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Design and Fabrication of 360 Degree Fire Protection System

S Muruganantham[1], T Arunkumar[2], K K Hariharasudan[2], S Sasi Kumar[2], S Jagadeesh[2]

[1]Assistant Professor, [2]UG Students - Final Year, Department of Mechanical Engineering,
Nandha Engineering College, Perundurai 638 052, Tamilnadu, India

Abstract

Robots have become out to be an aspect wherein many human beings have shown their interest and gained reputation due to the development of many technologies. Consequently, it has been decided to design some thing that may make human existence less difficult and more cozy, and the interest of this assessment is to make a "far flung managed 360 degree fireplace protection device." The proposed "faraway controlled 360 diploma fire safety machine" is designed for extinguishing hearth in a small floorplan of a residence, workplace, or shopping mall of precise dimensions with the help of family water and a water pump. Controlling this robotic demands an operator who can easily manage it from a faraway area with out being concerned in firefighting. The far flung manage system for this undertaking is based on conventional RF technology, however with one of a kind techniques. The accuracy of the control system has been fine throughout this undertaking. The firegetting rid of performance and model movement pace were both near expectation.

Keywords: Design, fabrication, 360 degree fire protection system, Bluetooth, remote.

1. Introduction

In most of the countries fire accidents are occuring commonly such as Indian people has suffered and lossed many lives because of fire accidents.a fire threat is the third most serious threat to the business continuity and operations.so,to minimize losses and lives resulting form accidents fire extinguisher robots will play the major role. The location of the fire accidents for example: garment factories, gas, petrol pumps and chemical companies etc. This type of accidents results in loss of lives and pollutes the environment.The government and other regulatory has prescribed fire safety standards and measures.In this project we have made a prototype of remote controlled 360 degree fire protection system which can control the fire without a help of man.

2. Problem Statement

The security of home, laboratory, office, factory and building is important to human life.We develop security system that contains a remote 360 degree fire protection system using sensor, motor pump with movable wheels.In previous fire protection system models they designed only with manual lifting model, we have fabricated to moving with wheels attached to the motors.

The system can initially quench with the remote controlling system.Fire outbreaks are known to cause significant loss of life.Victims and rescuers and property.Due to high temperature and presence of potentially hazardous material fire-fighting robots will be useful for extinguishing fire, particularly in places where fire-men cannot reach and work.It can thus reduce human injury from a burning fire.They spray small amounts of water from each sprinkler which may not be enough to put out the fire. The sprinklers are not targeted and spray an entire floor or building ruining computers, furniture and paperwork.

3. Summary

Numerous forest fires have spread through many acres of forestry, causing major damage and creating a real threat to both animal and plant life. Such fires are much more complicated to put out. It is preferable to be careful than to regret getting hurt. The smoke detector detects smoke, the relay activates the pump, and the sprinkler starts to rotate 360 degrees when a forest fire is present. The following variables affect how well this system works: DHT sensor for a smoke detector Centrifugal pump with buzzer Uno Arduino Sprinkler The controller controls the unit's accuracy and steadiness.The purpose of this essay is to familiarise the reader with the idea of "The application of Mechatronics." One of the most frequent causes of catastrophe and ecological calamities is simply human error. The suggested method enables automatic and semi-automatic security management, and it minimises or offers an overall average of disaster effects. There are two parts to the proposed process for defect detection and diagnosis. The evaluation of the process state is done in the first phase, and the values of the processing parameters are found in the second phase together with their relationships to the parameters of the process model.

Because of the current threat, protective systems should work to avoid failure or to reduce the effects of a potential catastrophe. The protection system can be installed to offer automatic and semiautomatic protection, which directly reduces the risk of fire.This system accomplishes three primary goals: it supports the monitoring and existing phase of forest fires, it acts as a preventive tool by anticipating forest fire risks, and it aids in the planning of the recovery of the burned regions. The neural network that underlies the forest fire prediction model produces output that is divided into four symbolic risk categories with an accuracy of 0.789. We are now developing the system's trail in a controlled realworld setting. Results on actual behaviour will be provided, which may be utilised to finetune the system until it is deemed ready for installation in a real application context. A system for monitoring, alerting, and promptly putting out the fire was created and built in response to the recent fires that have threatened the country's natural resources. Forester, command vehicle, and water-carrying helicopter instructions. Additionally, the fire operations centre keeps track of real-time feedback and sends data to the corporate offices. Due to the knowledge obtained from this research, smart mobile communications within firing range with devices like these may be extended to other Internet of Things IT applications like monitoring air pollution and flood estimation.Investigated separately were mechanical characteristics, thermal stability, water resistance, and fire resistance. To investigate the morphology and composition of the carbon chars, scanning electron microscopy energy dispersive spectroscopy, and X-ray diffraction

were employed. This is especially true in mosaic management scenarios, which are characterised by dispersed landownerships and a number of different land or fire management organisations in charge of suppressing wildfires. The exurban residential growth is close by, there are agreements with numerous local, state, and federal wildfire suppression organisations, and there is a geographically dispersed protection district.

