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//14. Februar 2024
//Medtech DIY
//Team Ananas Freunde
//EKG Box mit Display

#include <SPI.h> // Include SPI library for
communication with OLED display
#include <Wire.h> // Include Wire library for I2C
communication
#include <Adafruit_GFX.h> // Include Adafruit Graphics
library for drawing graphics
#include <Adafruit_SSD1306.h> // Include Adafruit SSD1306
library to control the OLED display

// Initialize the OLED display with width, height, and the
Wire interface
Adafruit_SSD1306 EKG_Display = Adafruit_SSD1306(128, 64,
&Wire);

#define sensor A0 // Define analog pin A0 as the sensor
input
#define Highpulse 540 // Threshold value for detecting a
heartbeat

// Variable declarations for drawing and heartbeat detection
logic
int sX = 0; // Previous x-coordinate for drawing line
int sY = 60; // Previous y-coordinate (baseline) for
drawing line
int x = 0; // Current x-coordinate for drawing line
int Svalue; // Store sensor value
int value; // Processed sensor value for display
long Stime = 0; // Store time since last heartbeat
long Ltime = 0; // Store the last time a heartbeat was
detected
int count = 0; // Counter for heartbeats
int Bpm = 0; // Beats per minute (unused in this code)

void setup() {
  Serial.begin(9600); // Initialize serial communication
  // Initialize OLED display with the I2C address 0x3C
  EKG_Display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
  delay(1000); // Wait for display to
initialize
  EKG_Display.clearDisplay(); // Clear the display
}

void loop() {

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    Svalue = analogRead(sensor);           // Read the sensor
value
    Serial.println(Svalue);               // Output the sensor
value to serial monitor
    value = map(Svalue, 0, 1024, 0, 45); // Map the sensor
value to a range for display

    int y = 60 - value; // Calculate y-coordinate for display
based on sensor value

    if (x > 128) { // If x exceeds display width, reset x and
clear display
        x = 0;
        sX = 0;
        EKG_Display.clearDisplay();
    }

    EKG_Display.drawLine(sX, sY, x, y, WHITE); // Draw line
from previous to current point
    sX = x; // Update
previous point's x-coordinate
    sY = y; // Update
previous point's y-coordinate
    x++; // Move to the
next x-coordinate

    BPM(); // Call BPM function to calculate and display heart
rate

    EKG_Display.setCursor(0, 0); // Set cursor at
top-left corner
    EKG_Display.setTextSize(2); // Set text size
    EKG_Display.setTextColor(SSD1306_WHITE); // Set text color
    EKG_Display.print("BPM :"); // Print label for
BPM
    EKG_Display.display(); // Update the
display with new graphics
}

void BPM() {
    if (Svalue > Highpulse) { // If sensor value exceeds
threshold
        Stime = millis() - Ltime; // Calculate time since last
heartbeat
        count++; // Increment heartbeat counter

        if (Stime / 1000 >= 60) { // If 60 seconds have
passed
            Ltime = millis(); // Reset last time
heartbeat was detected

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