

PROJECT TITLE : NOISE POLLUTION MONITORING SYSTEM

PHASE 4 : DEVELOPMENT PART – II

OBJECTIVE:

The objective of a noise monitor is to provide data regarding the level of noise in a location so that it may be compared to the established noise limits.

It helps identify work locations where there are noise problems, employees who may be exposed to noise levels that can cause hearing loss, and where additional noise measurements need to be made. This information also helps determine appropriate noise control measures that need to be put in place.

To regulate and control noise producing and generating sources. Maintain the ambient air quality standards in respect of noise.

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CODING WITH EXPLANATION:

Allows communication with alphanumerical liquid crystal displays (LCDs).

This library allows an Arduino/Genuino board to control LiquidCrystal displays (LCDs) based on the Hitachi HD44780 (or a compatible) chipset, which is found on most text-based LCDs. The library works with in either 4 or 8 bit mode (i.e. using 4 or 8 data lines in addition to the rs, enable, and, optionally, the rw control lines).

```
#include <LiquidCrystal.h> // include the LiquidCrystal
library

const int micPin1 = A0; // define the pin for the first
microphone
const int micPin2 = A1; // define the pin for the second
microphone
const int micPin3 = A2; // define the pin for the third
microphone
const int buzzerPin = 9; // define the pin for the buzzer
const int ledPin = 6; // define the pin for the LED
const int contrast = 50; // define the LCD contrast
LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // initialize the
LCD display
```

Configures the specified pin to behave either as an input or an output. See the [Digital Pins](#) page for details on the functionality of the pins.

As of Arduino 1.0.1, it is possible to enable the internal pullup resistors with the mode `INPUT_PULLUP`. Additionally, the `INPUT` mode explicitly disables the internal pullups.

Syntax

```
pinMode(pin, mode)
```

```
void setup() {  
  pinMode(buzzerPin, OUTPUT); // set the buzzer pin as  
  output  
  pinMode(ledPin, OUTPUT); // set the LED pin as output  
  lcd.begin(16, 2); // initialize the LCD display  
  analogWrite(6, contrast); // set the LCD contrast  
  Serial.begin(9600); // initialize the serial monitor  
}
```

Reads the value from the specified analog pin. Arduino boards contain a multichannel, 10-bit analog to digital converter. This means that it will map input voltages between 0 and the operating voltage (5V or 3.3V) into integer values between 0 and 1023. On an Arduino UNO, for example, this yields a resolution between readings of: 5 volts / 1024 units or, 0.0049 volts (4.9 mV) per unit. See the table below for the usable pins, operating voltage and maximum resolution for some Arduino boards.

```
void loop() {  
  // read the values from the microphones  
  int micValue1 = analogRead(micPin1);  
  int micValue2 = analogRead(micPin2);  
  int micValue3 = analogRead(micPin3);  
  
  // calculate the sound levels in dB for each microphone  
  float voltage1 = micValue1 * 5.0 / 1024.0; // convert  
  the first microphone value to voltage (5V reference)  
  float voltage2 = micValue2 * 5.0 / 1024.0; // convert  
  the second microphone value to voltage (5V reference)
```

```

float voltage3 = micValue3 * 5.0 / 1024.0; // convert
the third microphone value to voltage (5V reference)
float dB1 = 20 * log10(voltage1/0.0063); // calculate
the sound level in dB for the first microphone
float dB2 = 20 * log10(voltage2/0.0063); // calculate
the sound level in dB for the second microphone
float dB3 = 20 * log10(voltage3/0.0063); // calculate
the sound level in dB for the third microphone

// calculate the average sound level in dB for all
microphones
float averageDB = (dB1 + dB2 + dB3) / 3;

```

lcd.setCursor()

