SMART AIR QUALITY MONITORING SYSEM

- HARSHITHA N

Table of content

1. About the Smart Air quality System
    1. Description
    2. Identifying features
    3. State of art
    4. 5W's & 1H
    5. S.W.O.T analysis
2. Requirements
    1. High level requirements
    2. Low level requirements
3. Block Diagram and Blocks explanation
    1. Block Diagram
    2. Microcontroller
    3. Sensors
    4. Actuators
    5. Other
4. Architecture
    1. Flow Chart
    2. Structural Diagram
5. Test plan and output
    1. High level test plan
    2. Low level test plan
6. Application
7. Assumptions
8. Output
9. Future Scope
10. References

    Conclusion

1 Smart Air Quality Monitoring System

1.1 Abstract

This project is an Smart Air quality Monitoring System , which will be detect the amount of pollutants present in the air of the environment. If we know the amount of pollutants present in the air, then precaution can be taken to minimize the level of pollution in the air

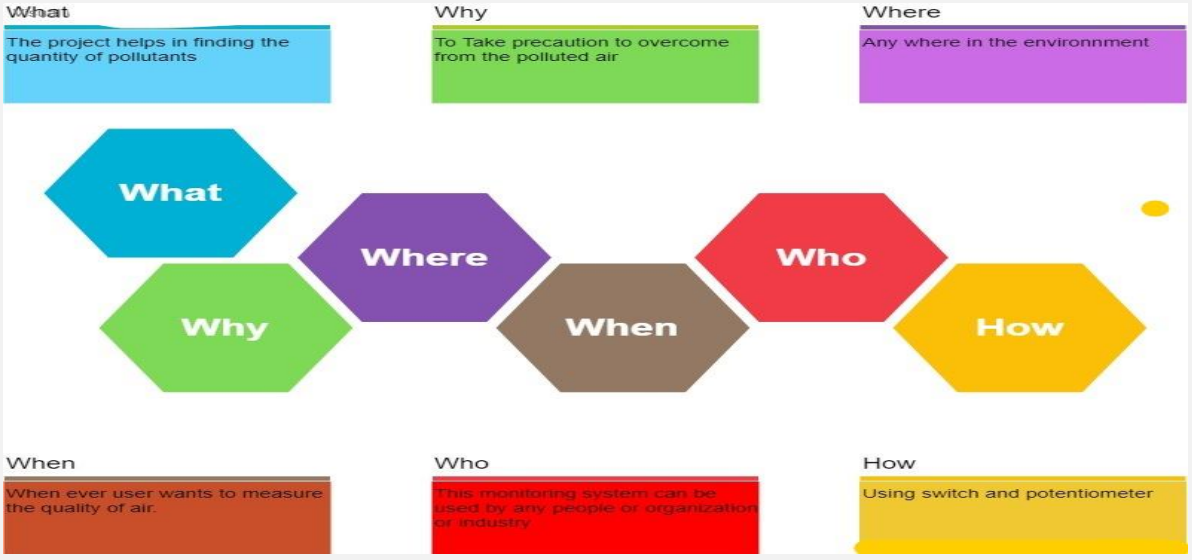
1.2 Identifying features

- The main feature of this project is:
- The LCD will display the percentage of Carbon dioxide and oxygen in the air
- The LED will glow to indicate when air quality is pure.
- The user will get to know easily about the quality of air they are surrounded by and take precautions for there safety.
- The cost of sensor used in project is low..

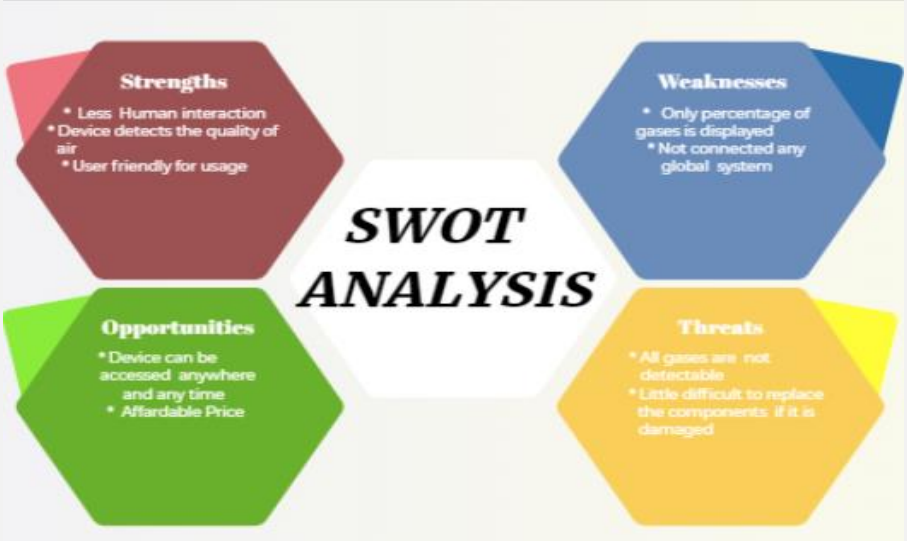
1.3 State of art

This project makes use of Potentiometer assumed as gas sensors, switch 2 as lambda sensors for sensing oxygen. The LCD displays the percentage of CO2 and O2 present in the gas. By combining all these components a final system is made called as S.A.M.S. As the technology is increasing rapidly these kind of system are very useful in our daily lives.

