#include <MultiFuncShield.h>

//Modified from Hacktronics Pat McMahon 9/6/2022

//MFS10

// Heart Monitor

void initializeSensorReading();

int data[4];

byte dataIdx=0;

byte pulseDetected = false;

int lastPulseTime = -1;

void setup() {

 // put your setup code here, to run once:

 MFS.initialize();

 initializeSensorReading();

 //Serial.begin(9600);

}

void loop()

{

 if (MFS.getTimer() == 0)

 {

 MFS.setTimer(10000); // reset millisecond countdown timer.

 if (lastPulseTime != -1)

 {

 lastPulseTime = 10000 + lastPulseTime;

 }

 }

 int sensorValue = analogRead(A5); // read the sensor.

 if (sensorValue < 20 || sensorValue > 970)

 {

 // Sensor hasn't normalized, check how long for in milliseconds.

 if (lastPulseTime != -1 && lastPulseTime - MFS.getTimer() > 700)

 {

 initializeSensorReading();

 }

 }

 else if (sensorValue > (3 \* 1024) / 5) // value is rising, so must be start of a pulse.

 {

 if (!pulseDetected)

 {

 pulseDetected = true;

 if (lastPulseTime == -1)

 {

 lastPulseTime = MFS.getTimer();

 }

 else

 {

 int pulsePeriod = lastPulseTime - MFS.getTimer(); // calculate time between pulses in millseconds.

 lastPulseTime = MFS.getTimer();

 int bpm = 60000 / pulsePeriod; // calculate beats per minute.

 if (bpm < 45 || bpm > 230) // bpm is outside acceptible range, so clear the data buffer.

 {

 initializeSensorReading();

 }

 else

 {

 // bpm is within range, but still need to calculate average.

 data[dataIdx++] = bpm;

 if (dataIdx >= 4)

 {

 dataIdx = 0;

 }

 if (data[0] && data[1] && data[2] && data[3]) // check if data buffer is full before calculating avg bpm.

 {

 int avgBpm = (data[0] + data[1] + data[2] + data[3]) / 4;

 MFS.blinkDisplay(DIGIT\_ALL, OFF);

 MFS.write(avgBpm);

 MFS.beep();

 }

 else

 {

 // buffer not full, so blink the display.

 MFS.blinkDisplay(DIGIT\_ALL, ON);

 }

 }

 }

 }

 }

 else if (sensorValue < (1024 / 2)) // value is falling, so must be end of pulse.

 {

 pulseDetected = false;

 }

 //Serial.println(sensorValue);

 //delay(10);

}

// Initialize the read buffer and display.

void initializeSensorReading()

{

 lastPulseTime = 0;

 dataIdx = 0;

 for (int i=0; i<4; i++)

 {

 data[i] = 0;

 }

 MFS.write(0);

 MFS.blinkDisplay(DIGIT\_ALL, OFF);

}