This function places the cursor (and any printed text) at any position on the screen. It can be used in the void setup() or void loop() section of your program. The cursor position is defined with lcd.setCursor(column, row) . The column and row coordinates start from zero (0-15 and 0-1 respectively).

```

// display the sound level on the LCD display and the
serial monitor
lcd.setCursor(0, 0); // set the cursor to the first row
of the LCD display
lcd.print("Sound Level: "); // print the text "Sound
Level: " on the LCD display
lcd.setCursor(0, 1); // set the cursor to the second row
of the LCD display
lcd.print(averageDB); // print the average sound level
on the LCD display
Serial.print("Sound Level: "); // print the text "Sound
Level: " on the serial monitor
Serial.println(averageDB); // print the average sound
level on the serial monitor

```

If you do not set the pinMode() to OUTPUT, and connect an LED to a pin, when calling digitalWrite(HIGH), the LED may appear dim. Without explicitly setting pinMode(), digitalWrite() will have enabled

the internal pull-up resistor, which acts like a large current-limiting resistor.

Syntax

```
digitalWrite(pin, value)
```

```
// control the LED and the buzzer based on the sound
level
if (averageDB > 70) { // if the sound level is higher
than 70 dB
    digitalWrite(ledPin, HIGH); // turn the LED on
    tone(buzzerPin, 1000, 500); // turn the buzzer on
} else { // if the sound level is lower than 70 dB
    digitalWrite;
}
}
```

DIAGRAM DESIGN:

```
{
  "version": 1,
  "author": "Uri Shaked",
  "editor": "wokwi",
  "parts": [
    { "type": "wokwi-arduino-uno", "id": "uno", "top": 200, "left":
20, "attrs": {} },
    { "type": "wokwi-lcd1602", "id": "lcd", "top": 8, "left": 20,
"attrs": {} },
    { "type": "wokwi-resistor", "id": "r1", "top": 140, "left": 220,
"attrs": { "value": "220" } },
    {
      "type": "wokwi-buzzer",
      "id": "bz1",
      "top": 66.16,
      "left": -72.28,
      "attrs": { "volume": "0.1" }
    },
  ],
  {
    "type": "wokwi-led",
    "id": "led1",
    "top": 175.61,
```

```

        "left": 339.36,
        "attrs": { "color": "red" }
    },
    {
        "type": "wokwi-led",
        "id": "led2",
        "top": 259.31,
        "left": 341.33,
        "attrs": { "color": "red" }
    },
    {
        "type": "wokwi-led",
        "id": "led3",
        "top": 329.23,
        "left": 345.27,
        "attrs": { "color": "red" }
    }
],
"connections": [
    [ "uno:GND.1", "lcd:VSS", "black", [ "v-51", "*", "h0", "v18" ] ],
    [ "uno:GND.1", "lcd:K", "black", [ "v-51", "*", "h0", "v18" ] ],
    [ "uno:GND.1", "lcd:RW", "black", [ "v-51", "*", "h0", "v18" ] ],
    [ "uno:5V", "lcd:VDD", "red", [ "v16", "h-16" ] ],
    [ "uno:5V", "r1:2", "red", [ "v16", "h-118", "v-244", "h50" ] ],
    [ "r1:1", "lcd:A", "pink", [ ] ],
    [ "uno:12", "lcd:RS", "green", [ "v-16", "*", "h0", "v20" ] ],
    [ "uno:11", "lcd:E", "green", [ "v-20", "*", "h0", "v20" ] ],
    [ "lcd:D4", "uno:5", "green", [ "v43.53", "h76.86" ] ],
    [ "lcd:D5", "uno:4", "green", [ "v36.63", "h75.24" ] ],
    [ "lcd:D6", "uno:3", "green", [ "v26.79", "h78.54" ] ],
    [ "lcd:D7", "uno:2", "green", [ "v52.39", "h79.87" ] ],
    [ "bz1:2", "uno:9", "red", [ "v36.28", "h220.75" ] ],
    [ "bz1:1", "uno:GND.1", "black", [ "v9.69", "h180.53", "v54.16" ] ],
    [ "led1:A", "uno:A0", "red", [ "v26.92", "h-60.72", "v166.42", "h-77.79" ] ],
    [ "led2:A", "uno:A1", "red", [ "v18.06", "h-50.87", "v108.32", "h-81.73" ] ],
    [ "led3:A", "uno:A2", "red", [ "v67.3", "h-125.71" ] ],
    [ "led3:C", "uno:GND.2", "black", [ "v47.6", "h-169.87" ] ],
    [ "led2:C", "uno:GND.2", "black", [ "v32.84", "h-17.24", "v86.66", "h-147.71" ] ],
    [ "led1:C", "uno:GND.2", "black", [ "v3.29", "h-15.27", "v198.92", "h-150.66" ] ],
],
"dependencies": {}