1.4 5W's 1H



Swot Analysis



2 Requirements

2.1 High Level Requirements

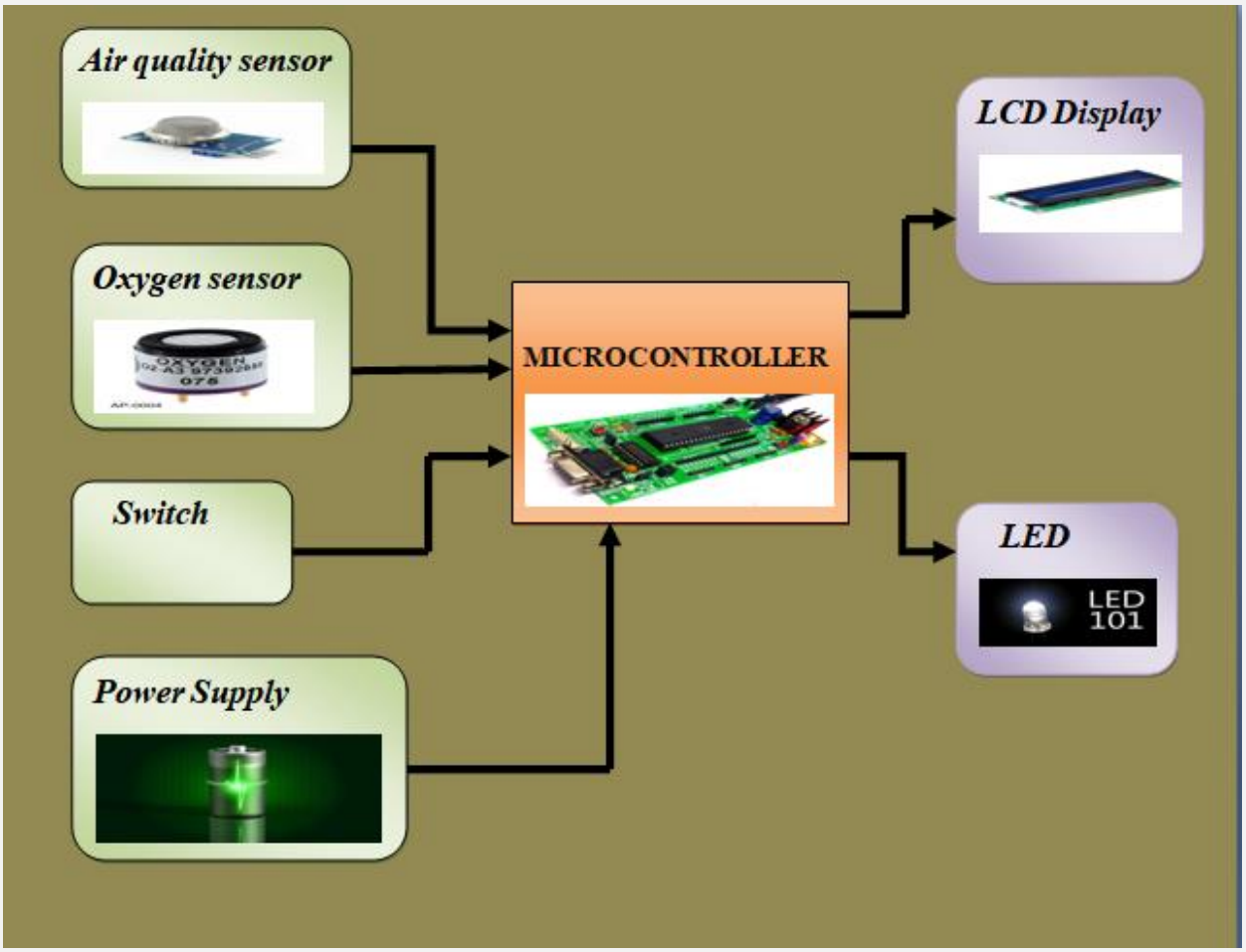
ID	High Level Requirements
HLR1	System shall measure the quantity of O2 and CO2
HLR2	There should be interface
HLR3	Potentiometer shall be controlled
HLR4	System shall detect the air is pure or not

2.2 Low Level Requirements

ID	Low Level Requirements
LLR1	Based on the requirement of user quantity of pollutants can be known
LLR2	Based on the percentage of O2 airquality can be determined
LLR3	If the Air quality is pure the LED shall be on
LLR4	Percentage of gas present in air shall displayed on screen

3 Block Diagram and Blocks explination

3.1 BLOCK DIAGRAM



1.2 Microcontroller(ATmega328)

ATmega328 is an 8-bit, 28-Pin AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash-type program memory of 32KB.It has an EEPROM memory of 1KB and its SRAM memory is 2KB. Its excellent features include cost-efficiency, low power dissipation, programming lock for security purposes, real timer counter with separate oscillator.

