International Journal On Engineering Technology and Sciences – IJETS™
ISSN(P):2349-3968,ISSN(O):2349-3976
Volume X, Issue IX, September - 2023

# FRAMEWORK FOR IDENTIFYING SMOKE IN BUILDINGS

[1]S. ARAVINTH, [2]N. ALLEN DAVID SELWIN, [3]S. SIVARAMAKRISHNAN, R.
[4]JEBARCHEL RAJIN ISRAEL, [5] Dr. R. RAVI
[1,2,4,5]Computer Science and Engineering, [3] Electrical and Electronics Engineering, [1,2,3,4,5] Francis Xavier Engineering College, Tirunelveli.

**Abstract—** *RF technology integration with smoke detector circuits is the goal of this paper. In the suggested system, when a smoke detector detects smoke, it triggers its alarm and transmits a low voltage signal to every other smoke detector nearby. The other smoke detectors make a tone to notify nearby occupants that one of the detectors has detected smoke after being activated by this low voltage signal. This technology does away with the necessity for a base because the transmitter and receiver are integrated into one unit. Each smoke detector is outfitted with all the electronics necessary to transmit and receive signals. Since they run on batteries, there is no need for any external connections.*

***Keywords****: Fire detector, smoke detector alarm, Arduino, and MQ2 Smoke sensor*.

## I. INTRODUCTION

Smoke detectors have reportedly been evaluated as an essential part of active fire detection strategies in contemporary business and residential buildings. Industries saw a rise in the use of smoke detectors in the 1970s, and this increase was Several noteworthy research initiatives that emphasized the life safety protection offered by smoke detectors were also conducted, providing important justification for the increased use of smoke detectors. Moreover, in order to comprehend the reply Several studies were done to determine the environmental working theory of these detectors. embarked. A very important method of evaluating smoke detector performance is accurate prediction due to the possibility of inhabitants and fire service notice, detector system performance depending on the output of the smoke detector. Software called Fire Dynamic Simulator is available. to anticipate the smoke detector's reaction. According to a citation, "fire loss data suggests 96% of fires were controlled and put out in buildings with mechanical sprinklers, according to these programs"[1]. The fire detection system activates the alert when a fire occurs, consequently setting off the automatic

Several noteworthy research initiatives that emphasized the life safety protection offered by smoke detectors were also conducted, providing important justification for the increased use of smoke detectors. Moreover, in order to comprehend the reply Several studies were done to determine the environmental working theory of these detectors. embarked. A very important method of evaluating smoke detector performance is accurate prediction. due to the possibility of inhabitants and fire service notice, detector system performance depending on the output of the smoke detector[2] Software called Fire Dynamic Simulator is available.

### Smoke identification

A smoke detector is a gadget that detects smoke, usually as a sign of a fire or a no-smoking area. Different smoke detection methods have been created to guarantee human safety and protect property from fire in both household and commercial settings.

1. The ionization chamber-prepared smoke alarm
2. The smoke detector using photoelectric technology

The photoelectric smoke detector looks for smoke using an optical beam. A photoelectric cell detects the loss of light intensity when smoke particles block the beam and raises a warning. The smoldering fires that produce relatively big amounts of smoke are what this sort of smoke detector responds to most quickly. The ionization chamber smoke detector, on the other hand, detects blazing flames that emit little smoke more quickly. It uses a radioactive substance to ionize the air in a sensor chamber; when smoke is present, this alters the flow of ions between two electrodes, setting off the alarm[3].

In a typical system, radioactive material releases alpha particles that remove electrons from the molecules of the air, resulting in the creation of positive oxygen and nitrogen ions. In order to create the negative oxygen and nitrogen ions, the electrons attach themselves to additional air molecules.

### 1. The smoke alert with an ionization chamber

Ionization of the air and the ensuing decrease in current allow an ionization smoke detector to detect smoke and fire.

In both the sealed reference chamber and the open ionization chamber, americium-241 emits ionizing radiation in the form of alpha particles. Ionization occurs to the air molecules inside the chamber. After ionization, the air contains positive ions and free electrons. While positive ions are drawn to the battery's negative terminal, electrons are drawn to the positive terminal. The assembly generates an electric current as a result.

A fire's smoke will enter the chamber and interact with the ions to neutralize them, lowering the current flowing through the circuit. The instrument notices this drop in current, and an alert is set off as a result. In general, ionization smoke detectors cost less to make than photoelectric smoke detectors. But their sensitivity is the issue; they are overly sensitive to smoking. They are frequently turned down owing of their propensity for false alarms brought on by cooking or other common household activities.

