VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI-590018, KARNATAKA

MINI PROJECT REPORT

ON

"Fire Alarm System using Arduino on Tinker CAD"

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CERTIFICATE

This is to certify the Mini Project Report entitled "**Fire Alarm System using Arduino on Tinker CAD**", prepared by **Mr/Ms.PRAJWAL N G**, bearing **USN 1CR21EC151**, a bona fide student of **CMR Institute of Technology, Bengaluru** in partial fulfillment of the requirements for the award of **Bachelor of Engineering in Electronics and Communication Engineering** of the V**isvesvaraya Technological University, Belagavi-590018**during the academic year 2021-22.

This is certified that all the corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The Mini Project has been approved as it satisfies the academic requirements prescribed for the said degree.

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Signature of Guide	**Signature of HOD**
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THANK YOU

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(1CR21EC151)

ABSTRACT

A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns. The primary thought in the present field advances are computerizations, power utilization, and expense adequacy. Automation is implied for the decrease risk of human neglection. Two sensors viz. The Temperature sensor and Air quality sensor which are utilized as a part of the Fire Detection System to recognize a fire.The temperature sensor records the temperature of the room. The Air quality sensor detects if there is any gas present in the room. Herewe have utilized an Arduino Uno to control all the command from both the sensors and execute them legitimately. Fundamentally it acts as the mind of the entire framework.

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Chapter 1

INTRODUCTION

A fire alarm system is a set of devices that detect and alert people to the presence of smoke, fire, carbon monoxide, or other fire-related emergencies. Fire alarms systems are required in most commercial buildings and are installed to protect life, and property.The four most common detectors are ionization, photoelectric, combination ionization /photoelectric, and heat. All smoke detectors sound an alarm, when they identify smoke, to notify a building's occupants. Examples include, schools, churches, restaurants, and corporate buildings. These devices may include smoke detectors, heat detectors, and manual fire alarm activation devices which are all connected to a Fire Alarm Control Panel (FACP) normally found in an electrical room. The purpose of a fire alarm system is to notify occupants, and emergency forces. They do this so that they can take action to protect themselves and others. Fire alarm systems may use visual and audio signalization to warn people about a possible fire, smoke, or carbon monoxide. Fire alarm systems also shutdown HVAC systems to prevent the spread of smoke and shutdown elevators.

About project and components used FireAlarm System by Interfacing Arduino with Temperature & Gas Sensor using Tinker Cad Simulation software is generally used before the circuits and devices are built. It is not only that small devices can be designed on software, complex and large circuits/devices can be simulated.By this, damage can be avoided when all the hazards and implications can be avoided in the simulation itself.In this project, we are going to design a Fire Alarm circuit using a few electrical components like Temperature and Gas sensors using TinkerCad and interface it with Arduino. Let's start with the components we will require to build the circuit in the TinkerCad software.

1.1 History of Tinker CAD:

History of TinkerCAD,TinkerCAD was founded by former Google engineer Kai Backman and his cofounder MikkoMononen, with a goal to make 3D modeling, especially the design of physical items, accessible to the general public, and allow users to publish their designs under a Creative Commons license. In 2011, the tinkercad.com website was launched as a web-based 3D

modeling tool for WebGL-enabled browsers.And in 2012 the company moved its headquarters to San Francisco. By 2012 over 100,000 3D designs had been published by users.In May 2013, Autodesk announced at a Maker Faire that they would acquire Tinkercad. In March 2017, Autodesk recommended users of the soon to be retired 123D Sculpt migrate to Tinkercad (or Maya LT). In May, Autodesk discontinued its 123D Circuits (Circuits.io) "Electronics Lab". The program's features were merged into Tinker cad.