1.3 Sensors

Potentiometer (Air Sensor-MQ135) - A potentiometer assumed as air quality sensor measures the quality of the air quality in percentage Air quality sensors are devices used to detect contaminants in the air. This includes particulates, pollutants and noxious gases that may be harmful to human health. It detect gases like carbon monoxide and carbon dioxide by measuring the absorption of infrared light.

Switch(Oxygen sensor):A Switch assumed as oxygen sensor measures the percentage of O2An oxygen sensor is an electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analysed.

1.4 Actuators

LCD Display :A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device. It uses the light-modulating properties of liquid crystals combined with polarizer's. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

LED: A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

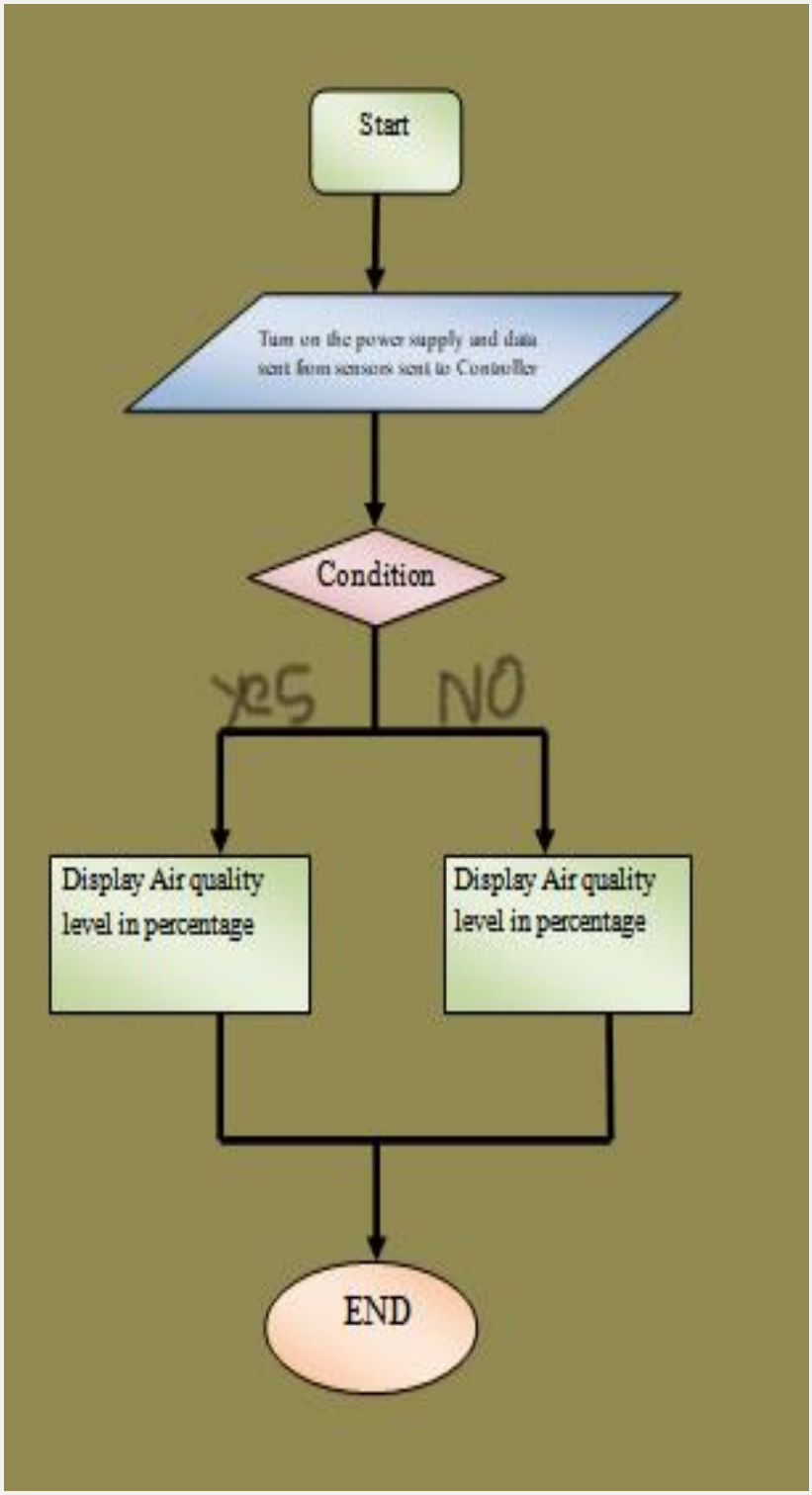
Resister :A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