```

}

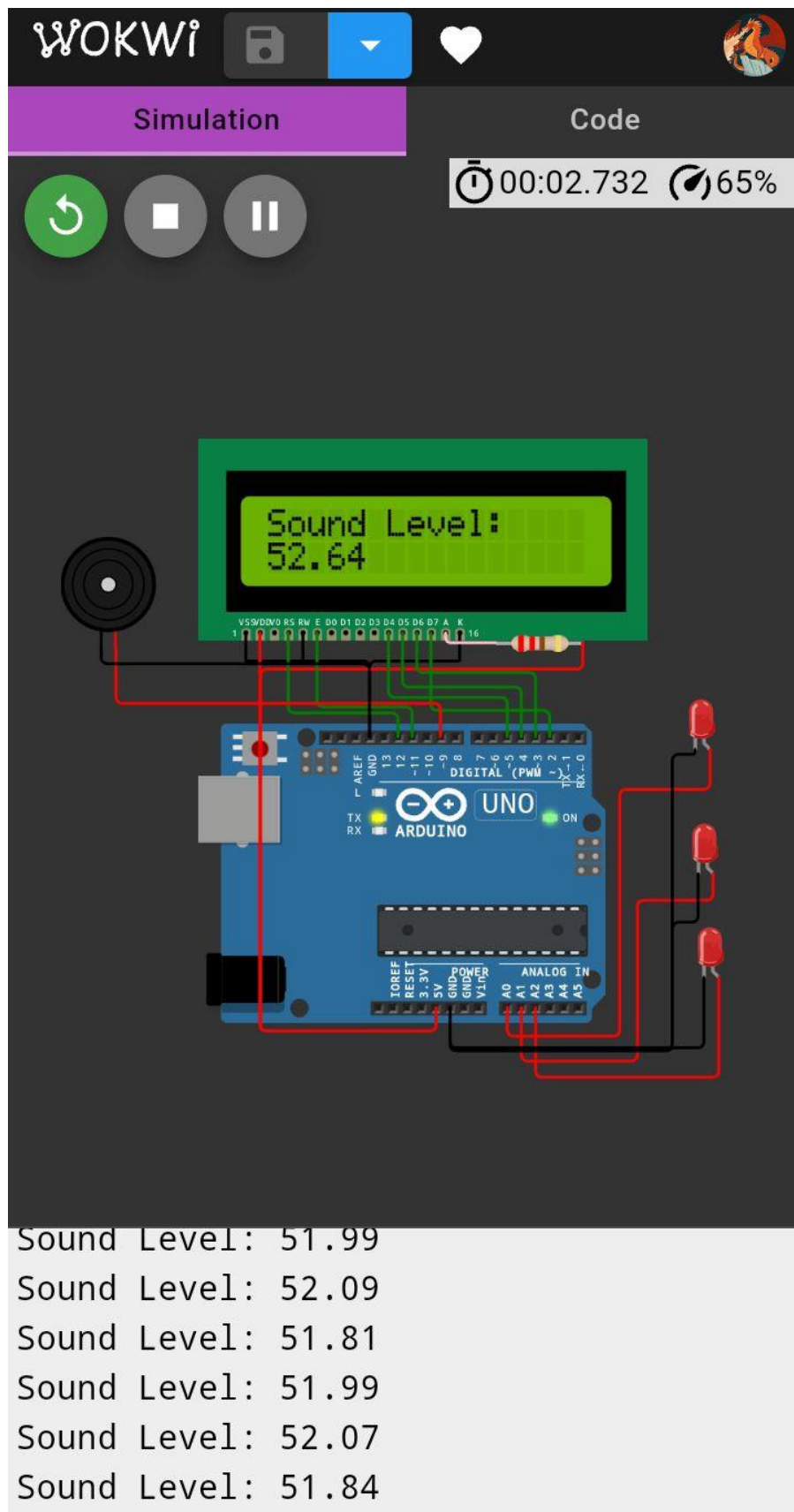
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lcd1602.ino diagram.json libraries.txt Library Manager Simulation

```
1 #include <LiquidCrystal.h> // include the LiquidCrystal library
2
3 const int micPin1 = A0; // define the pin for the first microphone
4 const int micPin2 = A1; // define the pin for the second microphone
5 const int micPin3 = A2; // define the pin for the third microphone
6 const int buzzerPin = 9; // define the pin for the buzzer
7 const int ledPin = 6; // define the pin for the LED
8 const int contrast = 50; // define the LCD contrast
9 LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // initialize the LCD
10
11 void setup() {
12   pinMode(buzzerPin, OUTPUT); // set the buzzer pin as output
13   pinMode(ledPin, OUTPUT); // set the LED pin as output
14   lcd.begin(16, 2); // initialize the LCD display
15   analogWrite(6, contrast); // set the LCD contrast
16   Serial.begin(9600); // initialize the serial monitor
17 }
18
19 void loop() {
20   // read the values from the microphones
21   int micValue1 = analogRead(micPin1);
22   int micValue2 = analogRead(micPin2);
23   int micValue3 = analogRead(micPin3);
24
25   // calculate the sound levels in dB for each microphone
26   float voltage1 = micValue1 * 5.0 / 1024.0; // convert ADC value to voltage
27   float voltage2 = micValue2 * 5.0 / 1024.0; // convert ADC value to voltage
28   float voltage3 = micValue3 * 5.0 / 1024.0; // convert ADC value to voltage
29   float dB1 = 20 * log10(voltage1/0.0063); // calculate dB level
30   float dB2 = 20 * log10(voltage2/0.0063); // calculate dB level