These characteristics describe the management environment in which RFPA emerges and operates. We spoke with experts in land or fire management as well as RFPA members in-depth. The development, design, and fabrication of a fire fighting robotic system featuring sensitive flame sensors, an avoidance mechanism, an alert, and SMS capability. For a microcontroller to successfully complete the task it has been programmed to perform, circuit design incorporates multiple components. Complete suppression of smoke and fire was successfully accomplished with the aid of a fire fighting autonomous robotic system outfitted with sensitive sensors for fire alarm and detection. The microprocessor was able to recognise the ultrasonic sensor's significant reaction, and the robotic system effectively avoided the obstacle as a result. Likewise, upon the detection of flame and smoke, the alarm and the SMS message capability were effectively triggered. A brief text message alerting the owner that fire has been detected was received on their mobile device.To enhance the qualities of aqueous intumescent fire resistant coatings, three different types of graphene were utilised as fire retardant fillers.

Due to the fact that the equipment has surpassed or is almost at the radiation and temperature thresholds, there is a danger of failure. To lessen the amount of radiation that equipment receives and the temperature increase, several PFP methods are simulated and applied to the equipment.The use of a portable water mist extinguisher to put out flames caused by flammable liquids and wood crib fires is described in this study using both theoretical and experimental experiments. According to theoretical analysis and experimental findings, the extinguishing mechanisms and process vary depending on the water mist characteristics [such as water flux density, droplet velocity, and diameter], and a portable water mist fire extinguisher with the right characteristics can put out Class A and Class B fires. In the experiments, a newly designed MC ingredient was utilised to increase the fire extinguishing effectiveness. The findings demonstrate that adding the right amount of MC additive can considerably increase the ability of portable watermist fire extinguisher to put out fires. A greater amount of water and a longer extinguishing time were needed to put out the fire. Polypropylene that is flame retardant was created using the intumescence theory. The two types of intumescence in PP based on modified ammonium polyphosphate and expandable graphite are examined in this research. The kinetic parameters of the decomposition employing a reactional scheme at two subsequent reactions can be ascertained using kinetic analysis performed under dynamic settings on the intumescent PPs. Simulations indicate that it is only possible when the heating rate is not excessive. Otherwise, the intumescent decomposition is the same.Modern Safety Control Theory, a novel quantitative fire safety assessment method, was proposed in the studies as a means of realising dynamic and quantitative fire management and control. This brand-new evaluation technique was applied to evaluate a real case development. The findings indicate that this method is appropriate for evaluating the fire safety

of buildings.In this study, the factors that determine the peak heat release rate in road tunnels are compared with some of the work that has been done on tunnel fires involving heavy goods vehicles.

It has been noted that earlier research on the impact of passive fire protection methods on peak has been lacking. Due to their growing complexity and the effects of climate change, many modern cities are now very vulnerable to catastrophic disasters. It is examined how such geoportals can be used in conjunction to offer effective and comprehensive management of natural disasters while also diffusing the created knowledge and other relevant useful information to the public. They offer the foundation required for successfully managing a natural disaster and, concurrently, for effectively disseminating the learned information. As a result, they improve safety and the efficient management of smart cities in the field of civil protection.Investigates if users of a power plant simulation can detect a fire and order an evacuation while occupied with a task. Because of this, the study involved changing the air filter on a gas-powered engine by following a set of instructions. As feedback from the participants who were immersed as occupants of the Powerhouse, several records of the pre-movement duration and individual perceptions of the evacuation drill in the simulation environment were obtained. The task added a higher sense of engagement that raised their level of presence, as the experimental group perceived the simulation environment to be more natural and interactive than the control.Through this investigation, they were able to double the extinction range of the automatic fire extinguisher that had previously been produced.

