DESIGN AND IMPLEMENTATION OF SONIC FIRE EXTINGUISHER SYSTEM

Vignesh . M[1],Saravanan . D[2],Nirmal Kumar . G[3],*Alice Christy . M*[4]

[1,2,3] *UG Student, Department of Electronics and Communication Engineering, Loyola institute of technology,, Tamilnadu, India*

[4] Professor, *Department of Electronics and Communication Engineering, Loyola institute of technology, Tamilnadu, India*

ABSTRACT

It is known that the technological advancements are increasing at a faster pace. But the utilization of technologies in various sectors are very low. People have witnessed various accidents caused by fire. The Common system consists of a water based automated fire extinguisher system. This might cause water shortage if the water level is very low. This cannot reduce the fire in critical situations. The system is only partly efficient.So we propose a system where we can efficiently control the fire using Sound based Fire extinguisher. The sound waves are utilized to reduce the fire by performing various processes.The proposed system overcomes the drawback in the existing system. The system here consists of a Frequency generator. The frequency generator is used to generate a signal of particular frequency. Based on the user input a particular frequency is provided to the PWM driver. The PWM driver is controlled by the Arduino controller. Now the PWM driver provides the frequency to the amplifier circuit. The amplifier amplifies the frequency and provides the output to the FET transistor. The output generated is efficient to clear the fire present in an area. If fire occurs in office it will be detected using temperature sensor and sonic fire extinguisher will be activated. Using camera located in that place also the fire will be detected and fire extinguisher will be activated.

Keyword: - *sonic wave, temperature sensor, operational amplifier, relay switch*

1. INTRODUCTION

1.1 OBJECTIVE

The Common system consists of a water based automated fire extinguisher system. This might cause water shortage if the water level is very low. This cannot reduce the fire in critical situations. So we have designed a Sonic Fire Extinguisher Extinguish Fire by Sound Waves. Generally, fire is extinguished with the help of water or carbon dioxide but by this Extinguishing fire through sound bass sound. The sound waves are utilized to reduce the fire by performing various processes. The proposed system overcomes the drawback in the existing system. Firefighting in an enclosed space has always been a problem,other than accessibility for the fire extinguisher technology to the closed space is a major challenge. A compact , independent and reliable fire extinguisher is required in order to overcome this problem. Space station and submarine are the main examples of the application that highly required new fire extinguisher technology that will be able to used in a confined and very limited space. Fire manipulation using sound was not a new technique. The interactions between sound and flames was first reported by John Leconte in 1858, who noted flames within anorchestral respond to beats within music. A German physicist, Heinrich Rubens in the 1900's, showed the technique using a section of pipe with holes perforated along the top. Subsequently, the height of the flames could be manipulated.

1.2 MOTIVATION

In many offices,shopping malls and many public places the location of fire extinguisher may not be known to the people. The water form sprinklers may cause the fire to spread and chemicals from fire extinguisher may cause any adverse effects. So this automatic sonic fire extinguishers are used to detect and handle the fire in the absence of human.

1.3 PROPOSED SYSTEM

The proposed system overcomes the drawback in the existing system. The system here consists of a Frequency generator. The frequency generator is used to generate a signal of particular frequency. Based on the user input a particular frequency is provided to the PWM driver. The PWM driver is controlled by the Arduino controller. Now the PWM driver provides the frequency to the amplifier circuit. The amplifier amplifies the frequency and provides the output to the FET transistor. The output generated is efficient to clear the fire present in an area. If fire occurs in office it will be detected using temperature sensor and sonic fire extinguisher will be activated. Using camera located in that place also the fire will be detected and fire extinguisher will be activated

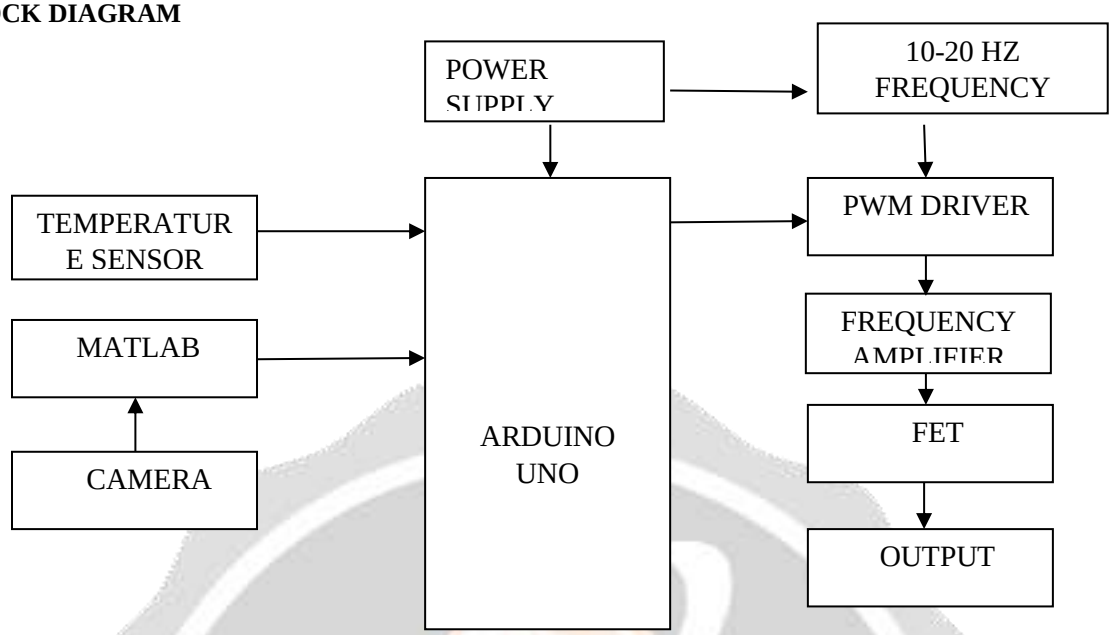
1.4 SOCIAL RELEVANCE

As for the sound wave propagation simulation, it is recommended that the simulation in other Multiphysics software such as COMSOL, to further verify the simulation results. Apart from that, another simulation could be performed, coupled with fluid dynamics of fire and acoustics to study how the fire is being extinguished with sound (acoustics) interaction. In the experiment part, different parameters could be used to further explore is study such as using different intensity of sound (by using
different speaker power rating),positioning of sound towards the fire source and size of flame (or flame intensity) & varying design of extinguisher .

