FIRE ALARM - A SAFETY DEVICE (THERMISTOR-TEMPERATURE SENSOR)

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ABSTRACT

Fire alarms area unit a very important device these days once smoke, fire ,carbon monoxide or alternative fire-related emergencies area unit detected by providing a prompt warning if a fireplace happens. The first reason to put in a fireplace alarm is to form the building, societies, malls, faculties and hotels/restaurants safe for the tenants. It works on the detection of fireside by sensing temperature employing a thermostat. As presently as a fireplace is detected the circuit becomes active with alert (sound) thereby giving associate degree audio alarm and at the same time activating the hearth termination system. They will conjointly finish off electrical, air handling instrumentation, or special method operations, and that they is also accustomed initiate associate degree automatic suppression system.

Keywords: Fire Alarm, Literature, Implementation, Results, Future Work.

I.   INTRODUCTION

A key side hearth of hearthside of fireplace protection is to spot a developing fire rising during a temporal arrangement manner and to alert the building's occupants and fire emergency organizations. this is often the role of fireside detection and alarm systems. Reckoning on the anticipated hearth situation, building and use sort, number, and sort of occupants and criticality of contents and missions, these systems will offer many main functions. First, they supply a method to spot a developing hearth through either manual or automatic ways and second, they alert building occupants to a fireplace condition and also the have to be compelled to evacuate. Another common perform is that the transmission of associate alarm notification signal to the fireplace department or alternative emergency response organizations. They'll additionally clean up electrical, air handling instrumentation, or special method operations and that they could also be wont to initiate automatic suppression systems.

Figure 1: Fire Alarm

Temperature sensors are among the foremost usually used sensors. Every type of apparatus use temperature sensors starting from computers, cars, room appliances, air conditioners, and residential thermostats. The 5 commonest styles of temperature sensors embody:

- Thermistor
- Thermocouple
- RTDs (Resistive Temperature Detectors)
- Arduino
- Piezo

A measuring system is that the most elementary style of a temperature meter that's accustomed verify the degree of hotness or coolness. Temperature sensors square measure out there in numerous sorts, shapes, and sizes. The 2 main kinds of temperature sensors square measure:

➢ Contact sort Temperature Sensors: There square measure many temperature meters that measure the temperature by being in direct contact with it. Such temperature sensors fall into the class of contact- sort. They'll be accustomed sight solids, liquids, or gases over a large vary of temperatures.

➢ Non- Contact Type Temperature Sensors: These sorts of temperature meters aren't in direct contact with the item rather they live the temperature through the radiation emitted by the warmth supply. Among the contact sort area unit thermocouples and thermistors.

II. LITERATURE REVIEW

1. Qian Ding, Zhenghong Peng, Tianzhen Liu and Qiaohui Tong

Multi-Sensor Building Fire Alarm System with Information Fusion Technology Based on D-S Evidence Theory (Published: 14 October 2014)

Multi-sensor and knowledge fusion technology supported Dempster-Shafer proof theory is applied within the system of a building hearth alarm to appreciate early detective work and horrific. By employing a multi-sensor to watch the parameters of the hearth method, like lightweight, smoke, temperature, gas and wetness, the vary of fireside watching in house and time is expanded compared with a single-sensor system. Then, the D-S proof theory is applied to fuse the data from the multi-sensor with the precise hearth model, and also the hearth alarm is a lot of correct and timely. The projected methodology will avoid the failure of the watching information effectively, manage the conflicting proof from the multi-sensor robustly and improve the responsibleness of fireside warning considerably.

2. Gong Hasson, Lecturer (Associate Professor), Master of Engineering Science, Kyungil University, Republic of Korea ,South Korea

Counter Measure For Minimize Unwanted Alarm Of Automatic Fire Notification System (01 Jan 2015)

Investigated the explanation for error through survey to putting together officers for minimizing the unwanted alarm of automatic hearth notification and instructed step for minimizing the unwanted alarm. The most explanation for the unwanted alarm is flawed hearth detector, interlocking with automatic hearth detection system, lack in hearth safety wardens ability, worn-out hearth sight receiver. The step for minimizing unwanted alarm is foremost, adjustment up the quality of model approval, Secondly, interlocking with crosswise circuit technique hearth quenching system or realizing automatic hearth notification system interlocking with home network, thirdly, adjustment up licensing examination of fireside safety law officer, lastly, it instructed term of use rule of fireside sight receiver.