Extinguisher range is around 5 metres, while extinction range is approximately 10 metres. It can be enhanced and implemented in other places, such as those with high ceilings, in the future.Numerous forest fires around the world every year result in catastrophes beyond all comprehension. Numerous very extensively researched solutions to this problem are currently being tested or are even ready for use as a result of the long-standing research interest in this subject. This work will provide a comprehensive overview of all technologies that have been applied to the detection of forest fires as well as detailed analyses of their approaches and procedures. Methods. There are numerous techniques and tools for research accessible on the market. The comparison of the four approaches is summarised in a detailed table at the conclusion.Investigations into the knitted materials' fire resistance revealed a significant reduction in heat release when phosphorous-containing compounds were present. POSS nanoparticles are added to PET-OP950 systems, which marginally reduces the material's fire resistance while improving smoke suppression and releasing fewer harmful gases after combustion. Melt spinning was used to create poly multifilament’s that were infused with fire retardants and then used to create fabrics. POSS nanoparticles are added to systems, which somewhat reduces the material's fire resistance but improves smoke suppression and releases fewer harmful gases after burning.Melt spinning was used to create poly multifilament’s that were infused with fire retardants and then used to create fabrics. POSS nanoparticles are added systems, which marginally reduces the material's fire resistance while improving smoke suppression and releasing fewer harmful gases after combustion. It was additionally deep shaded cationic dyed.Disasters involving fires happen regularly and for a variety of reasons. Strong action is necessary to maintain a fire-free environment. The results were presented using

frequency tables, mean and standard deviation. Basing on the study findings, the majority of the respondents reported that fire occurs frequently in the markets which are mostly caused by fault electricity, renovation, and inappropriate storage of flammable materials. This indicated a high level of fire disaster unpreparedness.

Due to space restrictions and environmental factors, the process area of an offshore oil and gas platform is extremely small and congested. Although the platforms have safety procedures in place, the process area is never entirely secure. In order to improve consequence/impact modelling and analysis of radiation and blast overpressures, a grid-based technique was chosen.

4. Fabrication Model

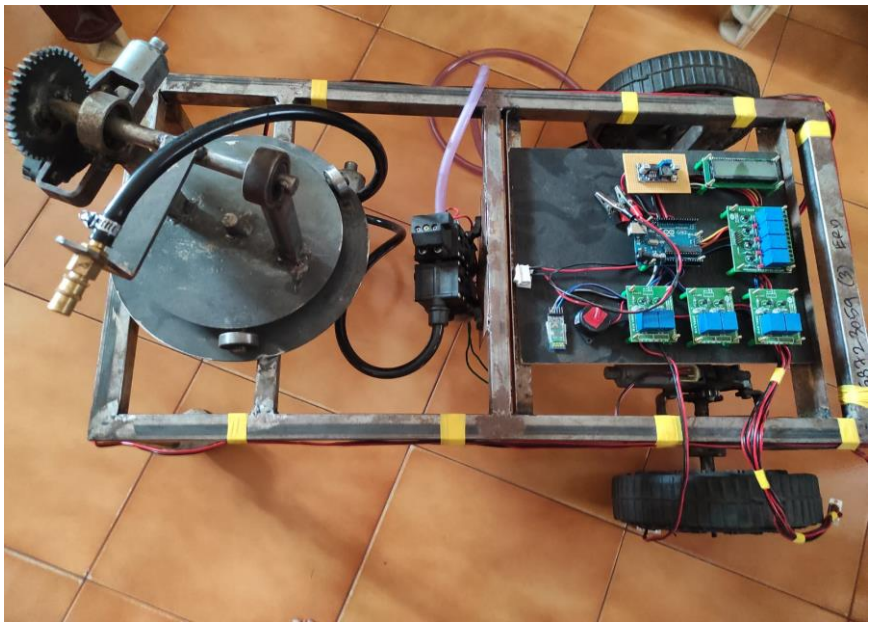

Figure 1. Fabrication Model

5. Working Principle

An aimable and adjustable strong-capacity water nozzle is combined with fire controllers and sprayers to combat huge fires. Fire Monitors cannot be moved, in contrast to fire extinguishers, and are installed permanently. This device has Arduino board to receive signal that require someone to use them to adjust the water jet's direction and aim it properly. This enables the user to control it from a secure distance. The system is powered by a motor connected to a strong sprayer motor with pipework and an integrated with this device. The movement of the nozzle direction is managed by a different drive.

6. Conclusion

Despite the fact that fire has always been a terrible phenomena, technological improvements have made fighting it easier. As they work to save lives and defend property from fires, firefighters risk their lives in an effort to arrive at the scene of a fire as quickly as possible. There have been some initiatives to develop shipboard automated fighting fires robots

to perform automated fire control in the navy. Additionally, there are many ways to put off a fire but it remains more secure to use this concept continually to minimise the use of fire soldiers, thus reducing the risk of physical injuries and death. This paper outlines an approach to the issue of combating fires with the support of Bluetooth controlled 360 degree rotating fire protection system.

