#define BLYNK\_TEMPLATE\_ID "TMPL6cLfNXX2y"

#define BLYNK\_TEMPLATE\_NAME "Nhà"

#define BLYNK\_AUTH\_TOKEN "NWh7SuvChvnKBUc2lv\_7KlbtJfJEmUtr"

#include <WiFi.h>

#include <HTTPClient.h>

#include <Wire.h>

#include <Adafruit\_GFX.h>

#include <Adafruit\_SSD1306.h>

#include <Adafruit\_MLX90614.h>

#include <MPU6050.h>

#include <MAX30100\_PulseOximeter.h>

#include <Ticker.h>

#include <BlynkSimpleEsp32.h>

// OLED Config

#define OLED\_WIDTH 128

#define OLED\_HEIGHT 32

#define OLED\_RESET -1

Adafruit\_SSD1306 display(OLED\_WIDTH, OLED\_HEIGHT, &Wire, OLED\_RESET);

// GY-906 Sensor

Adafruit\_MLX90614 mlx = Adafruit\_MLX90614();

// MPU6050 Sensor

MPU6050 mpu;

// MAX30100 Sensor

PulseOximeter pox;

Ticker timer;

// SIM Module

HardwareSerial simSerial(1); // UART1 RX=16, TX=17

#define SIM\_PHONE\_NUMBER "0355390945"

// Wi-Fi Credentials

char ssid[] = "Galaxy";

char pass[] = "11111111";

String GOOGLE\_SCRIPT\_ID = "AKfycbxWwrBXp6gZAFTTAGzehiUNoJ\_OdImT357L37Fu7h0bUSUgVob4fRDIE2\_vrJbWhodG";

// Global Variables

unsigned long lastDisplayUpdate = 0;

unsigned long lastBlynkUpdate = 0;

float temperature = 0.0;

float heartRate = 0.0;

float spO2 = 0.0;

bool fallDetected = false;

void setup() {

  Serial.begin(115200);

  Wire.begin();

  // Initialize WiFi

  WiFi.begin(ssid, pass);

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

    delay(1000);

    Serial.println("Connecting to WiFi...");

  }

  Serial.println("Connected to WiFi");

  // Initialize OLED

  if (!display.begin(SSD1306\_SWITCHCAPVCC, 0x3C)) {

    Serial.println("OLED initialization failed!");

    while (1);

  }

  display.clearDisplay();

  display.setTextColor(WHITE);

  display.setTextSize(1);

  // Initialize SIM module

  simSerial.begin(115200, SERIAL\_8N1, 16, 17);

  // Initialize Sensors

  if (!mlx.begin()) {

    Serial.println("MLX90614 initialization failed!");

    while (1);

  }

  mpu.initialize();

  if (!mpu.testConnection()) {

    Serial.println("MPU6050 connection failed!");

    while (1);

  }

  if (!pox.begin()) {

    Serial.println("MAX30100 initialization failed!");

    while (1);

  }

  pox.setIRLedCurrent(MAX30100\_LED\_CURR\_7\_6MA);

  pox.setOnBeatDetectedCallback(onBeatDetected);

  // Initialize Blynk

  Blynk.begin(BLYNK\_AUTH\_TOKEN, ssid, pass);

  // Start Timer for MAX30100 Updates

  timer.attach\_ms(100, update);

  // Display Welcome Message

  displayMessage("Welcome to", "khkt");

}

void loop() {

  Blynk.run();

  // Update temperature

  temperature = mlx.readObjectTempC();

  // Update heart rate and SpO2

  heartRate = pox.getHeartRate();

  spO2 = pox.getSpO2();

  // Detect Fall

  fallDetected = detectFall();

  if (fallDetected) {

    sendSMS("Warning: Fall detected!");

  }

  // Detect High Temperature

  if (temperature > 37.5) {

    sendSMS("Warning: High temperature!");

  }

  // Update OLED every second

  if (millis() - lastDisplayUpdate >= 1000) {

    displayData(temperature, heartRate, spO2, fallDetected);

    lastDisplayUpdate = millis();

  }

  // Update Google Sheets and Blynk every 5 seconds

  if (millis() - lastBlynkUpdate >= 5000) {

    sendToGoogleSheets(temperature, heartRate, spO2, fallDetected);

    Blynk.virtualWrite(V0, temperature);

    Blynk.virtualWrite(V1, heartRate);

    Blynk.virtualWrite(V2, spO2);

    Blynk.virtualWrite(V3, fallDetected ? 1 : 0);

    lastBlynkUpdate = millis();

  }

}

void update() {

  pox.update();

}

void onBeatDetected() {

  Serial.println("Beat detected!");

}

bool detectFall() {

  int16\_t ax, ay, az;

  mpu.getAcceleration(&ax, &ay, &az);

  float acceleration = sqrt(ax \* ax + ay \* ay + az \* az) / 16384.0;

  return acceleration < 0.7; // Fall threshold

}

void sendSMS(String message) {

  simSerial.println("AT+CMGF=1");

  delay(100);

  simSerial.println("AT+CMGS=\"" SIM\_PHONE\_NUMBER "\"");

  delay(100);

  simSerial.print(message);

  simSerial.write(26);

  delay(1000);

}

void sendToGoogleSheets(float temp, float hr, float spo2, bool fall) {

  if (WiFi.status() == WL\_CONNECTED) {

    HTTPClient http;

    String url = "https://script.google.com/macros/s/" + GOOGLE\_SCRIPT\_ID +

                 "/exec?temp=" + String(temp) +

                 "&hr=" + String(hr) +

                 "&spo2=" + String(spo2) +

                 "&fall=" + String(fall ? "1" : "0");

    http.begin(url);

    int httpResponseCode = http.GET();

    if (httpResponseCode > 0) {

      String response = http.getString();

      Serial.println("Google Sheets Response: " + response);

    } else {

      Serial.println("Error sending data: " + String(httpResponseCode));

    }

    http.end();

  } else {

    Serial.println("WiFi not connected");

  }

}

void displayMessage(String line1, String line2) {

  display.clearDisplay();

  display.setCursor(20, 10);

  display.println(line1);

  display.setCursor(0, 30);

  display.println(line2);

  display.display();

}

void displayData(float temp, float hr, float spO2, bool fall) {

  display.clearDisplay();

  display.setCursor(0, 0);

  display.print("Temp: ");

  display.print(temp, 1);

  display.println(" C");

  display.setCursor(0, 10);

  display.print("HR: ");

  display.print(hr, 0);

  display.println(" bpm");

  display.setCursor(0, 20);

  display.print("SpO2: ");

  display.print(spO2, 0);

  display.println(" %");

  display.setCursor(0, 20);

  display.print("           Fall: ");

  display.println(fall ? "Yes" : "No");

  display.display();

}