FIRE DETECTION SYSTEM

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ABSTRACT

Fire is one of the most dangerous forms of accidents that can cause many damages in the workplace. In extreme conditions, it can lead to loss of lives. It can turn millions of investments into ashes within a very short period. Due to the dangerous nature of fire accidents, its prevention needs utmost urgency. In many cases, fire hazards have been witnessed in workplaces that do not have strategies in place to handle fire breakouts.

To achieve the purpose of controlling these accidents, we studied the main standards on fire detection systems. For the practical part, Arduino nano was used as the control unit with other necessary components. Upon completing this project, it demonstrated how a fire detection and alarm system works and analyzed.

Keywords- Fire hazard, fire detection, accidents and Arduino nano.

INTRODUCTION

In our modern life, fire protection has become a top concern, because there are always fire hazards around us that can cause a great loss of property and human life. Therefore, having a fire detection system played an important role, which helped prevent and handle in time the fire when it occurred. Fire detection systems (FDS) are all structured and introduced with the same fundamental target in mind: to discover a fire; effective alarm and provide information to the inhabitants; warn and give information to first responders. How these objectives are satisfied depends on the particular situations – and also, the standard of the area of the world under consideration.

Having the system installed helps alert people possible fire, give them early warnings; automatically call the emergency services and contacts, minimize the time it takes for the fire department to come; lower the risks of false fire alarm; in the event of fault, it can tell the exact problem and can also have reduced fire damage.

Fire detection system is a simple circuit that detects the fire and activates the LED or buzzer. This device is very important to detect fire at the right time and prevent any damage to people or property. Fire detection

system is a part of a security system which helps in detecting or preventing damage. Installing this system in commercial buildings like offices, movie theaters, shopping malls and other public places is compulsory. It is composed of alarm initiating devices (smoke detectors and heat sensors), alarm notification appliances (buzzer or devices that produce loud noises), power supplies and wirings. These sensors are set to detect certain levels of heat or smoke that could be an indication of fire. A loud bell or a siren sometimes accompanied by blinking or flashing lights for individuals whohave hearing problems. There are many expensive and sophisticated fire alarm circuits in the form of stand alone devices but we have designed a fire detection system using common components like arduino nano, breadboard, flame sensor etc.

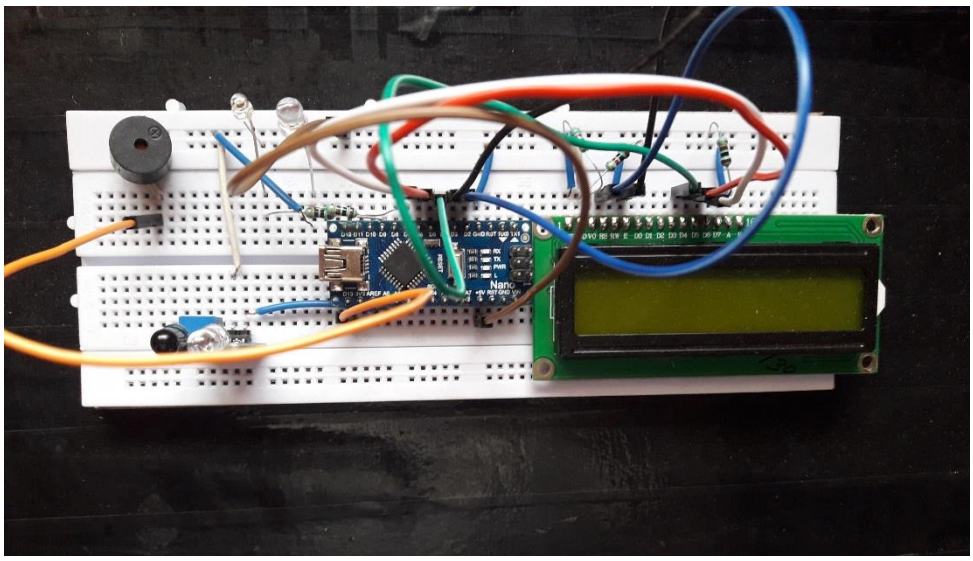

Fig.(1)- Project image

METHODOLOGY

In this system, we interface the flame sensor with arduino nano. The sensor basically detects IR(Infra Red) light wavelength between 760nm- 1100nm that is emitted from the fire flame. Most of the flame sensors came with the YG1006 sensor which is a high speed and high sensitive NPN silicon phototransistor.