Tinkercad is a free-of-charge, online 3D modeling program that runs in a web browser. Since it became available in 2011 it has become a popular platform for creating models for 3D printing as well as an entry-level introduction to constructive solid geometry in schools. Tinkercad is a good alternative to other 3D modeling software such as SketchUp or Fusion360—another solution from Autodesk—if you do not need the more advanced features of these solutions.It is currently available in 16 languages.Tinkercad uses a simplified constructive solid geometry method of constructing models. A design is made up of primitive shapes that are either "solid" or "hole". Combining solids and holes together, new shapes can be created, which in turn can be assigned the property of solid or hole. Shapes can be imported in three formats: STL and OBJ for 3D, and 2-dimensional SVG shapes for extruding into 3D shapes. Tinkercad exports models in STL or OBJ formats, ready for 3D printing.

1.2Features of Tinker CAD:

Even though Tinkercad is perfect for beginners, it does not mean that those who are moreexperienced with 3D modeling will not also enjoy this software. Given that it is based on CSG tocreate solid models, you can always make your model more complex by adding more shapes. Inmore concrete terms, all you have to do is select one of the available shapes, add or removematerial and voila you’re done! For example, you could start with a cylinder before addingtriangles, circles, cones, etc. The shape can then be moved and rotated, allowing users to see itfrom all angle.

Additionally, the software allows you to add electronic circuits to 3D models in order to createobjects with light and movement. The end result can even be simulated on the software to checkhow the components will respond in real life. Another feature of Tinkercad is its ability totransform a 3D design into buildable brick models, similar to creating legos. Finally, for

thosethat love Minecraft, you will be well served, as you will be able to make creations compatiblewith the application.

1.3Applications:

Therefore, Tinkercad can be used for a range of applications, including 3D printing. The 3D models can be saved in three different formats, STL, OBJ, and SVG. Once you have an STL file of your model, you can go on to using slicing software. Slicing software converts the 3D model into a series of thin layers and produces a G-code file containing instructions tailored to a specific type of printer. In other words, it is dividing the object into a stack of flat layers and describing these layers as linear movements of the 3D printer extruder. If you don't have a 3D printer, you can also order your model via the online service offered by Tinker cad. You should also know that it can be exported in SVG format for laser cutting.Tinker cad's 35Million users often compliment the intuitiveness of this CAD software.Transformation, duplication, and shape modification are easy to grasp. Additionally, Autodesk hasmade many resources available to its community.

For example, you will find inspiration, and tips& tricks to get started on their blog, as well as videos and course to get you started with 3D modelling The software works on any computer with an internet connection, you just have tocreate your account. It also offers a backup of 3D models on the cloud.

1.4Problem Statement:

It must be able to detect fires at all locations, residents must be able to activate it from convenient locations themselves, and it must alert residents in all portions of the house.

The primary motivation for fire alarm system requirements in building and fire codes is to provide early notification to building occupants so they can exit the building, and to notify the fire service so it can respond to the fire.

Chapter 2

Methodology

These are the main components that are used to establish the connections between different devices of the circuit the circuit connections are as follows. Firstly, we need to connect one line of the breadboard to the ground and the other to the power supply. This is done by connecting the 5V pin of the Arduino Board to one line of connection pins on the breadboard. The other line of the breadboard is connected to the ground terminal of the Arduino Board. These lines will be connected to other devices.

The Temperature sensor has three pins. Ground, Vout, and Vs (Supply). The Vs pin that has a range of 4-20V is connected to the power supply line of the breadboard. The Ground terminal of the sensor is connected to the ground line of the breadboard. The Vout terminal of the temperature sensor is connected to one of the Analog pins of the Arduino Board, A1 Now let us learn how the connections are done with the Gas sensor. This sensor has 6 pins. 3 pins of the gas sensor are directly connected to the power supply line of the breadboard. Amongst the other 3 pins of the sensor, one pin is connected to one of the Analog pins of the Arduino Board, A0. The pin in the middle is connected to the ground line of the breadboard. The third pin of the sensor is connected to a resistor and then connected to the ground line. The piezo buzzer is externally connected to the circuit. The ground pin of the buzzer is connected to the ground line of the breadboard. Another pin of the buzzer is connected to the digital pin, PIN 7 of the Arduino Board.

