

PROJECT REPORT

STRUCTURED PROGRAMMING

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ROBOTICS 2C | UPY

Materials

In this project the following materials were used for the circuit:

- Arduino Uno R3
- LCD 16 x 2
- 220-ohm Resistor
- Red LED
- Yellow LED
- Green LED
- Slide switch
- 100 ohms Resistor (3 units)
- 20 k-ohm Resistor
- Gas sensor
- Piezo
- Protoboard

All these materials were used in a simulation made in Tinkercad.

Objective

The objective of this project is to use all the knowledge acquired in class to make a programmed circuit; In this case, a circuit was taken as a reference where, through the data collected by a gas sensor, a signal is sent to sound a piezo to alert high gas levels.

Procedure

When analyzing this example, I proceeded to make modifications to the circuit, adding a 16 x 2 LCD display and 3 LEDs to be able to have more visual control of the signals and alerts that are generated in the circuit.

I started by connecting the LCD display to GND and VCC to their respective pins adding a slide switch to control the screen by turning it off and on, then the following pins were connected to the digital ports:

- Record Selection (D12)
- Activate (D11)

- DB4 (D5)
- DB5 (D4)
- DB6 (D3)
- DB7 (D2)

Then the contrast pins, Read / Write, Anode Led, Cathode Led were connected.

Having ready the connections of the display with the Arduino, we proceeded to add 3 LEDs, the piezo (which was connected to the Arduino by [D10]) and the gas sensor (which used an analog input [A0]).

Having the circuit connected correctly, first investigate everything about the operation of the LCD display to be able to send the information that you wanted to show on the screen; First it was necessary to add a library for the display (*LiquidCrystal.h*), which creates a variable of type *LiquidCrystal*. The display can be controlled by 4 or 8 lines of data.

1. The syntax was carried out, where the digital pins used for the display were indicated.

"LiquidCrystal(lcd(12, 11, 5, 4, 3, 2);"

2. The piezo variable was declared as an integer.
3. A transfer rate of 9600 was established.
4. And the inputs and outputs of the digital and analog pins were set.
5. It continued with the configuration of the display and the printing of the information received by the sensor and sent to the Arduino.
6. The If, Else if and else structure is performed for each required case.

In addition to the visual performance of the circuit, I wanted to add the frequency setting part of the piezo, where the more frequency the sound will be the sharper, at the same time setting the intermittence between sounds

Result

The result that was obtained was as expected, since the circuit is constantly showing the gas levels and warns of the stability or the danger that the sensor is perceiving according to these levels.

Also the result with the frequencies and the sound emitted by the piezo, was good; manages to distinguish and relate these sounds to the state related to the gas level perceived by the sensor.

Analysis and questions

Which components are digital inputs?

None, all are outputs since we do not enter any digital value.

Which components are digital outputs?

10 pins used on LCD Display, LED's and Piezo.

Which components are analog inputs?

The gas sensor.

Explain why you connect each component in the ports you use.

There was no port specification to use, so I decided to use an analog port between the digital ports and the gas sensor to my liking, since we need this so that the Arduino receives the signal of the gas levels.

Explain the differences, if any, between the simulation and the real circuit

One of the main differences that I could mention, is that for a real circuit component that are purchased are used and the model is not always the same as in the simulated circuit, therefore depending on the manufacturer can change the specification and pin distribution for connect it.

CODE

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

int piezo = 10;

void setup() {
  Serial.begin(9600);
  lcd.begin(16, 2);
  pinMode(13,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(6,OUTPUT);
  pinMode(A0, INPUT);
  pinMode(piezo, OUTPUT);
```

```
}

void loop() {

    int gas_lvl;
    gas_lvl = analogRead(A0);
    lcd.setCursor(00,00);
    lcd.print("Gas Level:");
    lcd.setCursor(11,00);
    lcd.print(gas_lvl);

    if(gas_lvl > 800){
        digitalWrite(13,HIGH);
        delay(100);
        digitalWrite(13,LOW);
        lcd.setCursor(00,1);
        lcd.print("Danger!");
        tone(piezo, 550, 100);
        delay(100);
    }
    else if(gas_lvl > 700){
        digitalWrite(6,HIGH);
        digitalWrite(6,LOW);
        lcd.setCursor(00,1);
        lcd.print("Warning!");
        tone(piezo, 500, 200);
        delay(300);
    }
    else {
        digitalWrite(7,HIGH);
        lcd.setCursor(00,1);
        lcd.print("Stable :)");
        delay(500);
    }
    Serial.println(gas_lvl);
    delay(100);
    lcd.clear();
}
```

CIRCUIT

