Automatic Fire Rescue System

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***Abstract*—Arduino based fire rescue system is generally used to help us to detect fire in time. A servo motor, a piezoelectric buzzer, 3 led lights and a gas sensor are used to detect the density of the smoke and a temperature sensor to detect the temperature, depending on the conditions of fire rescue system. In this project an automatic fire detection using a smoke detector sensor is used and an automation system which can sense temperature and gas density of a room.**

Keywords- Fire rescue system, Automatic, emergency prevention

I. INTRODUCTION

The automatic fire rescue system is the most indispensable infrastructure for any building design these days. In recent days, fire incidents are commonly reported. This might be due to the negligence of people in many cases or any kind of accident. Consider a few example-in places like fuel filling stations, crackers shop, houses, hospitals and mainly in workplace etc. Here an automation system which can sense temperature and gas density of a single room. When fire is detected, the LCD display will show the density of smoke and the temperature and also show a alert message. In that time red LED will automatically glow and piezoelectric buzzer will make a sound of alarm and as soon as possible it will open the emergency door with respect of emergency purpose (in this project we are using servo motor).The LED indicator have other two modes also. But, when the LED is green it indicates that everything is normal, yellow indicates there's might be some kind of problem (smoke or temperature increasing). This implemented fire detection system will be more efficient and provide more safety compared to the other conventional fire alarm system available.

II. REQUIRED COMPONENTS

A. Gas Sensor

A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage.

Fig.1 Gas Sensor

B. Temperature Sensor

The basic principle of working of the Temperature sensors is the voltage across the diode terminals. If the voltage increases, the temperature also rises, followed by a voltage drop between the transistor terminals of base and emitter in a diode.

C. Servo Motor

Servo motor works on the PWM (PULSE WIDTH MODULATION) principle, which means it's angle of rotation is controlled by the duration of pulse applied to its control PIN. Basically, servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears.

Fig.2Servo Motor

D. Piezoelectric Buzzer

When an alternating voltage is applied to the piezo-ceramic element, the element extends and shrinks diametrically. This characteristic of piezoelectric material is utilized to make the ceramic plate vibrate rapidly to generate sound waves.

Fig.3 Piezoelectric Buzzer

E. LCD Display

The principle behind the LCDs is that when an electrical current is applied to the liquid crystal molecule, the molecule tends to untwist. This causes the angle of lightwhich is passing through the molecule of the polarized glass and also causes a change in the angle of the top polarizing filter.

F. LED

A light-emitting diode is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

Fig.4LED

G. BULB

An incandescent bulb works on the principle of incandescence, a general term meaning light produced by heat. In an incandescent type of bulb an electric current is passed through a thin metal filament, heating the filament until it glows.

III.BLOCK DIAGRAM

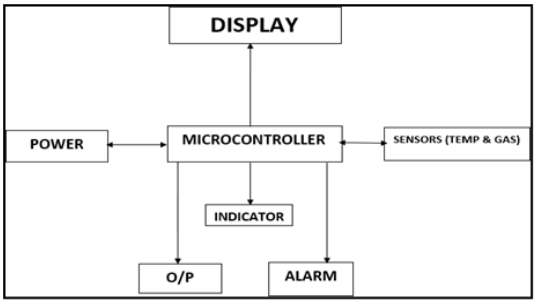

Fig.5Block Diagram

IV.CIRCUIT DIAGRAM

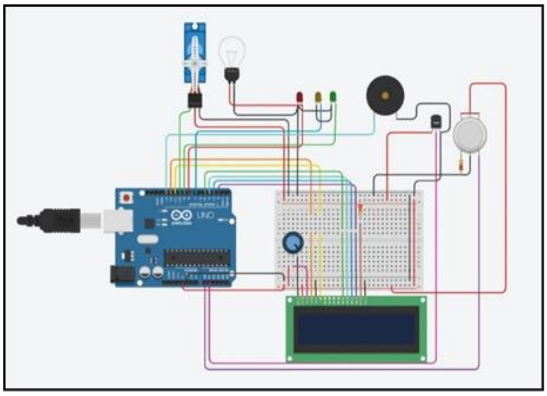

Fig.6Circuit Diagram

V.STEPS OF PROPOSED WORK

1) Start the simulation in the Tinkercad platform of switch on the device.
2) Put the temperature below of 100oC and gas density below 250ºC. And observe the indicator light and LCD display.
3) Now, put the temperature above 100ºC and put the gas. Density below 250oC and observe the changes in the indicator light and LCD display.
4) Now, low the temperature value below100ºC and put the gas density upper to the 250ºC and observe the indicator and LCD display.
5) At last put the temperature above 100ºC and put the gas density above 250ºC also and observe the changes in the output section and also see the indicator colour and LCD display.