References

1. A.B. Rajendra, Fiza Mariam, Chethana Y.P and G. Loka Priya - Indian Journal of Science and Technology - Vol 12(48) -Year – 2019.
2. Anand Mohan Misra, Mohd. Maroof Siddiqui, Priya Gupta, Pameer Singh - International Journal Of Engineering Science & Advanced Technology - International Journal Of Engineering Science & Advanced Technology - Volume-2, Issue-4,831 – 835.
3.Sveta CVETANOVIC, Danilo POPOVIC, Emina MIHAJLOVIC, Dusica PESIC - Technical university of Ostrava - Vol. VI, No. 2, 2011 - p. 39 – 43.
4. Amparo Alonso-Betanzos, Oscar Fontenla-Romeroa, Bertha Guijarro-Berdin˜as, Elena Herna´ndez-Pereira , Marı Inmaculada Paz Andrade, Eulogio Jime´nez, Jose Luis Legido Soto, Tarsy Carballas - Expert Systems with Applications 25 – Year - (2003).
5. Jafari Ali and Karimi Mojtaba - International Conference on Industrial Engineering – Year – 2017.
6 Wang Zhan, Lei Ni, Zhaozhan Gu, Fusheng Cui, Juncheng Jiang, Le Chen - Powder Technology – Year – 2021.
7. Amanda M. Stasiewicz, Travis B. Paveglio - Rangeland Ecology & Management – Year – 2018.
8. Lexter J. Resullar, Angelou Joefred N. Congreso, Fernando Comandante, Floramyr P. Sarvida, Phd. & Engr. Gideon G. Buniel. MIT - Asian Journal of Basic Science & Research - Volume 2, Issue 4, Pages 21-51 – Year – 2020.
9. Wang Zhan, Zhaozhan Gu, Juncheng Jiang,Le Chen - Process Safety and Environmental Protection – Year – 2020.
10. Geovana Pires Araujo Lima, Josiane Dantas Viana Barbosa, Valter Estevao ˜ Beal, Marcelo Albano Moret S. Gonçalves, Bruna Aparecida Souza Machado, Juliano Zaffalon Gerber, Benjamin S. Lazarus - International Journal of Disaster Risk Reduction – Year – 2021.
11. Zafiris Triantafyllidis, Luke A. Bisby - Construction and Building Materials – Year – 2020.
12.T. A. ROBERTS, I. BUCKLAND, L. C. SHIRVILL, B. J. LOWESMITH and P. SALATER - Process Safety and Environmental Protection.
13. Henrik Bjelland, Ove Njå, Atle William Heskestad, Geir Sverre Braut - Safety Science – Year – 2021.
14. Jaewook Kwon - Case Studies in Fire Safety – Year – 2014.
15. Jia Wui Lim, Til Baalisampang, Vikram Garaniya,Rouzbeh Abbassi, Faisal Khan, Jie Ji - Journal of Loss Prevention in the Process Industries – Year – 2019.
16. Zhou Xiaomenga, Zhou Biao, Jin Xiang - Journal of Cultural Heritage – Year – 2010.
17. Serge Bourbigot, Johan Sarazin, Tsilla Bensabath, Fabienne Samyn, Maude Jimenez - Fire Safety Journal – Year – 2019.
18. HUANG Yan-bo, HAN Bing, ZHAO Zhe - Procedia Engineering - Year – 2011.
19. Mukesh Singh Tomar, Shashank Khurana - Tunnelling and Underground Space Technology – Year – 2019.
20. Constantinos Nefros,Gianna Kitsara,Constantinos Loupasakis - IFAC PapersOnLine – Year – 2022.
21. Ebo Kwegyir-Afful - International Journal of Disaster Risk Reduction – Year – 2022.

22.Shotaro Sadaishi, Kosuke Ando, Masahiko Hanada, Kanya Mizuguchi, Hiromichi Hanada, Seiichi Serikawa, Yuhki Kitazono - International Conference on Intelligent Systems and Image Processing – Year – 2018.
23. Ahmad A. A. Alkhatib - International Journal of Distributed Sensor Networks - Volume 2014, Article ID 597368.
24. Stéphane Giraud - Polymer Degradation and Stability – Year – 2012.
25. Hari T. Deo, Ph.D, Nagesh K. Patel, Bharat K. Patel – Journal of Engineered Fibers and Fabric - Volume 3, Issue 4 – 2008.
26. Alade E. Ilori and Rabiu A. Magaji - Asian Journal of Geographical Research - Article no.AJGR.53708 – Year – 2019.
27.Oluwaseyi Igbekele Adeleye, Tolulope Odigwe Ajobiewe, Success Victor Shaibu, Taofeek Olavinka Oladipo – Open Science Journal – Year – 2020.
28. Onuegbu, Williams, A.A. Obafemi, O.S. Eludoyin - ISSN No:-2456-2165 - International Journal of Innovative Science and Research Technology - Volume 6, Issue 6,Year - 2021.
29. R. PULA, F. I. KHAN, B. VEITCH and P. R. AMYOTTE - Process Safety and Environmental Protection.
30. Ricardo Eirisa, Anujeet Jain, Masoud Gheisari, Andrew Wehle - Safety Science – Year – 2020.