1.5 Other

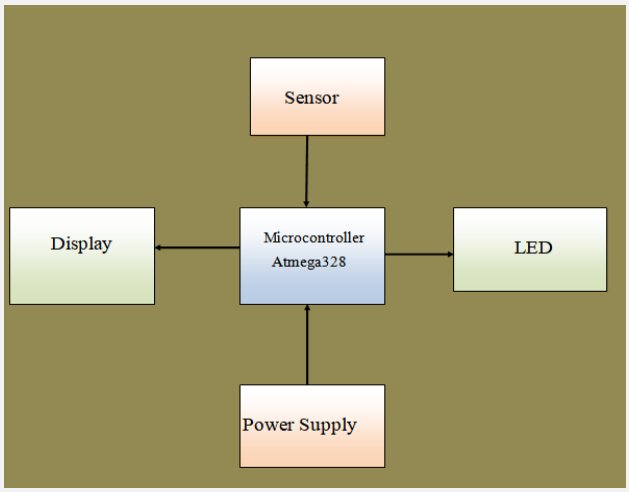
Voltage Source: A voltage source is a two-terminal device which can maintain a fixed voltage. An ideal voltage source can maintain the fixed voltage independent of the load resistance or the output current

4. Architecture

4.1 Flow chart



4.2 Structural Diagram



5 Test plan and output

5.1 HIGH LEVEL TEST PLAN

Test ID	Description	Exp I/P	Exp O/P	Actual Output	Passed or Not
HLT01	Examine if the code is working as expected	Initialize circuit	Correct Output	Correct Output	Passed
HLT02	Examine if the system works when no power is given	No Power	Switch Off	Switch Off	Passed
HLT03	Examine if the system works when power is given	Power	Switch On	Switch On	Passed
HLT04	Examine if the LED glows when the switch is Off	Switch2 Off	No LED Glows	No LED Glows	Passed
HLT05	Examine if the Switch1 works when the Sensor is On and LED glows	Sensor On	Correct Output	Correct Output	Passed

5.2 LOW LEVEL TEST PLAN

Test ID	Description	Exp I/P	Exp O/P	Actual Output	Passed or Not
LLT01	Display the percentage of air	Air	Displays CO2%	Displays as CO2%	Passed
LLT02	Display Level Of Water	Air	Displays as O2%	Displays as O2%	Passed
LLT03	The LED glows when O2 is in Common ratio	Information sent	LED Glows	LED Glows	Passed
LLT04	The LED doesn't glows O2 is in Common ratio	Switch Off	LED doesn't glow	LED doesn't glow	Passed
LLT05	When volt source turned Off	No Voltage	Off	Off	Passed

