PROJECT NAME : NOISE POLLUTION MONITORING

PROJECT DEFINITION:

Noise monitoring refers to the systematic process of measuring, recording, and assessing sound levels in various environments to understand the extent of noise pollution and its potential impact on human health and the surrounding ecosystem. The sensors interact with microcontroller which processes this data and transmits it over internet. This allows authorities tonmonitor air pollution in different areas and take action against it.

INTRODUTION:

Noise pollution:

Noise pollution is an invisible danger. It cannot be seen, but it is present nonetheless, both on land and under the sea. Noise pollution is considered to be any unwanted or disturbing sound that affects the health and well-being of humans and other organisms. Sound is measured in decibels.

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.

WOKWI DOCS:

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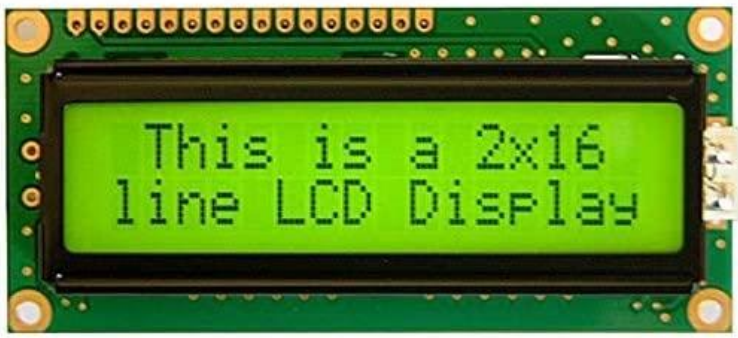
LCD (Liquid Crystal Display):



LCD(Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation.

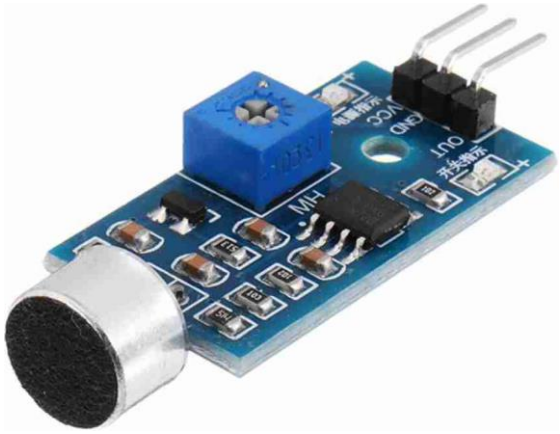
The liquid crystal display (LCD) panel is designed to project on-screen information of a microcomputer onto a larger screen with the aid

of a standard overhead projector, so that large audiences may view on-screen information without having to crowd around the TV monitor.

ARDUINO UNO:

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

MICROPHONE



Using an electret microphone, the Arduino can detect sounds and perform actions based on the input it receives. For example, the sound of hands clapping, a door closing, or someone's voice can all be used to trigger an Arduino's output.