Lastly, the LED is connected to the Arduino directly.The cathode of the LED is connected to the GND pin of Arduino and the anode of the LED is connected through a resistor to the digital pin 13 of the Arduino

2.1 Implementation

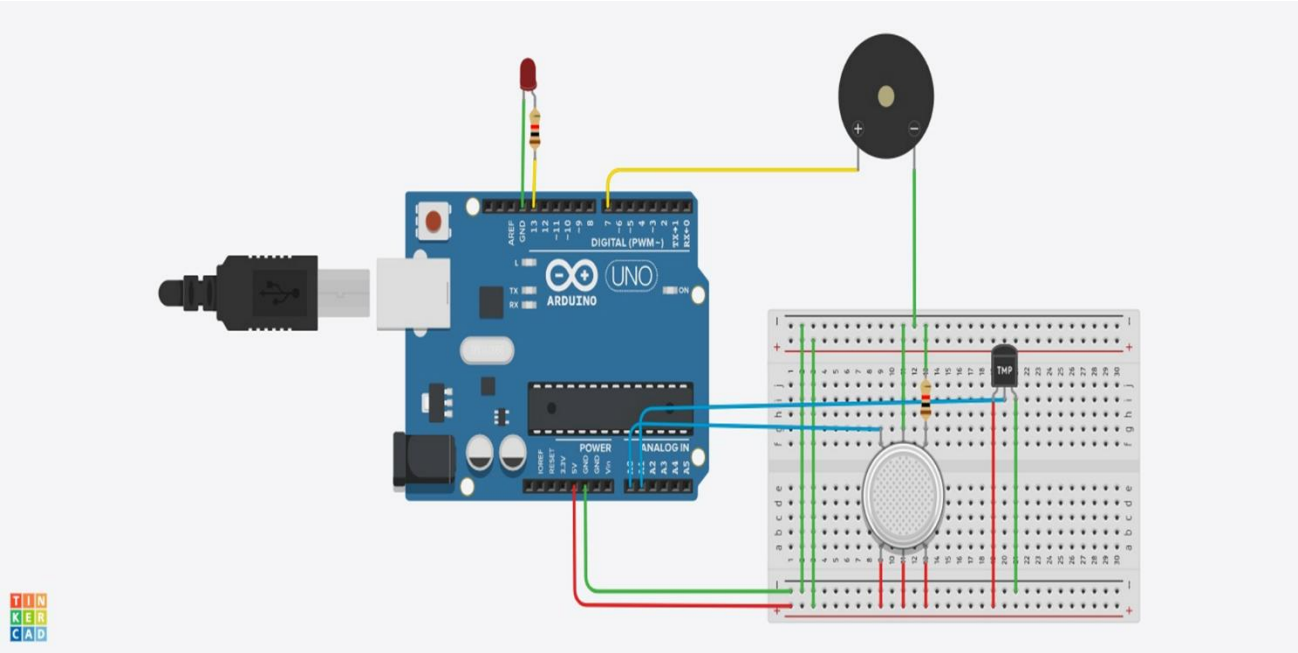

Fig 2.1 Implementation

Chapter 3

About Project and Components

About project and components used Fire Alarm System by Interfacing Arduino with Temperature & Gas Sensor using Tinker Cad.Simulation software is generally used before the circuits and devices are built. It is not only that small devices can be designed on software, complex and large circuits/devices can be simulated.

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3.1 List of components used and their information:

3.1.1 Arduino UNO Board

Arduino UNO board is a microcontroller that is used to accept inputs from sensors connected and provide an output action on the desired device connected to it. The sensor inputs can be from light-detecting sensors, motion sensors (Ultrasonic or IR), temperature sensors, etc. The output from this device can be received through other output devices such as LED, Buzzer, Serial monitor, etc**.**