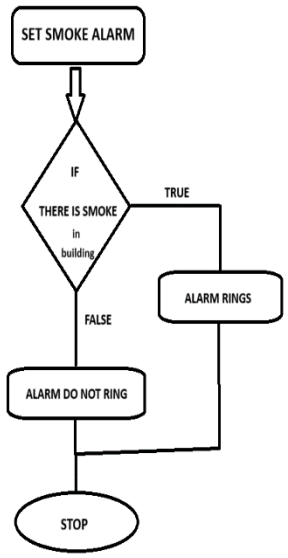
### 2. The photoelectric innovation based smoke alarm

A light sensor is a photoelectric smoke detector, commonly referred to as a light detector. A common light sensor consists of the following parts: an optical chamber, a cover, a case molding, a photodiode, and an infrared LED. With the use of a lens, LED light is transformed into a beam. The photodiode receives this light and continuously detects it after that. The light beam hitting the photodiode is disrupted when smoke rises from a fire or other causes. This disturbance in light is recognized as a symptom of fire and activates the alarm.

As per the Public Fire Security Affiliation (NFPA), "photoelectric smoke discovery is for the most part more receptive to flames that start with a significant stretch of seething" (likewise alluded to as seething flames). Research from Texas A&M and the NFPA is likewise refered to by the Californian city of Palo Alto, which states: " Lab and handle testing have demonstrated that photoelectric smoke alerts give sufficient notification to a wide range of flames and have demonstrated to be essentially less inclined to be deactivated by occupants.

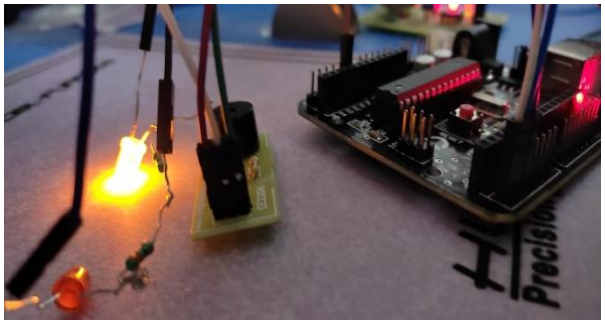
1) Carbon Monoxide and Carbon Dioxide Detection - utilized to identify smoke or combustion based on carbon monoxide or carbon dioxide levels in the atmosphere.
2) An aspirating or air sampling detector examines the sampled air to look for combustion components.
3) Video Smoke Detection - based on video feedback of the area, detects smoke. The use of numerous strategies makes this volume-based detection, as opposed to point-based detection, more efficient.
4) Optical Beam Detectors: The principle of light obscuration is typically used to detect smoke. The dense smoke blocks an LED's light and alerts the alarm system that there is a fire by signaling that there is a fire.

**Flowchart**




**How a smoke alarm capabilities:**

In case of dense smoke, A smoke detector working at tandem with oscillator is needed for this purpose. Here photon coupled interrupter module work as smoke detector while NE555 timer working as oscillator generates loud alarm sound. The fundamental purpose of this circuit is to sound the alarm in the event of heavy smoke. This requires an oscillator and a smoke detector



operating together. Here, a NE555 timer acting as an oscillator produces a loud alarm sound, and a photon coupled interrupter module serves as a smoke detector.

The resistor R1 and/or setting VR1 give the current channel to light up the internal led when the photo transistor is functioning normally. This emits photons that keep the
photo transistor in the saturation region and cause its collector and reset input (pin 4) of the IC to be drawn towards ground. An IC 555 timer's reset pin is low when it resets the timer repeatedly without producing any outputs.

Consider the following second scenario: Smoke accumulates in the photo interrupter's slot when a room is filled with it, blocking the path of the light rays from the led to the photo transistor.. Due to the reverse biasing of the photo transistor base, which causes it to switch off, the collector and reset pin of the integrated circuit are kept high by the resistor R2.Smoke thereby disables the timer's reset feature[4]. An IC in astable mode produced a square wave output at pin number 3.. The frequency of this wave should be between 2 Hz and 20Hz and it depends on the values of R3, R4, and C1, with 380 Hz being the value given in the circuit.C3 successfully transmits the output to the speaker provides protection from erroneous triggering.

Think about the following second scenario: The photo interrupter's smoke-filled slit blocks the light rays from the led to the photo when the room is full with smoke.
reverse bias in the transistor base of a photo transistor it to shut off, and as a result, the IC's reset pin and collector are kept elevated by resistor R2.hence, the timer's reset condition is smoke disables. At pin number 3, an IC in astable mode produced a square wave output. the frequency of this wave should be between 2Hz and 20KHz, and its depending on R3, R4, and C1 values for the value given in its 380 Hz circuit.C3 successfully transmits the output to a speaker producing sound from an electrical signal at pin C2.