31   float dB3 = 20 * log10(voltage3/0.0063); // calculate dB level
32
33   // calculate the average sound level in dB for the three microphones
34   float averageDB = (dB1 + dB2 + dB3) / 3;
35
36   // display the sound level on the LCD display
37   lcd.setCursor(0, 0); // set the cursor to the first row, first column
38   lcd.print("Sound Level: "); // print the text
39   lcd.setCursor(0, 1); // set the cursor to the first row, second column
40   lcd.print(averageDB); // print the average sound level
41   Serial.print("Sound Level: "); // print the text to the serial monitor
42   Serial.println(averageDB); // print the average sound level to the serial monitor
43
44   // control the LED and the buzzer based on the sound level
45   if (averageDB > 70) { // if the sound level is high
46     digitalWrite(ledPin, HIGH); // turn the LED on
47     tone(buzzerPin, 1000, 500); // turn the buzzer on for 500ms
48   } else { // if the sound level is lower than 70 dB
49     digitalWrite(ledPin, LOW); // turn the LED off
50   }
51 }
```

RESULT:



Conclusion:

In wokwi, By deploying a network of smart sensors equipped with noise detectors, this system continuously gathers real-time acoustic data from various locations. Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in a particular areas through IOT. A sound level meter (SLM) can measure sound at different frequencies (called octave band analysis) and record sound clips to determine the source of noise pollution. Noise monitoring safeguards employees' hearing from any excessive noise in the workplace that leads to hearing problems, insomnia, hypertension, heart disease, ear injuries, and the ringing and buzzing in the ear called tinnitus