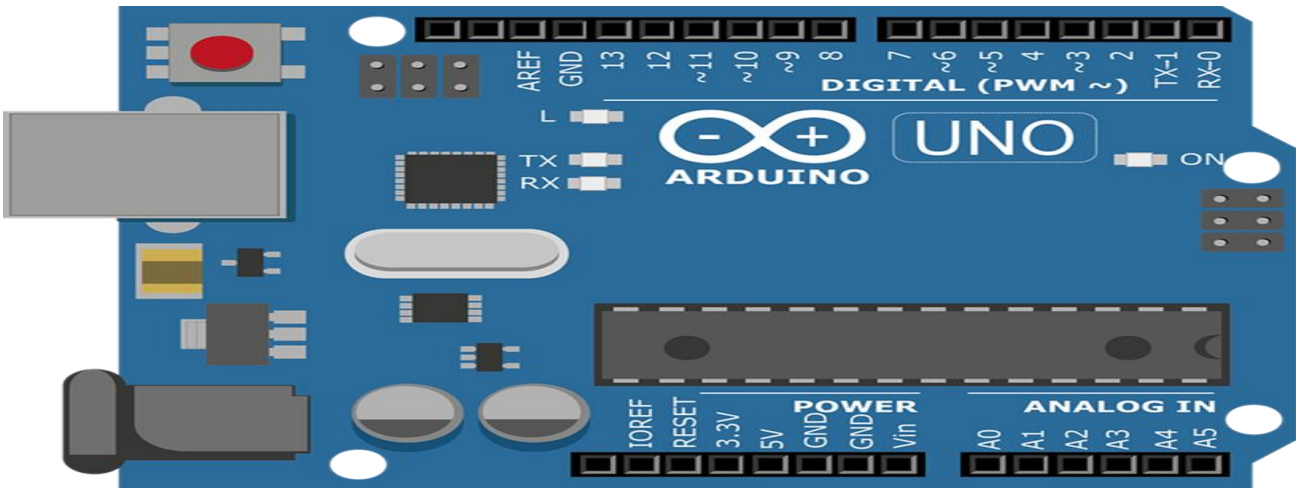

Fig 3.1.1 Arduino UNO Board

3.1.2 LM-35 Temperature Sensor

LM-35 Temperature Sensor gives an analog output based on the instantaneous temperature value.This analog output is proportional to the instantaneous input.

Fig 3.1.2 LM-35 Temperature Sensor

3.1.3. Gas sensor

The MQ2 gas sensor is used to measurethe concentration or presence of gas in theatmosphere. It is also used to detect smoke in the air. Based on the gas, a potential difference is generated by changing the resistance of the material present inside the sensor. The output is measure in termsof Voltage.

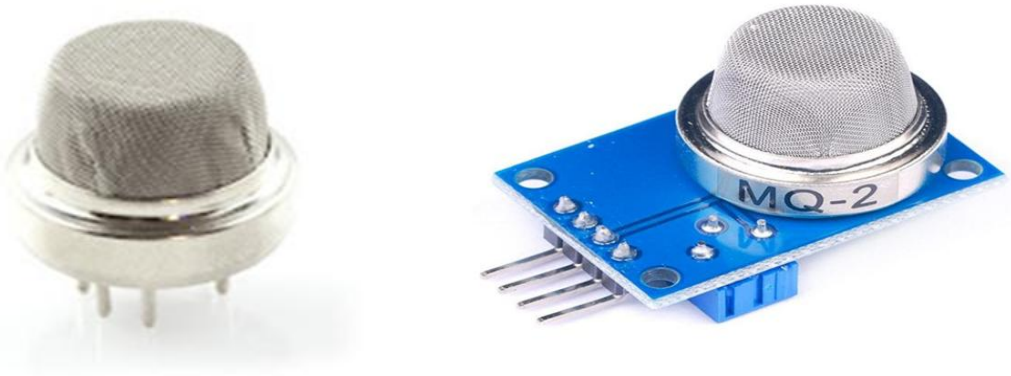

Fig 3.1.3. Gas sensor

3.1.4 Resistors

1k Ohm Resistor.Resistors are passive devices that restrict the flow of current or divide the voltage through the circuit. The input power passes through these resistors and then to the sensors to avoid damage**.**