Ionization detectors come first. These use a little amount of carefully contained radioactive material to ionize the air molecules between two metal plates. This results in a tiny electric current moving through the air from one plate to the other. Particles that enter the chamber draw ions to them and take them out, which lowers the current.

## Conclusion

It is best to have smoke detectors in every bedroom, every hallway, and on every story of our home when it comes to fire protection. With so many smoke detectors, we can be sure that our house is secure against the unimaginable. One of the simplest and least expensive is a smoke detector. Because it is the most effective and works well to protect, the majority of industries utilize it.Since smoke is a precursor to fire, this system can be very useful in home and industrial settings to detect smoke and warn people of an imminent fire rather than depending on heat/temperature sensors that sound the alarm when the fire has already begun. This can significantly contribute to saving lives.

## REFERENCES

[1] Mohsen, H., El-Dahshan, E.S.A., El-Horbaty, E.S.M. and Salem, A.B.M., (2018) ,"Classification using deep learning neural networks for brain tumors", Future Computing and Informatics Journal, Vol 3, pp.68-71.
[2] Badisa, H., Polireddy, M. and Mohammed, A., (2019), "CNN Based Brain Tumor Detection", International Journal of Engineering and Advanced Technology (IJEAT), Vol 8, pp.1731-1734.
[3] Kurade, Mrunal, Nikita Nakil, Shreya Pai, Vidya Ringane, and P. K. Akulwar International Journal for Research in Applied Science & Engineering Technology (IJRASET), Vol. 8, pp. 700-707.
[4] Hameurlaine, M. and Moussaoui, A., (2019), "Survey of Brain Tumor Segmentation Techniques on Magnetic Resonance Imaging",Nano Biomed. Eng, Vol 11, pp.178-191.
[5] Jeevanantham, V., G. Mohan Babu, M. Krishna Prabha, A. Maria Vimala, and M. Sangeetha. (2020), "A Survey of Computer-aided diagnosis of MRI-Based Brain Tumor Detection and Classification " ,Vol. 16, pp. 50-57.
[6] Hunnur, M.S.S., Raut, A. and Kulkarni, S.,( 2017), July. In 2017 International Conference on Computing Methodologies and Communication (ICCMC) ,IEEE,pp. 717-722.
[7] Archa, S.P. and Kumar, C.S., (2018), "Segmentation of Brain Tumor in MRI Images Using CNN with Edge Detection," International Conference on Emerging Trends and Innovations in Engineering and Technological Research (ICETIETR), IEEE, pp. 1-4.
[8] Sajjad, M., Khan, S., Muhammad, K., Wu, W., Ullah, A. and Baik, S.W., (2019) "Multi-grade brain tumor classification using deep CNNwith extensive data augmentation", Journal of computational science, 30,

pp.174-18.

[9] Gawande, S.S. and Mendre, V., (2017), " Brain tumor diagnosis using image processing: A survey ", 2nd IEEE International Conference on Recent Trends in Electronics, Information Communication Technology (RTEICT) , IEEE ,pp. 466-470.

[10] Sergaki, E., Spiliotis, G., Vardiambasis, I.O., Kapetanakis, T., Krasoudakis, A., Giakos, G.C., Zervakis, M. and Polydorou, A., (2018), "Application of ANN and ANFIS for detection of brain tumors in MRIs by using DWT and GLCM texture analysis", IEEE International Conference on Imaging Systems and Techniques (IST) , pp. 1-6.

[11] eddy, D., Bhavana, V. and Krishnappa, H.K., (2018) "Brain Tumor Detection Using Image Segmentation Techniques" International Conference on Communication and Signal Processing (ICCSP), pp. 0018-0022.

[12] Abdalla, H.E.M. and Esmail, M.Y., (2018), "Brain Tumor Detection by using Artificial Neural Network", International Conference on Computer, Control, Electrical, and Electronics Engineering (ICCCEEE), pp. 1-6.

[13] Amarapur, B., (2017),"An Automated Approach for Brain Tumor Identification using ANN Classifier", International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC), pp. 1011-1016.
.

[14] Vinoth, R. and Venkatesh, C., (2018), "Segmentation and Detection of Tumor in MRI images Using CNN and SVM Classification", Conference on Emerging Devices and Smart Systems (ICEDSS), pp. 21-25.

[15] K.M. Mahesh, J.A. Renjit,(2018), "Evolutionary intelligence for brain tumor recognition from MRI images:A critical study and review". Evol. Intell., Vol 11, pp.19-30.

[16] S. Iqbal, M.U.G. Khan, T. Saba, et al., (2018), "Computer-assisted brain tumor type discrimination using magnetic resonance imaging features. Biomed. Eng. Lett." Vol 8, Issue 1, pp. 5-28.