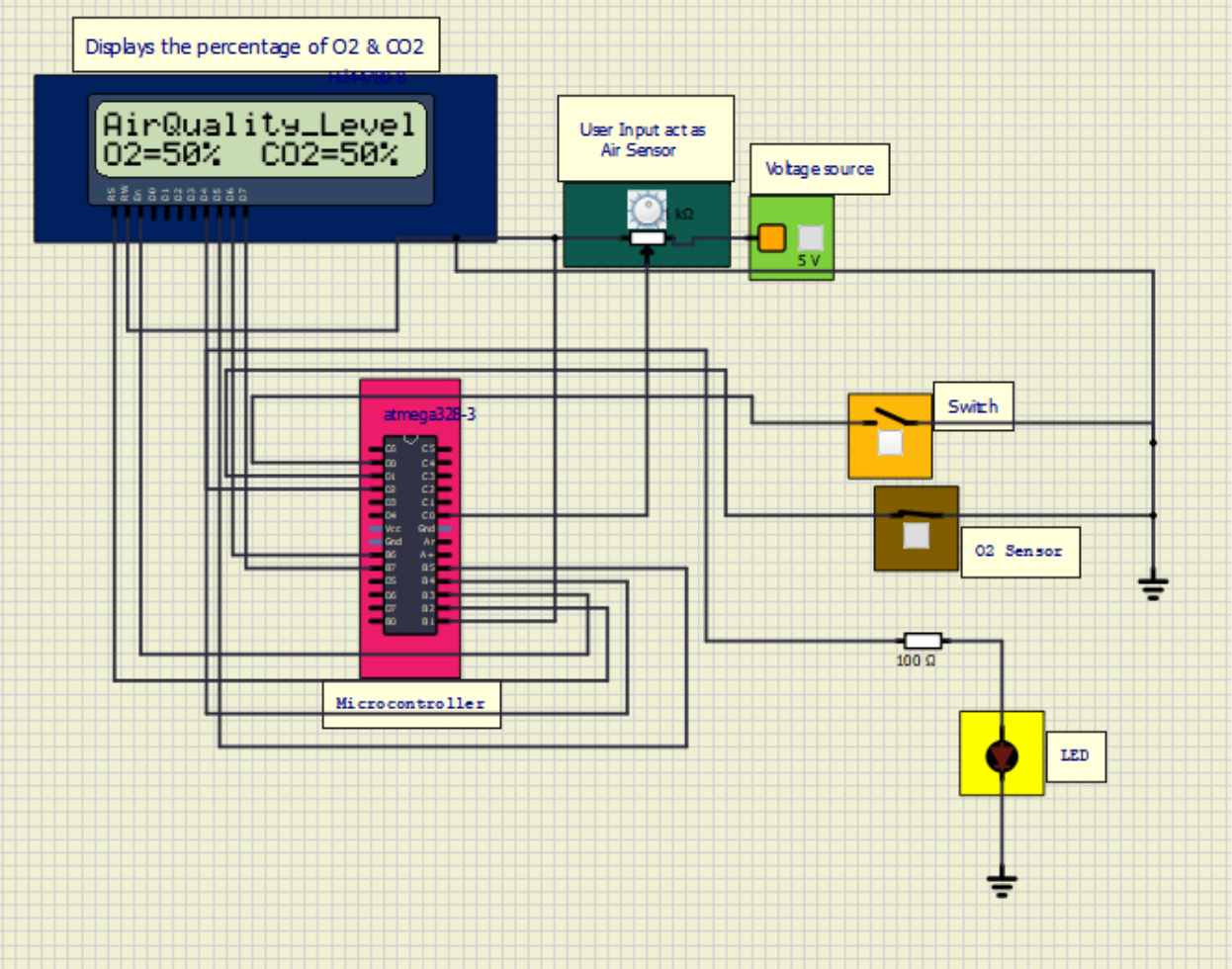
6 Application

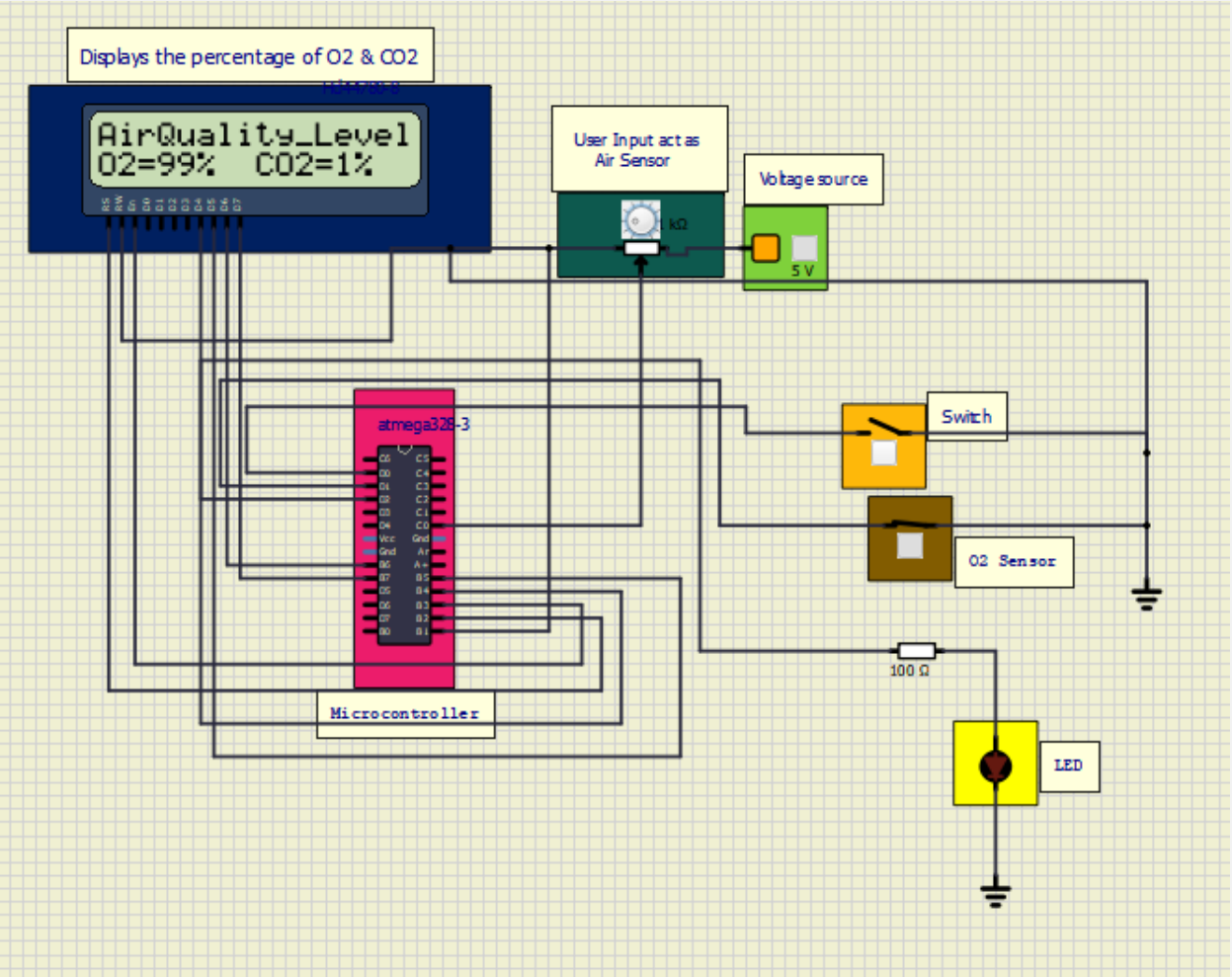
1. This system shall be used as Indoor Air Quality Monitoring System
2. This system shall be used as Particulate Matter Monitoring
3. This system shall be used as Gas Detection System
4. This system shall be used as Outdoor Air Quality Monitoring System