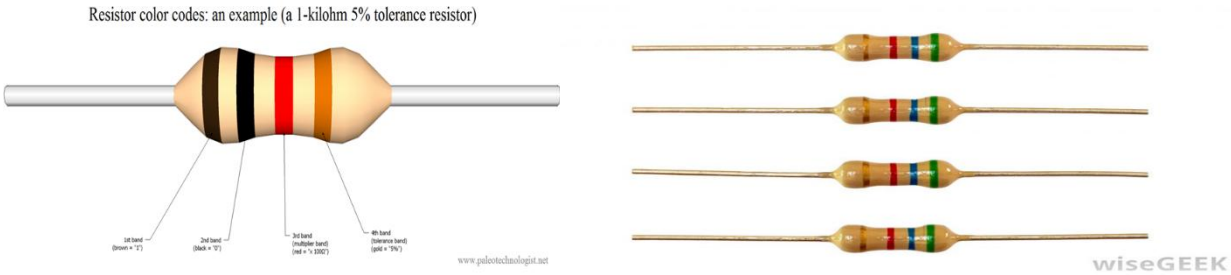

Fig 3.1.4 Resistors

3.1.5 Breadboard

The breadboard is the basic component of any circuit building process. All components, be it input sensors or output display devices are connected to the power supply, microcontroller using wired connections through a breadboard. The holes in the breadboard are in series. There are various sizes like full-sized, half-sized, and mini breadboard Led Light Emitting Diode is a commonly used light source. It is a semiconductor that emits light when current flows through it.

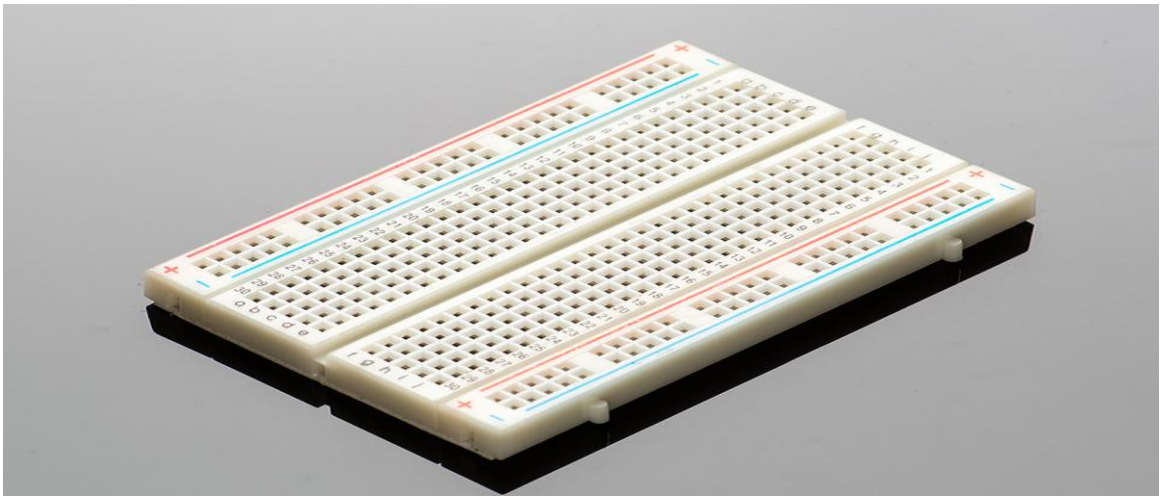

Fig 3.1.5 Breadboard

3.1.6 Piezo Buzzer

It is an electrical component that generates a beep sound on receiving an input. It works on the principle of piezo crystal Jumper Wire.These are the main components that are used to establish the connections between different devices of the circuit.

Fig 3.1.6 Piezo Buzzer

Chapter 4

Working and Implementation

Coming to the working of the circuit, we can understand it in two parts.

