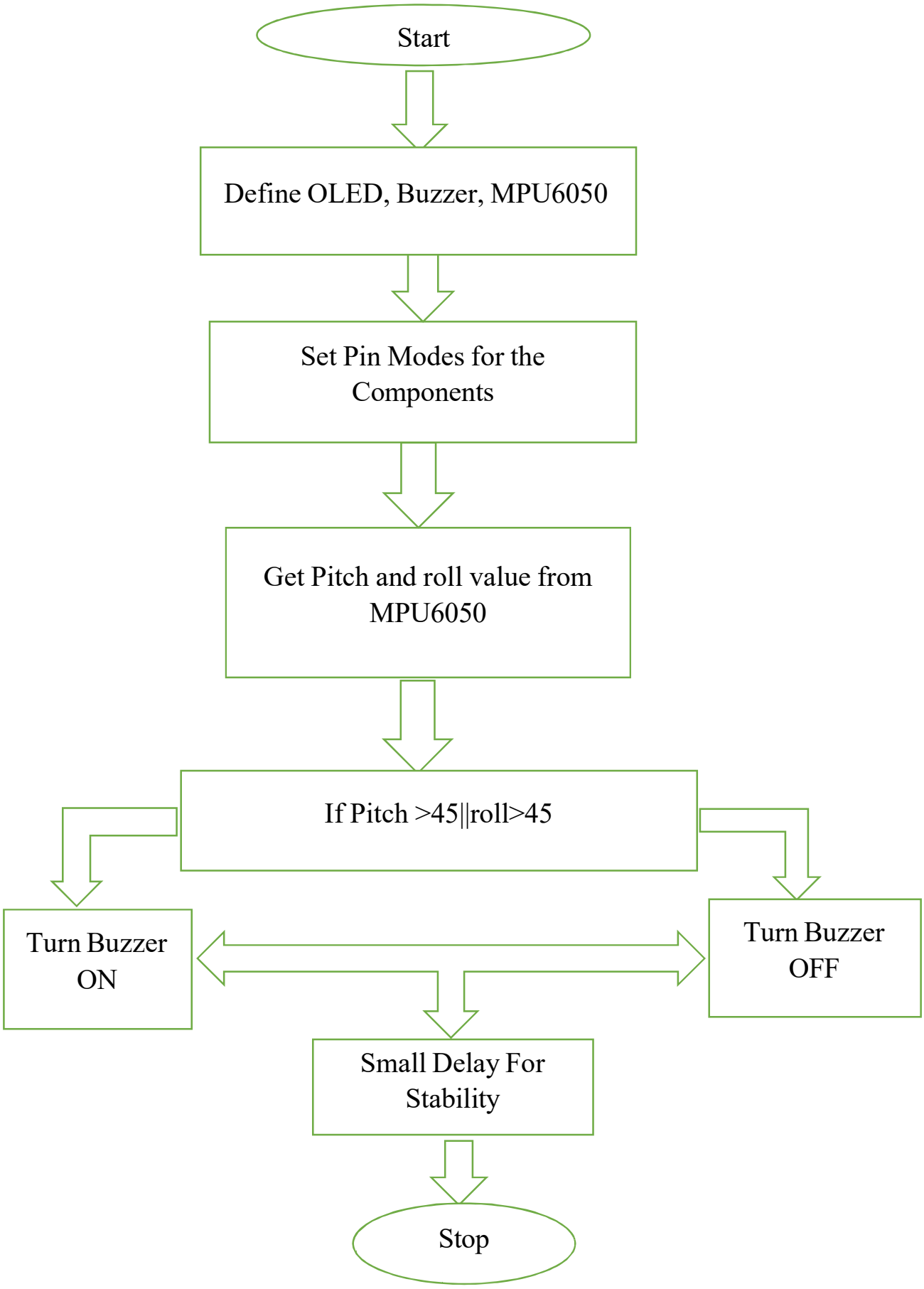
4. Active Buzzer

- **Range:**
  - Operating Voltage: **3V – 5V**
  - Typical Frequency: **2kHz – 5kHz** sound tone
  - Sound Level: **~85–100 dB (at 10 cm)**
- **Applications:**
  1. Alarm and alert systems (fire, gas, motion).
  2. Timers and notification indicators.
  3. Security systems in home automation.