The way this system detects a fire is through its initiating devices such as heat or flame detectors. Heat detectors are programmed to signal the alarm panel when a certain temperature is reached in its vicinity. This temperature is typically quite high, so it accurately senses a fire and does not send a false alarm in instances like a room being kept at a high temperature during the winter months.

The fire alarm is connected to the system's initiating devices through either 2- or 4-wire circuits. This circuitry allows the control panel to monitor the state of its initiating devices, identifying whether the devices are in normal or alarm mode. The control panel shows these readings on its display panel.

When a fire starts, the smoke or heat will activate one of the initiating devices, or someone will activate the manual pull station, alerting the fire alarm system to the fire and putting it in alarm mode. So this system is designed to alert us to an emergency so that we can take action to protect ourselves, staff and the general public.

This system will ensure early warning to allow emergency responses to occur well before a fire causes serious damage. It is not uncommon for modern types of systems to detect smoldering cables or overheating circuit boards. Early detection can save lives and help limit damage and downtime.

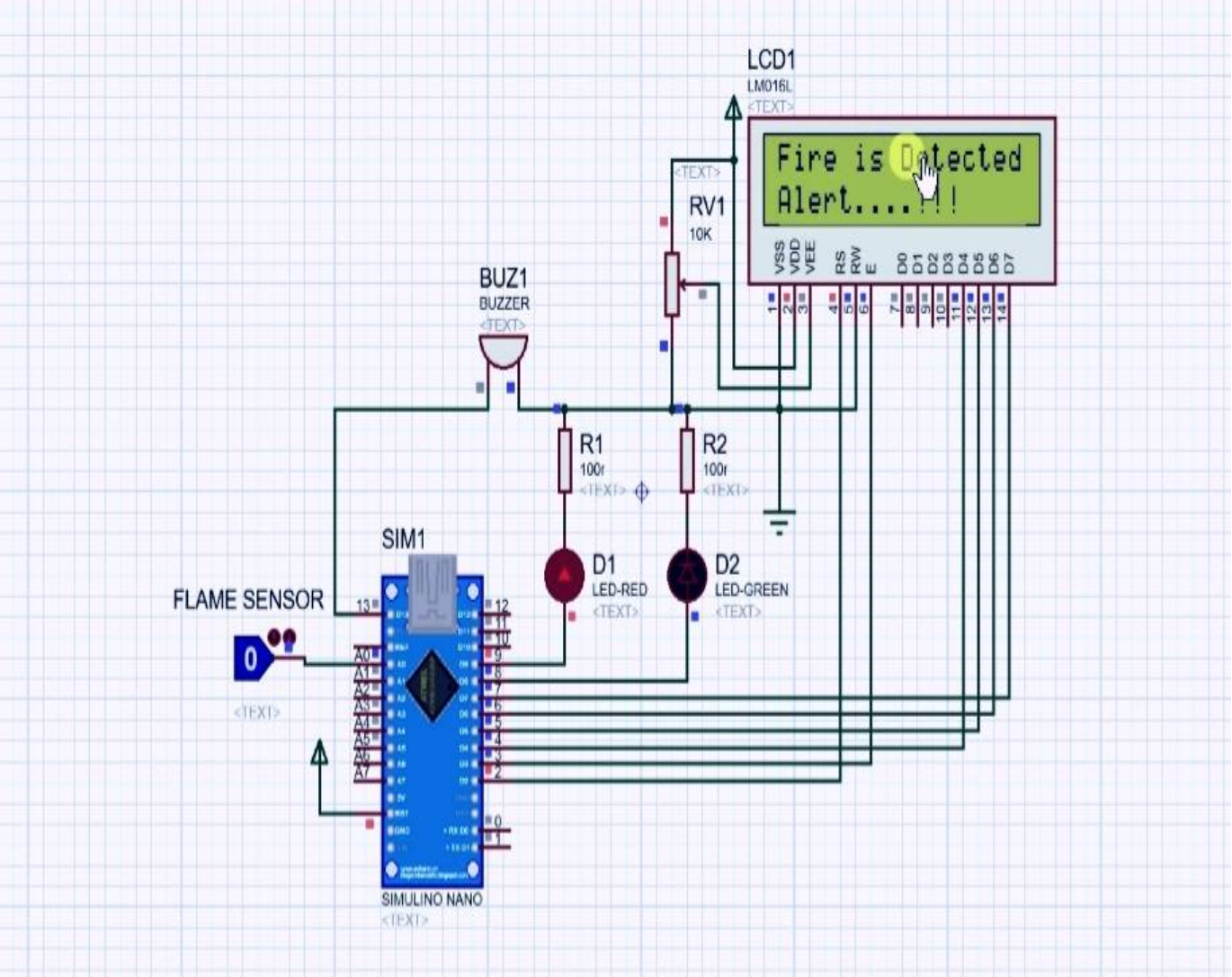

Fig.(2)- Circuit diagram of fire detection system

RESULT AND DISCUSSION

By detecting a fire quickly and accurately (i.e, by not sacrificing speed and causing false alarm) and providing early warning notification, a fire detection system can limit the emission of toxic products created by combustion, as well as global warming gases produced by fire itself. These environmental effects are often overlooked, but undoubtedly occur in all fire scenarios. Therefore, reducing the likelihood of fire is an important part of designing this system.

The main objective of this project has been to detect high temperature and send signal to the alarm system. It is designed with the use of flame sensor and arduino nano as main components for efficient results. This system works together to detect, contain, control and detect fire in its early stages and help people and environment.

CONCLUSION

Designing and implementing the system that we have undertaken is not going to be an easy task. We have cost and power efficiency in our mind while coming up with the idea for the device. The developed device consists of different components which are intended to work according to the goals of the device in the resource constraint environment. Keeping these points in mind, we have constructed a smart smoke detection system that is both inexpensive and resource efficient.