- Temperature sensor and its output.
- The Temperature sensor takes in input and when the temperature increases, the voltage increases, and hence the output initiates the functioning of the Buzzer.
- For every one degree increase in temperature, there is a 10mV increase in the voltage.
- A gas sensor is also used to detect smoke along with the concentration of gases.
- Based on the type of gas present in the atmosphere, a potential difference is developed by changing the Resistance of the material present inside the sensor and the same is measured as output.
- The Concentration of the gas is measured in ppm and the output analog value is needed to be converted into digital which is done by the ADC (Analog to Digital Converter) present in the sensor itself.
- Based on the condition given in the code, the LED glows or remains OFF

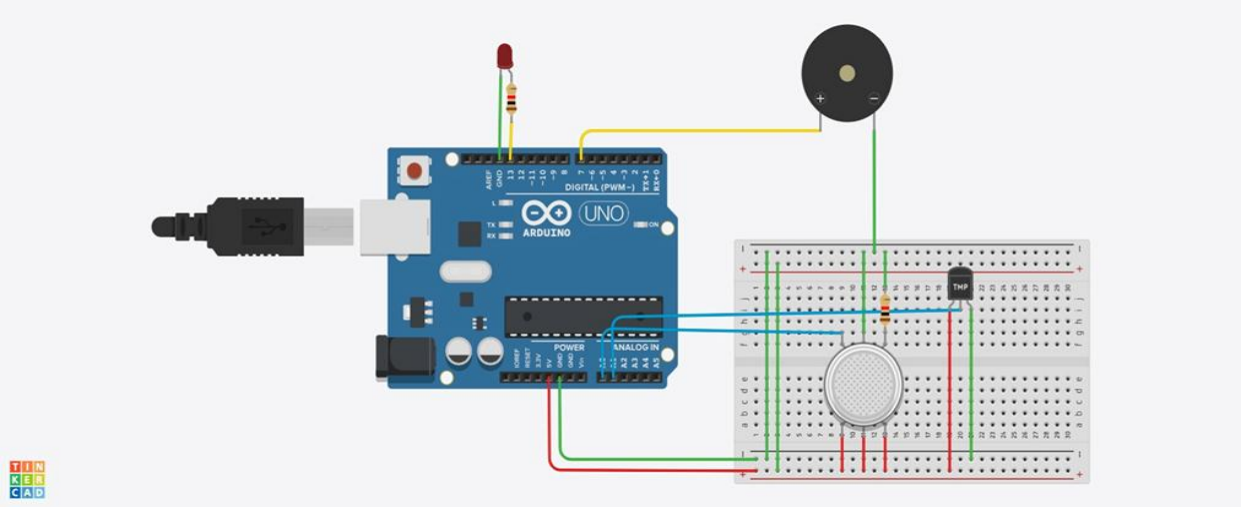

Fig 4 Working and Implementation

4.1 Code

```
// C++ code
//
float temp;
float vout;
float vout1;
int LED = 13;
int gasSensor;
int piezo = 7;
void setup() {
  pinMode(A0, INPUT);
  pinMode(A1, INPUT);
  pinMode(LED, OUTPUT);
  pinMode(piezo, OUTPUT);
  Serial.begin(9600);
}
void loop() {
  vout = analogRead(A1);
  vout1 = (vout / 1023) * 5000;
  temp = (vout1 - 500) / 10;
  gasSensor = analogRead(A0);
  if (temp >= 80) {
    digitalWrite(LED, HIGH);
  } else {
    digitalWrite(LED, LOW);
  }
  if (gasSensor >= 100) {
    digitalWrite(piezo, HIGH);
  } else {
    digitalWrite(piezo, LOW);
  }
  Serial.print("in DegreeC= ");
  Serial.print(" ");
  Serial.print(temp);
  Serial.print("\t");
  Serial.print("GasSensor= ");
  Serial.print(" ");
  Serial.print(gasSensor);
  Serial.println();
  delay(1000);
}
```

Chapter 5

Conclusion

As the fire system is alerting user about fire as per the concentration of smoke and temperature that is configured, the alarm system is working properly.

In conclusion, this project would be of great importance in warehouses of different products where it is very likely to catch fire. This project is mainly focused on fire security system in places away from the locals in which case it won't be alerted to the firemen and fire station in case of a huge warehouse fire. Most warehouses are located away from the local vicinities, which would make it difficult for the warehouse owner to know about the fire but due to the IoT based Fire Security System, the owner would be directly notified in case of a fire or a fire threat.

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