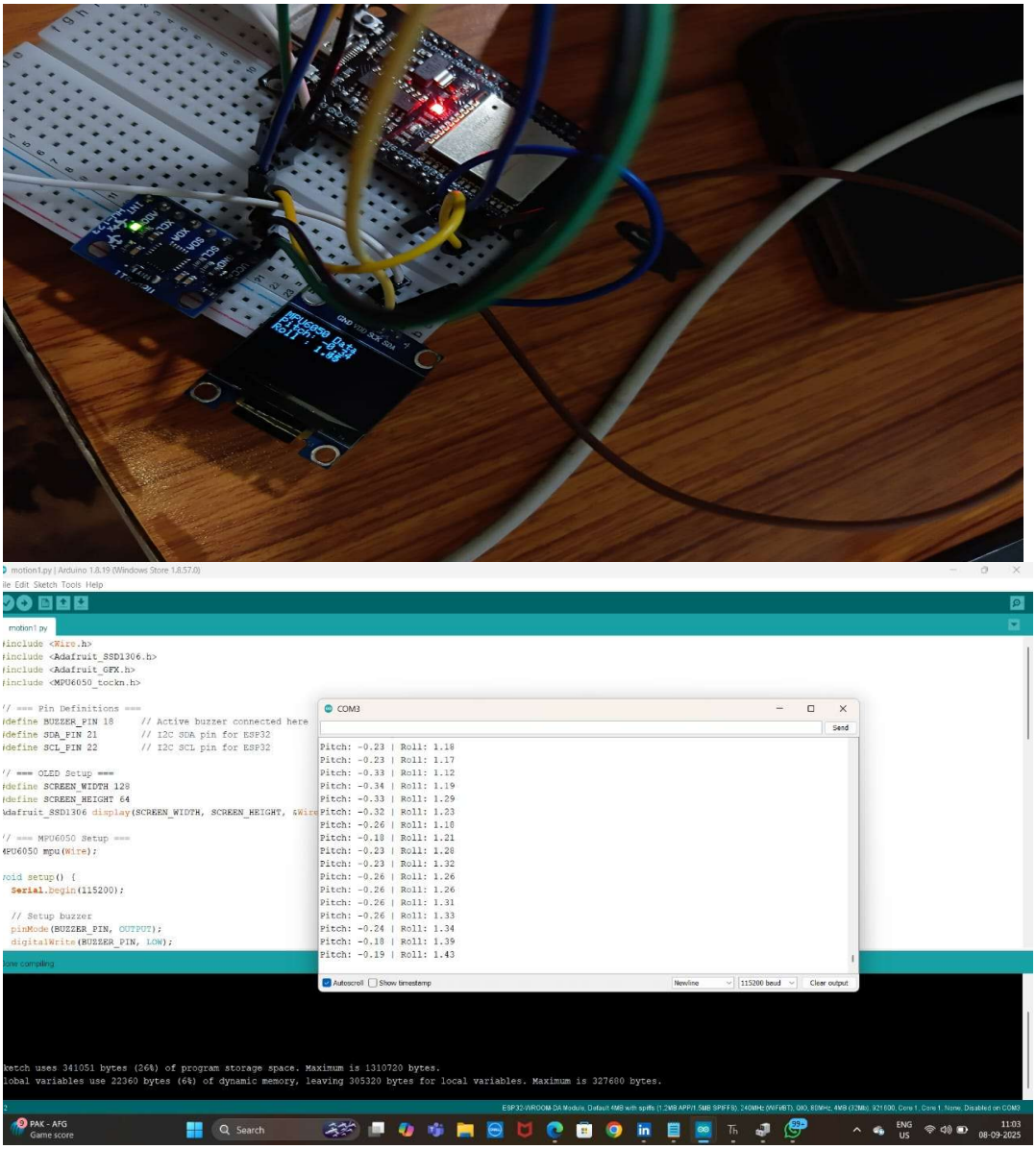
PIN TABLE:

COMPONENTS	PIN ON COMPONENTS	PIN ON ESP32
MPU6050	VCC	3.3V
	GND	GND
	SDA	GPIO21
	SCL	GPIO22
OLED (SSD1306, I2C)	VCC	3.3V
	GND	GND
	SDA	GPIO21
	SCL	GPIO22
Buzzer	VCC	GPIO18
	GND	GND

Flow chart:


Start
Define OLED, Buzzer, MPU6050
Set Pin Modes for the Components
Get Pitch and roll value from MPU6050
If Pitch >45||roll>45
Turn Buzzer ON
Turn Buzzer OFF
Small Delay For Stability
Stop

EXECUTION :


motion1.py | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help
motion1 py
#include <Wire.h>
#include <Adafruit_SSD1306.h>
#include <Adafruit_GFX.h>
#include <MPU6050_tockn.h>
// === Pin Definitions ===
#define BUZZER_PIN 18 // Active buzzer connected here
#define SDA_PIN 21 // I2C SDA pin for ESP32
#define SCL_PIN 22 // I2C SCL pin for ESP32
// === OLED Setup ===
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire
// === MPU6050 Setup ===
MPU6050 mpu(Wire);
void setup() {
Serial.begin(115200);
// Setup buzzer
pinMode(BUZZER_PIN, OUTPUT);
digitalWrite(BUZZER_PIN, LOW);
Done compiling.
COM3
Send
Pitch: -0.23 | Roll: 1.18
Pitch: -0.23 | Roll: 1.17
Pitch: -0.33 | Roll: 1.12
Pitch: -0.34 | Roll: 1.19
Pitch: -0.33 | Roll: 1.29
Pitch: -0.32 | Roll: 1.23
Pitch: -0.26 | Roll: 1.16
Pitch: -0.18 | Roll: 1.21
Pitch: -0.23 | Roll: 1.28
Pitch: -0.23 | Roll: 1.32
Pitch: -0.26 | Roll: 1.26
Pitch: -0.26 | Roll: 1.26
Pitch: -0.26 | Roll: 1.31
Pitch: -0.26 | Roll: 1.33
Pitch: -0.24 | Roll: 1.34
Pitch: -0.18 | Roll: 1.39
Pitch: -0.19 | Roll: 1.43
Autoscroll
Show timestamp
Newline
115200 baud
Clear output
Sketch uses 341051 bytes (26%) of program storage space. Maximum is 1310720 bytes.
Global variables use 22360 bytes (6%) of dynamic memory, leaving 305320 bytes for local variables. Maximum is 327680 bytes.
PAK - AFG
Game score
Search
ENG
US
11:03
08-09-2025