Results are displayed on the serial window. Here based on our room condition the threshold value we took was 100 for the flame sensor. When we place a flame near the flame sensor arduino automatically turns on the LED and buzzer. And when we remove the flame arduino automatically turns off the LED and buzzer. These detectors are supposed to alert people if there is a danger of fire and they are required in public places, especially one where fire accidents are more likely to happen such as kitchen and restaurant. So this fire detection system is very useful for such places as it is easy to make and cheaper compared to other detection systems.

REFERENCE

Mariani, Michael (April 8, 2020). "The Components Of A Commercial Fire Alarm System". Commercial Fire And Communications.

Chenebert, A.; Breckon, T.P.; Gaszczak, A. (September 2011). "A Non-temporal Texture Driven Approach to Real-time Fire Detection". Proc. International Conference on Image Processing (PDF). IEEE. pp. 1781–1784.doi:10.1109/ICIP.2011.6115796.

hdl:1826/7588. ISBN

978-1-4577-1303-3. S2CID 11394788. Retrieved 8 April 2013.

Dunnings, A.; Breckon, T.P. (2018). "Experimentally Defined Convolutional Neural Network Architecture Variants for Non-temporal Real-time Fire Detection". Proc. International Conference on Image Processing (PDF). IEEE. Retrieved 9 August 2018.

National Fire Protection Association (February 2001). "Chapter 3 Fundamental Fire Protection Program and Design Elements". NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants. National Fire Protection Association. standard: Gaseous Fire Suppression Systems 3.10.7.

National Fire Protection Association (2011). "Chapter 4 Annex A". NFPA 12 Standard on

Carbon DioxideExtinguishingSystems. NationalFire Protection Association.
standard:

A.4.5.6.2.2.

Cote, Arthur E. (March 2000). Fire Protection Handbook eighteenth edition. National Fire Protection Association. pp. 5–8. ISBN 0-87765-377-1.

NFPA 72 – National Fire Alarm and Signaling Code – 2010 Edition. National Fire Alarm

Association, 2009, Page 118, Subsection 24.4.1

"Fire Door Holders - Geofire". Geofire. Retrieved 21 March 2018.

"Fire Industry Association Fact File 0058". the Fire Industry Association ("FIA"). Archived from the original on 2015-02-20. Retrieved 2015-02-20.