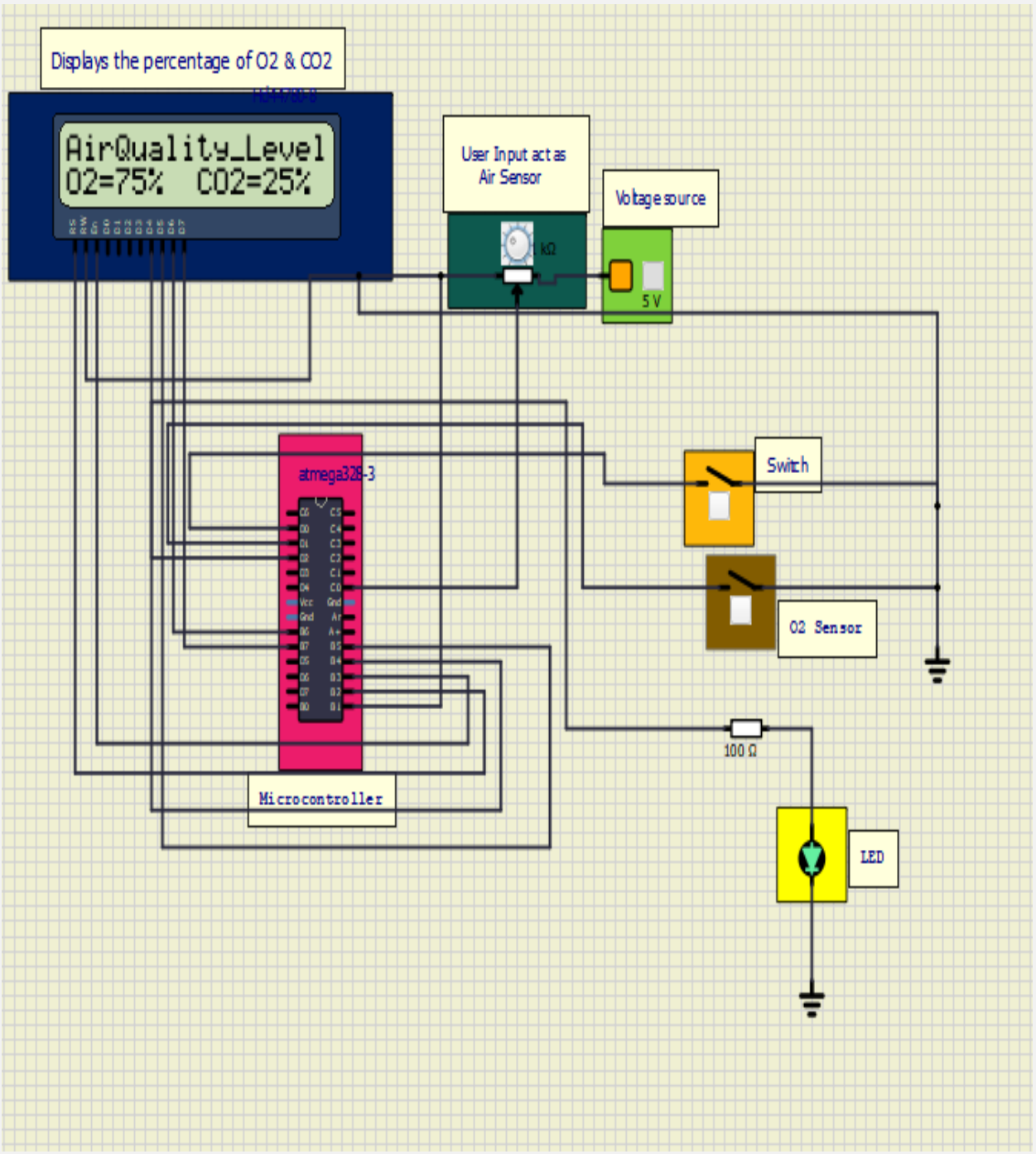
7 Assumptions

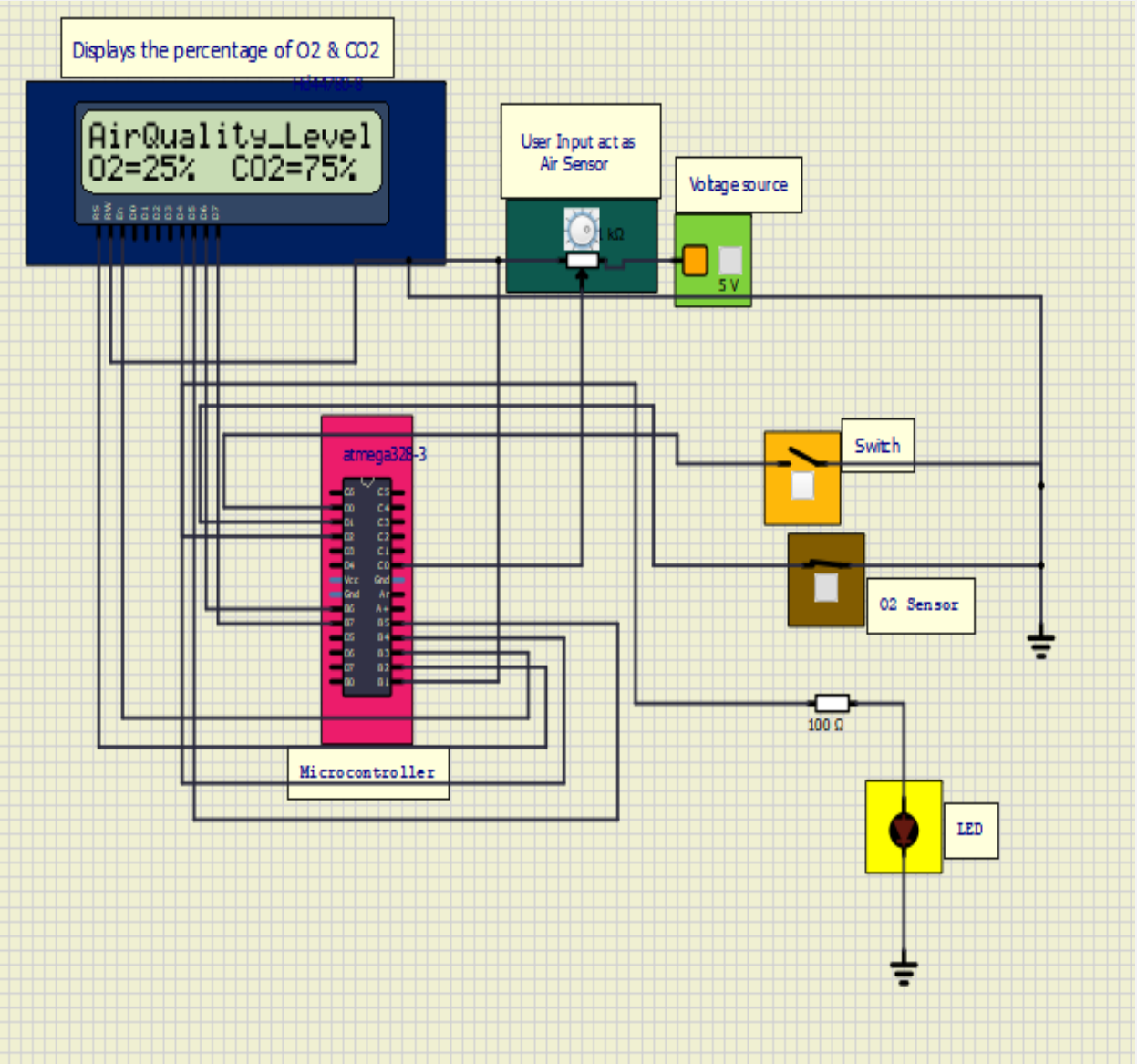
- Potentiometer as gas sensor.
- Switch-2 as Lamda sensor

8 Output

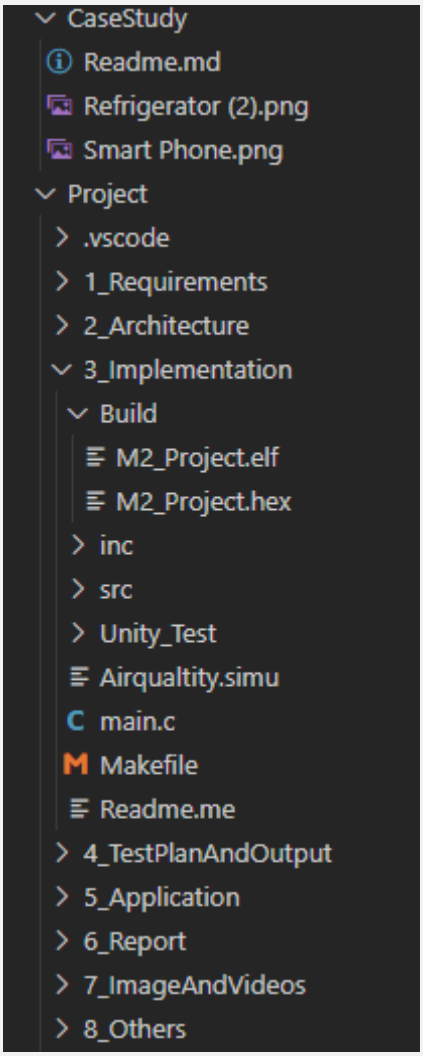

Displays the percentage of O2 & CO2
AirQuality_Level
O2=50% CO2=50%
User Input act as Air Sensor
kΩ
Voltage source
5 V
atmega328-3
Switch
O2 Sensor
100 Ω
LED
Microcontroller