1.5 BACKGROUND STUDY

Fire extinguishers are trying to eradicate one of the elements in the pyramid (a flametetrahedron) in order to eliminate the flame. Firefighting in an enclosed space has been a problem, other than the accessibility for the fire fighter to access the place,accessing the water, carbon dioxide (CO2) or other fire extinguisher technology to the closed space is a major challenge. A compact, independent and reliable fire extinguisher is required in order to overcome this problem. Space station and submarine are the main examples of the application that highly required new fire extinguisher technology that will be able to be used in a confined and very limited space. Fire manipulation using sound was not a new technique. The interactions between sound and flames was first reported by John Leconte in 1858, who noted flames within anorchestral respond to beats within music. A German physicist, Heinrich Rubens in the1900s, showed the technique using a section of pipe with holes perforated along the top. One end was sealed off with a sound speaker connected; the other sealed off . Subsequently, the height of the flames could be manipulated. The amplifier amplifies the frequency and provides the output to the FET transistor. The output generated is efficient to clear the fire present in an area. If fire occurs in office it will be detected using temperature sensor and sonic fire extinguisher will be activated. Using camera located in that place also the fire will be detected and fire extinguisher will be activated

2. BLOCK DIAGRAM



3. RESULTS

The main Objective of the project is to identify the frequency range that will be able to suppress an open flame and to analyze the physics of sound flame interactions.

Fig 4.1

Fig 4.2

->The proposed system overcomes the drawback in the existing system.

->The system here consists of a Frequency generator. The frequency generator is used to generate a signal of particular frequency.

-> Based on the user input a particular frequency is provided to the PWM driver.

->The PWM driver is controlled by the Arduino controller. Now the PWM driver provides the frequency to the amplifier circuit.

->The amplifier amplifies the frequency and provides the output to the FET transistor.

->The output generated is efficient to clear the fire present in an area.

4. CONCLUSION

In this work, we present a system where we can efficiently control the fire using Sound based Fire extinguisher. The sound waves are utilized to reduce the fire by performing various processes. The existing system consists of a water based automated fire extinguisher system. This might cause water shortage if the water level is very low. This cannot reduce the fire in critical situations. The system is only partly efficient. People have witnessed various accidents caused by fire. The common method we use for fire reduction is done using water or sand based extinguishers. But in some cases the presence of these, may become shortage enough to reduce the fire. So we propose a system where we can efficiently control the fire using Sound based Fire extinguisher. The sound waves are utilized to reduce the fire by performing various processes

As for the sound wave propagation simulation, it is recommended that the simulation in other Multiphysics software such as COMSOL, to further verify the simulation results. Apart from that, another simulation could be performed, coupled with fluid dynamics of fire and acoustics to study how the fire is being extinguished with sound (acoustics) interaction. In the experiment part, different parameters could be used to further explore is study such as using different intensity of sound (by using different speaker power rating),positioning of sound towards the fire source and size of flame (or flame intensity) & varying design of extinguisher .

5. REFFERENCES

[1] M. Kobes, I. Helsloot, B. de Vries, and J. G. Post, "Building safety and human behaviour in fire: A literature review," *Fire Safety J.*, vol. 45, no. 1, pp. 1–11, 2010.

[2] E. Ronchi, E. D. Kuligowski, R. D. Peacock, and P. A. Reneke, "A probabilistic approach for the analysis of evacuation movement data," *Fire Safety J.*, vol. 63, no. 1, pp. 69–78, 2013.

[3] A. Cuesta, O. Abreu, and D. Alvear, "Methods for measuring collective behaviour in evacuees," *Safety Sci*, vol. 88, pp. 54–63, Oct. 2013.

[4] A. Kneidl, D. Hartmann, and A. Borrmann, "A hybrid multi-scale approach for simulation of pedestrian dynamics," *Transp. Res. C, Emerg. Technol.*, vol. 37, pp. 223–237, Dec. 2016.

[5] E. Kuligowski, "Predicting human behavior during fires," *Fire Technol.*, vol. 49, no. 1, pp. 101–120, 2013.

[6] B. L. Mesmer and C. Bloebaum, "Incorporation of decision, game, and Bayesian game theory in an emergency evacuation exit decision model," *Fire Safety J.*, vol. 67, pp. 121–134, Jul. 2014.

[7] R. Lovreglio, D. Borri, L. dell'Olio, and A. Ibeas, "A discrete choice model based on random utilities for exit choice in emergency evacuations," *Safety Sci.*, vol. 62, pp. 418–426, Feb. 2014.

[8] M. Haghani and M. Sarvi, "Human exit choice in crowded built environments: Investigating underlying behavioural differences between normal egress and emergency evacuations," *Fire Safety J.*, vol. 85, pp. 1–9, Oct. 2016.

[9] N. W. F. Bode and E. A. Codling, "Human exit route choice in virtual crowd evacuations," *Animal Behaviour*, vol. 86, no. 2, pp. 347–358, 2016.