3. Rishika Yadav, Poonam Rani, Department of Computer Science & Engineering, Graphic Era Hill University, Dehradun, India

Sensor Based Smart Fire Detection and Fire Alarm System (3 Nov 2020)

The use of various IoT devices for home automation has become extremely popular in recent years. Fire detection and shunning of fireside accidents is one in every of the mandatory and vital application of home automation victimisation IoT. Ancient fire device needs Brobdingnagian installation price and labour. The planned IOT based mostly hearth device primarily detects hearth at associate early stage, generates associate automatic alarm and inform the remote user or preparation station concerning the hearth natural event. This conjointly tries to extinguish the hearth. the utilization of Arduino is planned to sense the environment for prevalence of fireside with the assistance of fireside and gas detector. the event of home hearth alert system is constructed supported Arduino board. the hearth is detected at associate early stage and therefore the system generates associate alarm and sends SMS or decision alerts to mobile numbers keep within the Arduino program, via the GSM module. At the same time, a water sprayer manufacturing device is switched on for the management of fireside. This example system will facilitate users to boost their safety standards with immediate response by preventing accidents. This may eventually permit each the lives and therefore the properties from the disaster. The functions of every module and its implementation is delineated intimately.

III. CONSTRUCTION

This fire alarm circuit is built with Arduino. A thermistor is used as a heat sensor. When the temperature increases the resistance of the thermistor drops to the tune of 1K at 70 degrees Celsius. It consists of three

transistors and the preset. This makes allow resistance path for the transistors to conduct the current flow to the speaker. This sets the alarm sound.

➢ **Circuit Elements:**

1. THERMISTOR (10k)

A thermistor is a type of resistor whose resistance is dependent on temperature more than in standard resistors. The word is a portmanteau of thermal and resistor.

Thermistors are available in two types:

-> PTC (Positive Temperature Coefficient)

-> NTC(Negative Temperature Coefficient)

The resistance of a PTC thermistor increases as the temperature increases. In contrast, the resistance of an NTC thermistor decreases as the temperature increases , and this seems to be the most commonly used thermistor.

Figure 2: Thermistor

2. Transistor (BC 547)

A transistor is a semiconductor gadget which is utilized to intensify or switch electronic signs and electrical force. It is made out of semiconductor material generally with no less than three terminals for association with an outer circuit. A voltage or current applied to one sets of the semiconductor's terminals changes the current through another pair of terminals. In light of the controlled (yield) power, a semiconductor can enhance a sign. Today, a few semiconductors are bundled exclusively, however a lot more are discovered installed in coordinated circuits.
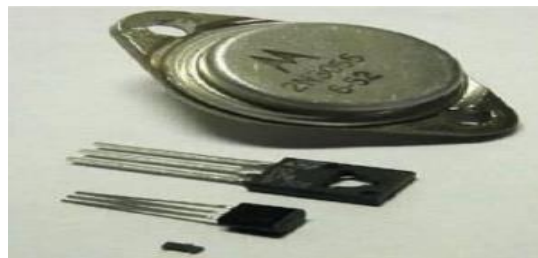

Figure 3: Transistor

3. Arduino

Arduino is an open-source equipment and programming organization, venture and client local area that plans and makes single-board microcontrollers and microcontroller packs for building computerized gadgets. Its equipment items are authorized under a CC-BY-SA permit, while programming is authorized under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), allowing the assembling of Arduino sheets and programming circulation by anybody. Arduino sheets are accessible economically from the authority site or through approved merchants.

Figure 4: Arduino

4. Piezo

Certain crystals like Barium titanate, Quartz, Lithium tantalite, etc. have the property of producing electricity on applying a force or pressure over them under specific arrangement. Also, they can work in inverse by transforming the electrical signal applied across them into vibrations. Hence, they are used as transducers in many applications. They are called as piezoelectric materials. Hence, a Piezoelectric Transducer produces voltage when applying a force over them and vice versa. It is a material which generate electricity on increasing temperature.

IV.   WORKING

Principle- A fire alarm works on the principle of detecting the fire leakage or fire accident, this detecting of fire is done with the help of a thermistor.

➢ We have build this fire alarm circuit using Arduino, a thermistor (used as a heat sensor) and transistor (which is used to drive the circuit).

➢ Resistance of the thermistor is high (over10k).When the temperature increases, the resistance of the thermistor drops to the tune of 1k at 70 ^{0}C.

➢ This turns off the transistor and turns on the IC and switches on the alarm.

➢ The timer IC used in the circuit works as an a stable multivibrator oscillator which is used to oscillate in audio frequency band. As stated earlier, timer IC is driven by two transistors . The frequency of IC depends upon the value of resistors R4 and R3.

➢ The loud speaker which is used for fire alarm is connected to the transistor Q2 which is then connected to the pin number 3 of IC.

