

Arduino Code

For Carbon Dioxide detection in air

This code communicates with the MQ135 air quality sensor with the help of the [MQ135.h library](#). The sensor is supposed to preheat for 24 hours before taking readings. Once the code runs, it prints out the concentration of detected gases in ppm on a serial monitor and the results are displayed on an LCD screen. An alarm system (LED light) is also set to glow if the CO₂ values cross a threshold value of 1000ppm.

```
#include "MQ135.h"
#include <Wire.h>
#include <LiquidCrystal_I2C.h> //Header file for LCD

LiquidCrystal_I2C lcd(0x27,16,2);//set the LCD address to x27 for a 16 chars
and 2 line display

#define led          9           //led on pin 9
const int gas_pin = A0;         //analog feed from MQ135
MQ135 gasSensor = MQ135(gas_pin);

void setup(){

  lcd.init();                  // initialize the lcd
  lcd.begin(16,2);             // consider 16 chars + 2 lines lcd
  lcd.backlight();            // illuminate to produce visible reading
  lcd.clear();                 // clear lcd
  lcd.setCursor(4,0);         //set cursor of lcd to 1st row and 5th
column
  lcd.print("Group L");       // print as a sentence on lcd

  pinMode(gas_pin,INPUT);     //MQ135 analog feed set for input
  pinMode(led,OUTPUT);        //led set for output
  Serial.begin(9600);         //serial comms for debugging
}

void loop(){
  float ppm = gasSensor.getPPM();
  Serial.println(ppm);        // print ppm on serial monitor
  delay(1000);
  lcd.clear();                // clear lcd
  lcd.setCursor(0,0);         // set cursor of lcd to 1st row and 1st
column
  lcd.print("Air Quality: "); // print as a sentence on lcd
  lcd.print(ppm);             // print value of MQ135
  if(ppm>999){                //if co2 ppm > 1000
    digitalWrite(led,HIGH);   //turn on led
    lcd.setCursor(2,1);       // set cursor of lcd to 2nd row and 3rd
```

```
column
  lcd.print("AQ Level BAD"); //print as a sentence on lcd
}
else{
  digitalWrite(led,LOW);      //turn off led
  lcd.setCursor(1,1);        // set cursor of lcd to 2nd row and 2nd
column
  lcd.print ("AQ Level Good"); // print as a sentence on lcd
}
}
```

For noise disturbance detection in the environment

```
/* This code is meant to monitor the sound intensity using LM393 sensor
connected to Arduino UNO board.
//The used sensor has only a digital output. Therefore, the number of times
the sensor detects a sound is summed up over a sampling time called
"SAMPLE_TIME".
//Then the sum called "sampleBufferValue" is printed on a Serial Monitor
(laptop), and visualized with the Serial Plotter.
// The code allows to communicate with a LED in order to provide a visual
alarm if the "sampleBufferValue" surpasses a preset Threshold "Threshold"
*/

// 0 means silence and 1 means noise

const int OUT_PIN = 12;      // The OUTPUT of the sound sensor is
connected to the digital pin D12 of the Arduino
const int SAMPLE_TIME = 10; // The sampling time in milliseconds, can
be set differently if required
const int Threshold = 90;    // Threshold on decibel value for LED
switching ON, the value has been optimized with respect to the used sampling
time (900 cumulative digital counts  $\approx$  90 dB from "Schall")

unsigned long millisCurrent; // current time
unsigned long millisLast = 0; //previous time
unsigned long millisElapsed = 0; // difference between current time and
previous time (time interval)

int sampleBufferValue = 0;   // initiate the sum of digital outputs
over the sampling time
int led = 8;                 // LED on pin 4 of Arduino
int dB = 0;                  //initiate sound intensity dB value

void setup() {

  Serial.begin(9600);        //Arduino starts serial communication with
baud rate 9600
```

```
pinMode(led,OUTPUT);          // the LED is connected as output for alarm
purpose
}

void loop() {

  millisCurrent = millis();          //the current time is
assigned to the dedicated variable
  millisElapsed = millisCurrent - millisLast; //the elapsed time is updated
  if(digitalRead(OUT_PIN) == HIGH){    //HIGH means noise
    sampleBufferValue++;              //increments the sum variable
by 1
  }
  if (millisElapsed > SAMPLE_TIME) {    //if the elapsed time surpasses
the sampling time, print the sampleBufferValue and test threshold for alarm
  dB = 0.0666 *(sampleBufferValue) + 30.223; //linear regression to
calculate the decibel value based of the rough calibration of the sensor
response
  Serial.println(dB);                // print decibel values on the
Serial Monitor
  Serial.print("dB");                // print sound unit decibel
  if (sampleBufferValue > Threshold) { // test if the threshold is
surpassed
    digitalWrite(led, HIGH);         //blink LED 2 ms ON and 1 ms OFF
    delay(2);
    digitalWrite(led, LOW);
    delay(1);
  }
  digitalWrite(led, LOW);            // the LED is turned off to be
ready for the next sample
  sampleBufferValue = 0;              // re-initialization of the
sampleBufferValue variable for the new sampling time
  millisLast = millisCurrent;        // update the previous time to be
the start for the next sample
}
}
```

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