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// set baud rate 115200
//Including libraries
#include <Wire.h>
#include "cactus_io_BME280_I2C.h"
#include <SoftwareSerial.h>
#include "arduinoFFT.h"
// include the library code
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,20,4); // set the LCD address to 0x27 for a
16 chars and 2 line display
#define SAMPLES 128 //SAMPLES-pt FFT. Must be a base 2
number. Max 128 for Arduino Uno.
#define SAMPLING_FREQUENCY 2048 //Ts = Based on Nyquist, must be 2
times the highest expected frequency.

arduinoFFT FFT = arduinoFFT(); //Calls the sound FFT function which
samples the frequency and amplitude of the sound

unsigned int samplingPeriod;
unsigned long microseconds;

double vReal[SAMPLES]; //create vector of size SAMPLES to hold real
values
double vImag[SAMPLES]; //create vector of size SAMPLES to hold
imaginary values
int sensorPin = A1; // select the input pin for the LDR

int sensorValue = 0; // variable to store the value coming from the
sensor

int led = 9; //Declaring led for flame
int ledHummanActivity = 11; // Declaring led for humman activity
int ledChainsaw = 12; // Declaring led for chainsaw
//int ledGunshot = 8; // Declaring led for Gunshot
int buzzer = 13; // Declaring pin for buzzer
// Create the BME280 object
BME280_I2C bme; // I2C using default 0x77

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// or BME280_I2C bme(0x76); // I2C using address 0x76
float temp;
int ledPin=7; //definition digital 7 pins as pin to control the LED

//Setup
void setup() {
  {
    lcd.init(); //initialize the lcd
    lcd.backlight(); //open the backlight
  }
  {
    Serial.begin(115200); //Baud rate for the Serial Monitor
    samplingPeriod = round(1000000*(1.0/SAMPLING_FREQUENCY)); //Period
inmicroseconds
  }
  int case_t=99; //senario

// declaring outputs
  pinMode(led, OUTPUT); // Flame
  pinMode(ledHummanActivity, OUTPUT); //Human Activity
  pinMode(ledChainsaw, OUTPUT); //Chainsaw
  pinMode(buzzer, OUTPUT); //Buzzer

  Serial.begin(115200); //Set BPS Rate

  Serial.print(F("Bosch BME280 Barometric Pressure - Humidity - Temp
Sensor | cactus.io")); //Print to Serial monior

  if (!bme.begin()) {
    Serial.print(F("Could not find a valid BME280 sensor, check wiring!
")); //If can't find sensor will display
    while (1);
  }

  bme.setTempCal(-1);

  Serial.print(F("Pressure\tHumdity\t\tTemp\t\tTemp")); //Print to
monior

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// activate LED
pinMode(ledPin,OUTPUT);    //Set the digital 7 port mode, OUTPUT:
Output mode

}

//loop
void loop() {
    {

}

/*****/
{
    /*Sample SAMPLES times*/
    for(int i=0; i<SAMPLES; i++)
    {
        microseconds = micros();    //Returns the number of
microseconds since the Arduino board began running the current script.

        vReal[i] = analogRead(0); //Reads the value from analog pin 0
(A0), quantize it and save it as a real term.
        vImag[i] = 0; //Makes imaginary term 0 always

        /*remaining wait time between samples if necessary*/
        while(micros() < (microSeconds + samplingPeriod))
        {
            //do nothing
        }
    }

    /*Perform FFT on samples*/
    FFT.Windowing(vReal, SAMPLES, FFT_WIN_TYP_HAMMING, FFT_FORWARD);
    FFT.Compute(vReal, vImag, SAMPLES, FFT_FORWARD);
    FFT.ComplexToMagnitude(vReal, vImag, SAMPLES);

    /*Find peak frequency and print peak*/
    double peak = FFT.MajorPeak(vReal, SAMPLES, SAMPLING_FREQUENCY);
    Serial.print(F("Frequency peak detected is,\r\n"));
    Serial.println(peak);    //Print out the most dominant frequency.

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if(peak>700)//If the sound peak is larger than 700
{
  digitalWrite(buzzer, HIGH); //Turn on buzzer
  Serial.print(F("CHAINSAW\r\n")); //Print to Serial Monitor
  Serial.print (F("Sending information to authorities\r\n"));
  digitalWrite(ledChainsaw, HIGH); //Turn on chainsaw LED

// Serial.print(F("FIRE")); //LCD print

// Serial.print(F("LED on")); //LCD print

  delay(1000); //delay
  lcd.setCursor ( 0, 0 );          // go to the top left corner
  lcd.print("CHAINSAW      "); // write this string on the top row
  lcd.setCursor ( 0, 1 );          // go to the 2nd row
  lcd.print("Recorded at"); // pad string with spaces for centering
  lcd.setCursor ( 0, 2 );          // go to the third row
  lcd.print("Latitude: 43.509838"); // pad with spaces for centering
  lcd.setCursor ( 0, 3 );          // go to the fourth row
  lcd.print("Longitude: -80.68398");

  delay (1000); // delay

  digitalWrite(ledChainsaw, LOW); //turn off LED
  digitalWrite(buzzer, LOW); //turn off Buzzer
}

else if (peak>400 && peak<700) //If the sound peak is larger than
400 but less than 700
{
  digitalWrite(buzzer, HIGH); //Turn on buzzer
  Serial.print (F("HUMAN ACTIVITY\r\n")); //LCD
  Serial.print (F("Sending information to authorities\r\n"));
  digitalWrite(ledHummanActivity, HIGH); //LED on
  delay (1000); //delay
  lcd.setCursor ( 0, 0 );          // go to the top left corner
  lcd.print("HUMAN ACTIVITY"); // write this string on the top row
  lcd.setCursor ( 0, 1 );          // go to the 2nd row
  lcd.print("Recorded at"); // pad string with spaces for centering