Displays the percentage of O2 & CO2
AirQuality_Level
O2=99% CO2=1%
User Input act as Air Sensor
kΩ
Voltage source
5 V
atmega328-3
Switch
O2 Sensor
100 Ω
Microcontroller
LED

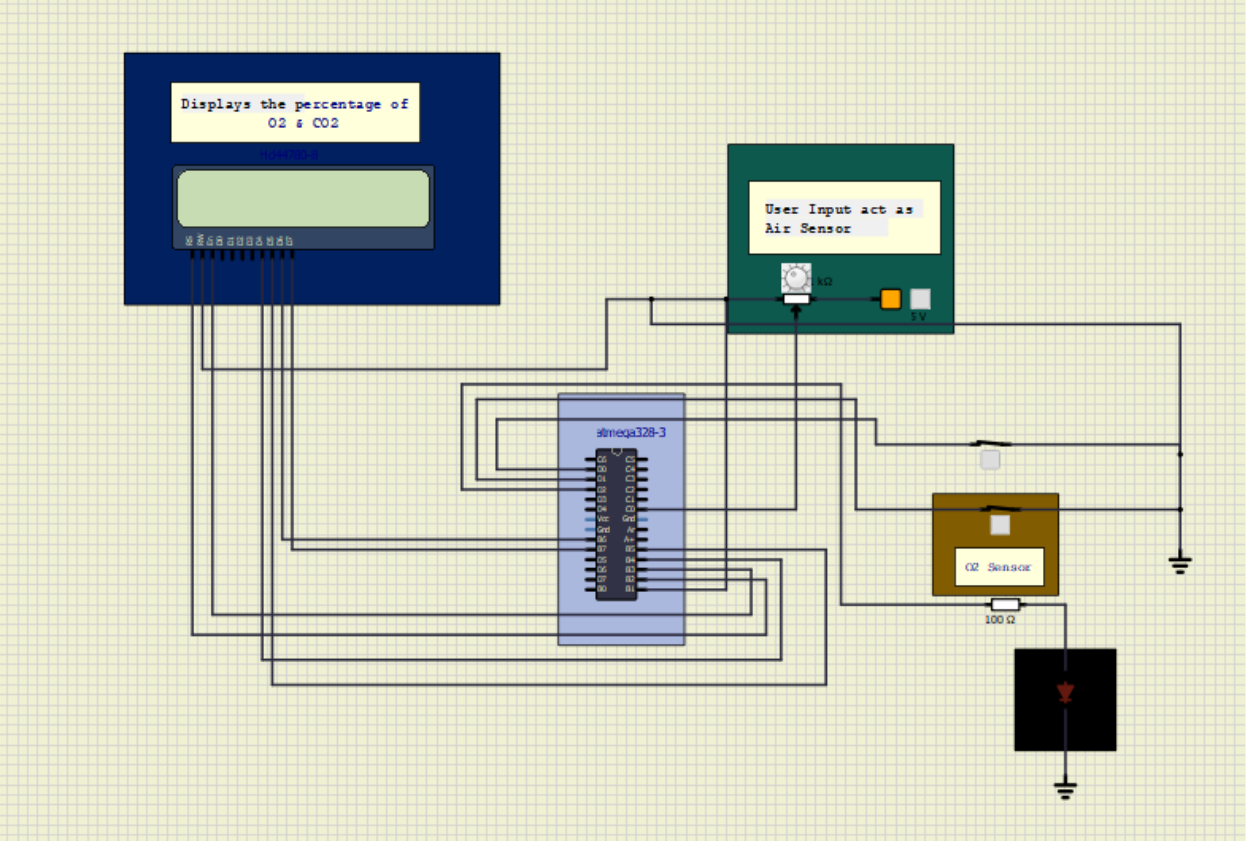

Displays the percentage of O2 & CO2
AirQuality_Level
O2=75% CO2=25%
User Input act as Air Sensor
kΩ
Voltage source
5 V
atmega328-3
Switch
O2 Sensor
100 Ω
Microcontroller
LED


Displays the percentage of O2 & CO2
AirQuality_Level
O2=25% CO2=75%
User Input act as Air Sensor
kΩ
Voltage source
5 V
atmega328-3
Switch
O2 Sensor
100 Ω
Microcontroller
LED

Hex Files Created.



Simulation Circuit



9 Future Scope

- Percentage of all gases are implemented

10 References

https://www.rcciit.org/students_projects/projects/aeie/2018/GR1.pdf

Conclusion

- Therefore, improving air quality can deliver substantial health benefits; reducing air pollution levels means reducing premature deaths and diseases from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. the most harmful air pollutant.