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
```

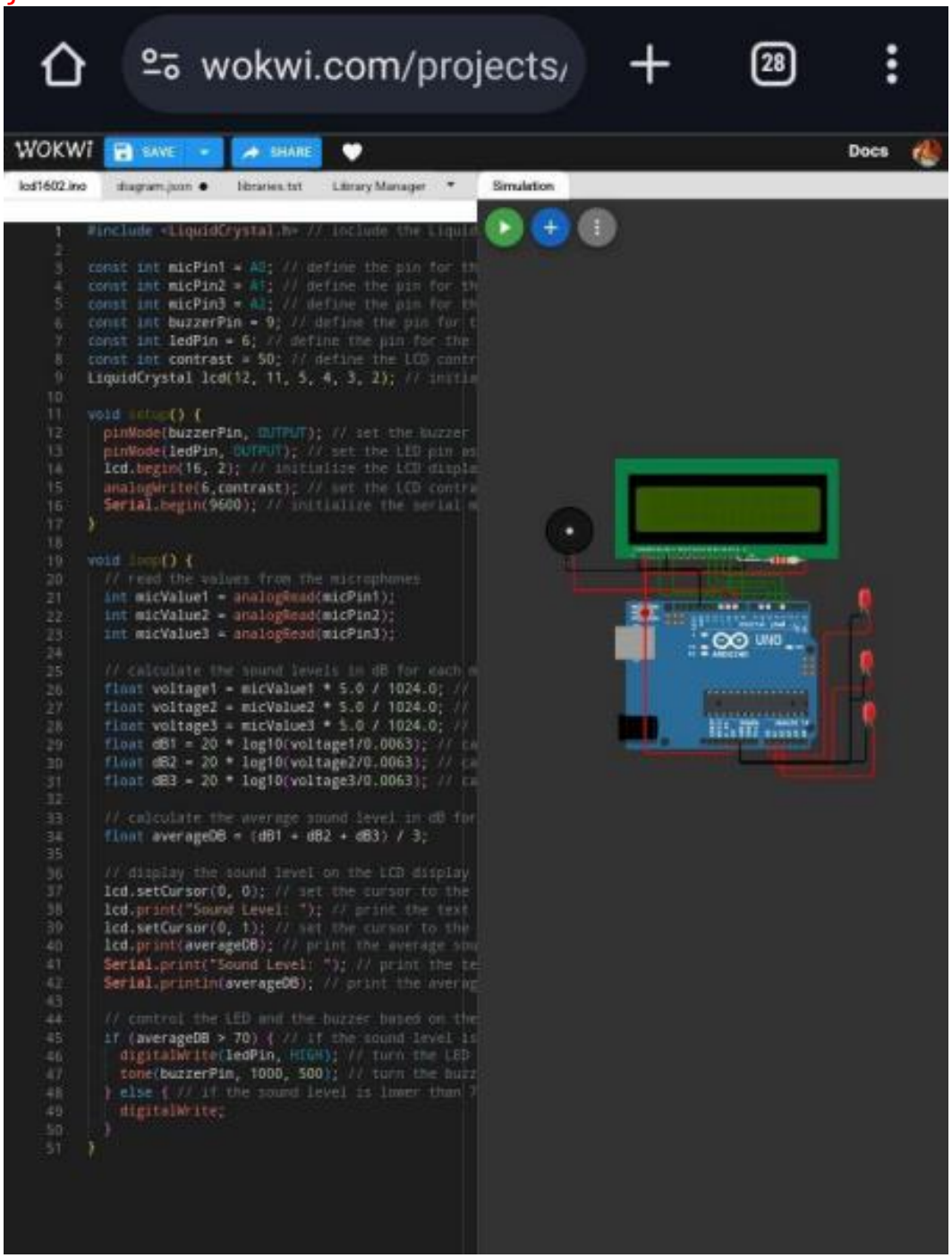
If you do not set the `pinMode()` to `OUTPUT`, and connect an LED to a pin, when calling `digitalWrite(HIGH)`, the LED may appear dim. Without explicitly setting `pinMode()`, `digitalWrite()` will have enabled
the internal pull-up resistor, which acts like a large current-limiting resistor.

Syntax

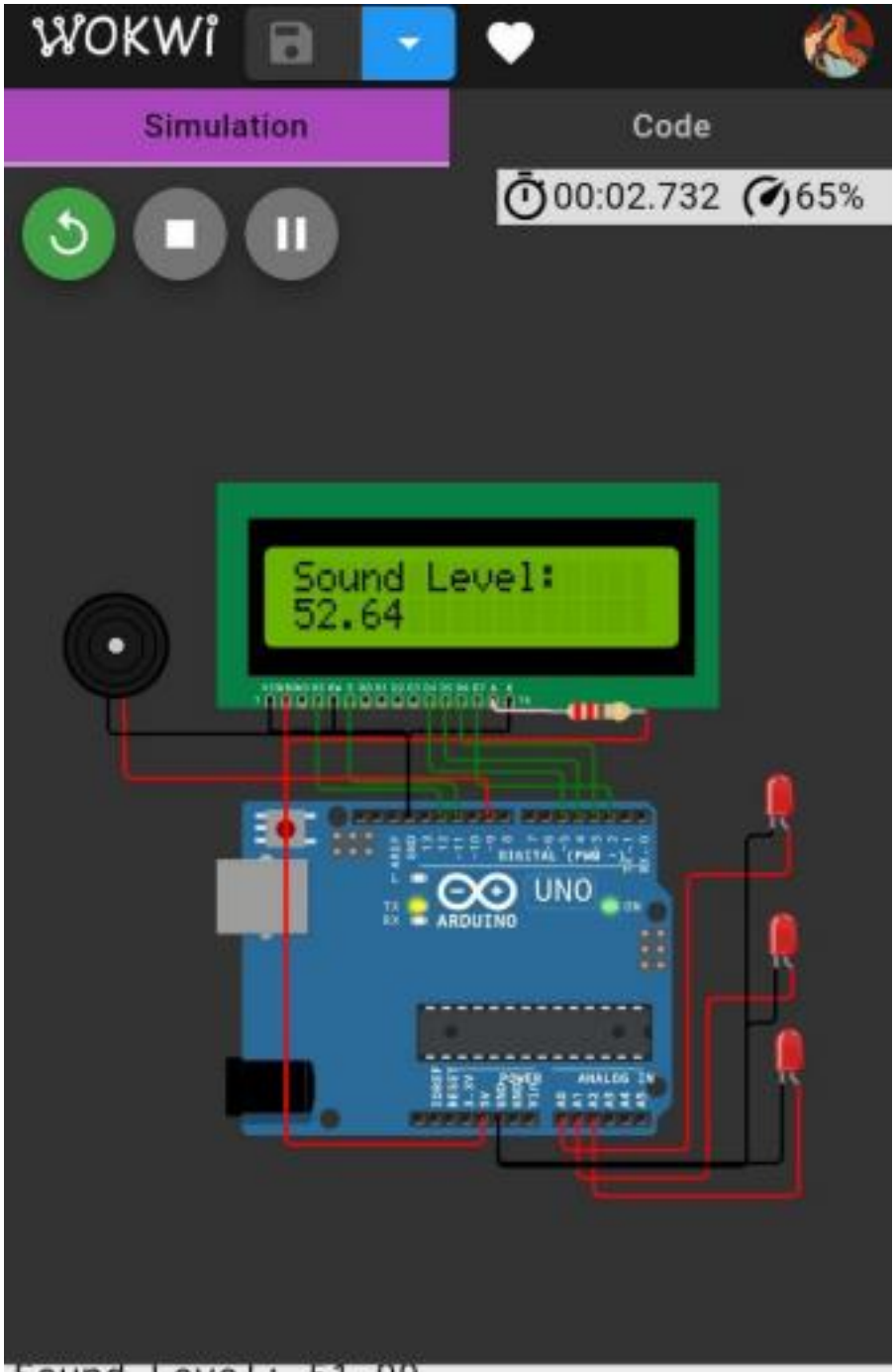
```
digitalWrite(pin, value)
```

```
  // 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;
  }
}
```



RESULT:




```
Sound Level: 51.99
Sound Level: 52.09
Sound Level: 51.81
Sound Level: 51.99
Sound Level: 52.07
Sound Level: 51.84
```

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