VI.RESULTS & DISCUSSIONS

The three cases are explained in the following ways:

1) If the temperature is normal and no smoke is generated, then the FIRE RESCUE system will detect the conditions and it will show a GREEN light. This is an indication that the situation is normal.
2) If there is an increase in the temperature or the smoke density increases, then the FIRE RESCUE system will show a YELLOW light. If either of the conditions are true, the yellow light will start blinking. This is an indication that the situation is quite not normal.
3) If the temperature and smoke density both increases to its higher level than the FIRE

RESCUE system will show a RED light, simultaneously the Piezoelectric Buzzer will start beeping and a Bulb beside the servo motor will start to glow. The servo motor will rotate, which is used to help the doors and windows open in emergency cases. This is an indication of a worst situation which states fire is detected.

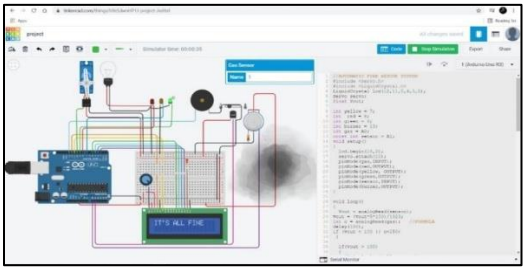

Fig.7Fire Rescue System [Step 1]

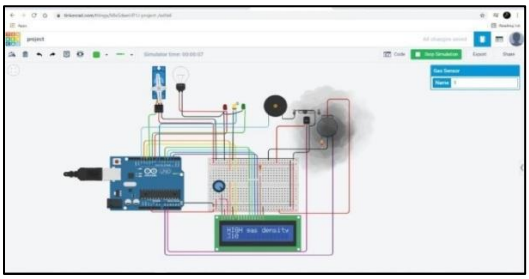

Fig.8Fire Rescue System [Step 2]

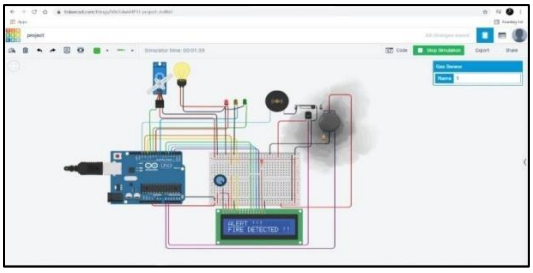

Fig.9Fire Rescue System [Step 3]

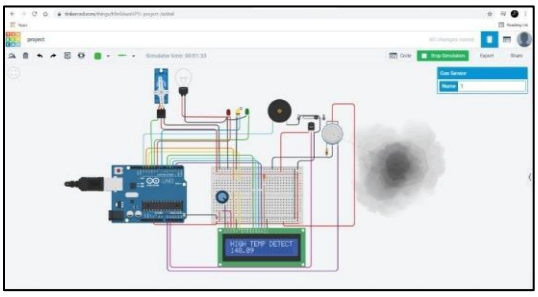

Fig.10Fire Rescue System [Step 4]

VII.CONCLUSION

This fire and smoke alarm system can be monitored locally in the premises, or remotely at a distant place as per requirement. This system used low cost, reliable instruments that were suitable to develop a fire & smoke detector and affordable with societal impacts. Our project 'Automatic Fire Rescue system' is based on such principle only but we have introduced some more features to enhance our project work. In our project we have added two servo motors, LCD display which will show the temperature and density of the smoke along with an alert message. The introduced LED and Piezoelectric buzzer in the circuit will blink and give an alert alarm sound. The added concept which makes our project different from similar available prototype present in the market is the automatic opening of an emergency door for the people to execute. In future as per customer requirements we can change ranges of indication based on where it will be placed.

REFERENCES

[1] cedengineering.com/userfiles/Overview%20of%20Fire%20Alarm%20&%20Detection%20Systems.pdf
[2] https://realpars.com/fire-alarm-system/
[3] https://firerisk.co.uk/different-types-of-fire-detector-heads/
[4] https://courses.lumenlearning.com/firetech/chapter/firefighter-safety-and-modern-building-construction/