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    lcd.setCursor ( 0, 2 );          // go to the third row
    lcd.print("Latitude: 43.509838"); //Print Lat and Long
    // pad with spaces for centering
    lcd.setCursor ( 0, 3 );          // go to the fourth row
    lcd.print("Longitude: -80.68398");

    digitalWrite(ledHummanActivity, LOW); //LED off
    digitalWrite(buzzer, LOW); //Buzzer off

}
//GUNSHOT

else if (peak>16 && peak<100) //If the sound peak is larger than 16
but less than 100
{
    // digitalWrite(buzzer, HIGH); //Turn on buzzer
    // Serial.print (F("GUNSHOT\r\n")); //LCD
    // Serial.print (F("Sending information to authorities\r\n"));
    //digitalWrite(ledGunshot, HIGH); //LED on

    delay (1000); //delay

    // lcd.setCursor ( 0, 0 );          // go to the top left corner
    // lcd.print("GUNSHOT"); // write this on the top row
    // lcd.setCursor ( 0, 1 );          // go to the 2d row
    // lcd.print("Recorded at"); // pad string with spaces for centering
    // lcd.setCursor ( 0, 2 );          // go to the third row
    // lcd.print("Latitude: 43.509838"); // pad with spaces for
centering
    // lcd.setCursor ( 0, 3 );          // go to the fourth row
    // lcd.print("Longitude: -80.68398");

    // digitalWrite(ledGunshot, LOW); //LED off
    // digitalWrite(buzzer, LOW); //Buzzer off

}

else //If the sound peak is less than 400
{

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Serial.print (F("No Alerts\r\n")); //LCD print
    }
    delay (1000); //delay
}

Serial.print(F("-----\r\n")); //Print -----
{

sensorValue = analogRead(sensorPin);
Serial.print(F("Flame sensor value detected is,\r\n"));
Serial.println(sensorValue);

if (sensorValue < 100) //If the flame value is less than 100

{

    Serial.print(F("FIRE")); //LCD print

    Serial.print (F("Sending information to authorities\r\n"));

    digitalWrite(led, HIGH); //LED on

    digitalWrite(buzzer, HIGH); //Buzzer on

    delay(1000); //delay
    //LCD
    lcd.setCursor ( 0, 0 );           // go to the top left corner
    lcd.print("FIRE"); // write this string on the top row
    lcd.setCursor ( 0, 1 );           // go to the 2nd row
    lcd.print("Recorded at"); // pad string with spaces for centering
    lcd.setCursor ( 0, 2 );           // go to the third row
    lcd.print("Latitude: 43.509838"); // pad with spaces for centering
    lcd.setCursor ( 0, 3 );           // go to the fourth row
    lcd.print("Longitude: -80.68398");
}

digitalWrite(led, LOW); //LED off

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digitalWrite(buzzer, LOW); //Buzzer off

delay(sensorValue); //delay

}

//Temperature, humidity, pressure
    bme.readSensor();
//Print to serial monitor
    Serial.print(F("-----\r\n"));
    Serial.print(F("Pressure, Hummidity, Temperature is\r\n"));
    Serial.print(bme.getPressure_MB()); Serial.print("\t\t");    //
Pressure in millibars
    Serial.print(bme.getHumidity()); Serial.print("\t\t");
    Serial.print(bme.getTemperature_C()); Serial.print(" *C\t");
    Serial.print(bme.getTemperature_F()); Serial.println(" *F\t");

    temp = bme.getTemperature_C(); // write temperature to a variable

    Serial.print(F("-----\r\n")); //Print to Serial
monior
    Serial.print (F("My Science project\r\n"));
    //Serial.print (temp);
    Serial.print (F("Connor Jantzi\r\n"));
    Serial.print(F("-----\r\n"));
    if(temp>25) digitalWrite (ledPin,HIGH);
//Print GPS info to Serial monior
    Serial.print(F("Global Positioning System Data:,\r\n"));
    Serial.print(F("Valid fix: yes\r\n"));
    Serial.print(F("Num. satelllites: 5\r\n"));
    Serial.print(F("HDOP: 1.6\r\n"));
    Serial.print(F("Latitude (deg): 43.509838\r\n"));
    Serial.print(F("Longitude (deg): -80.683982\r\n"));
    Serial.print(F("Altitude (m): 366.120\r\n"));
    Serial.print(F("-----\r\n"));
    Serial.print(F("\r\n"));

    //delay
    delay(1000);

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