➢ When temperature of the thermistor increases it causes a low resistance path for a current flowing towards the base of the transistor. For this type of fire alarm circuit we can use a low power supply of 3V to 12V.

➢ The circuit consists of a 10k ohm thermistor this is NTC (negative temperature coefficient) thermistor, which decreases its resistance in the temperature , at room temperatureithasaresistanceof10Kohm. Another resistance is connected to the thermistor to form voltage divider circuit and this is connected to the transistor through a diode.

➢ Speaker turns on only when the transistor is grounded and when the temperature increases .

Power Supply:

A well-regulated power supply is necessary for this circuit because even slight changes in the supply voltage could alter the biasing of the transistor used in the fire sensing section and this could seriously affect the circuit's performance.
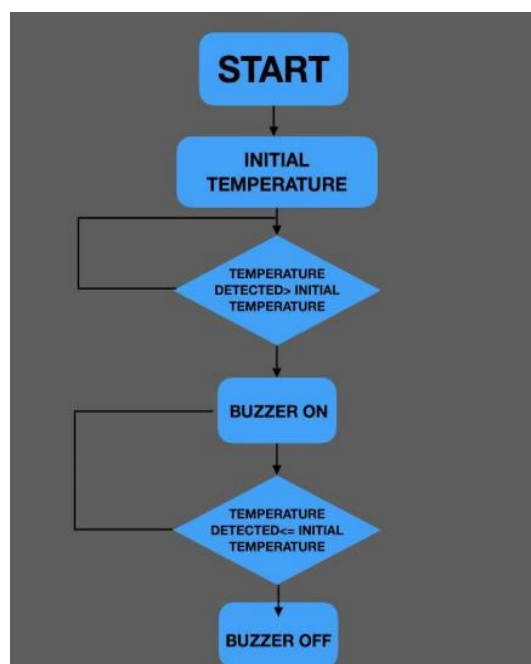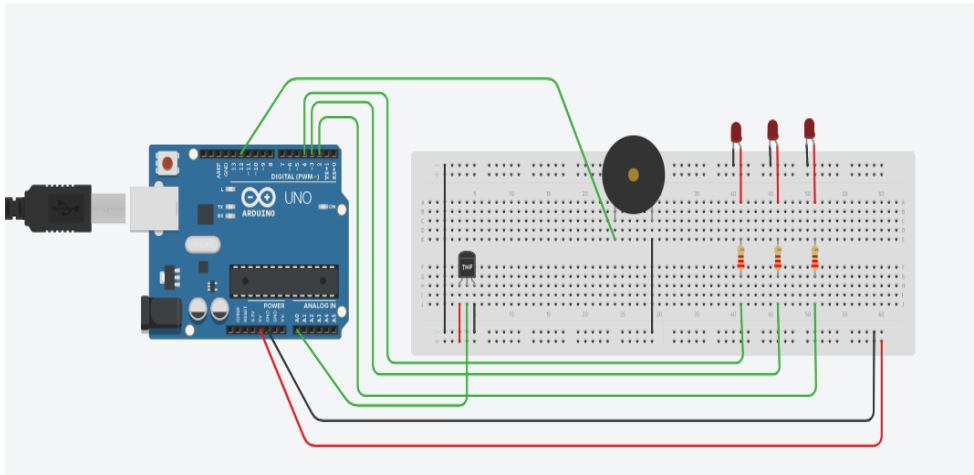

Figure 5: Flow Chart

Figure 6: Circuit Diagram

V.   RESULT

Follow this link to see the simulation of our project:-

Circuit Design Simple Fire Alarm System

OR

https://www.tinkercad.com/things/emc3qpYWO0i

In this we have used a key in place of thermistor, in this closing a key signifies increase in temperature and decrease in resistance hence giving shortest low resistance path to the speaker. When the temperature is increased the circuit successfully worked and responded as explained in working.

VI.   CONCLUSION

This small size fire alarm system is used to sense the presence of fire, smoke, or other types of aerosols. It also helps to warn people from danger and we can prevent the accident by its alert sound. We can also use this sort of fire alarm in houses, buildings, industries, and other important places to avoid serious fire accidents.

FUTURE SCOPE

1. We implemented a fire alarm, but we want to install a thief detection system to prevent stealing and to inform authorities and the rescue team as soon as a threat gets detected.

2. To make the circuit less complex and expensive.

3. Minimising the transistor for easy installation.

4. We can implement multi-sensors that can detect smoke, gas, etc. which can alert us a little earlier than the heat sensor.

5. To protect our homes, offices, Universities, industries, etc. automatically without any person when a fire occurs.

ACKNOWLEDGEMENTS

VII.   REFERENCES

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