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# Arduino-Based Emergency Unmanned Fire Protection System

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**Abstract:** The safety of a person's home, workplace, factory, and other structures is crucial. We create a fire-fighting robot that can be operated via a semiautomatic control. The highest source is the destructive damage that electrical energy causes. It is because our security system can't alert us to unusual or harmful situations. Additionally, it is challenging for the user to identify minor burns caused by electrical appliances. When using an automatic water cannon, the user might take some extra time to do things like locate a water source. Small charred areas and locations that are difficult for users to access, even with automatic water cannons, might make a fire difficult to detect. In order to control the water cannon for the intelligent building, a "semiautomatic water Canon (movable) for fire extinguishing using Arduino" was designed. This robot is able to sense the fire flames in the region where a fire is occurring and will automatically spray water in that direction.

**Keywords:** Semiautomatic water cannon, Arduino

## I. INTRODUCTION

Rescue and firefighting operations are thought to be particularly risky undertakings. Rescue and evacuation of injured firemen and bystanders from hazardous buildings are dangerous. Because they frequently lack prior understanding of the infrastructure of dangerous buildings, firemen can face significant obstacles when trying to enter the building, activate the automatic water cannon, and identify civilians. A lot of firemen have been hurt while doing their tasks, such as using automatic water cannons and rescuing individuals, because they are exposed to major threats on the job, including flames, heat, and high levels of CO or CO<sub>2</sub>. The safety of a person's home, workplace, factory, and other structures is crucial. We create a fire-fighting robot that can be operated via a remote control. The highest source is the destructive damage that electrical energy causes. It's because our security system can't alert us to unusual or harmful situations. Additionally, it was challenging for the user to identify the minor burns caused by electrical appliances. When using an automatic water cannon, the user might take some extra time to do things like locate a water source. Small charred areas and locations that are difficult for users to access, even with automatic water cannons, might make a fire difficult to detect. In order to control the water canon for the intelligent building, "automated water Canon (movable) for fire extinguishing" was designed. This robot will move to the region where a fire is occurring and will automatically spray water in that direction.

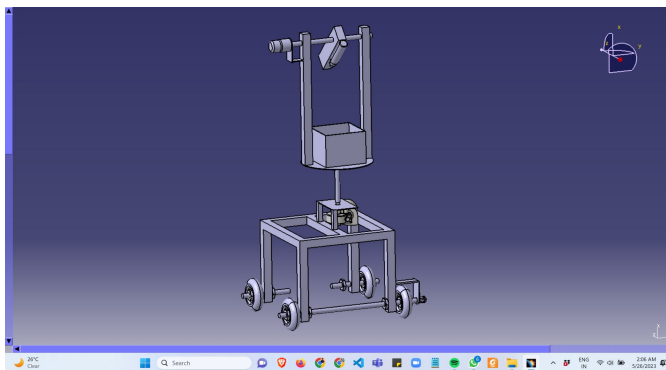
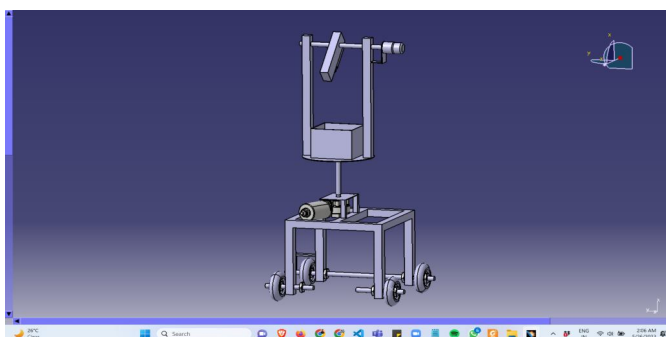
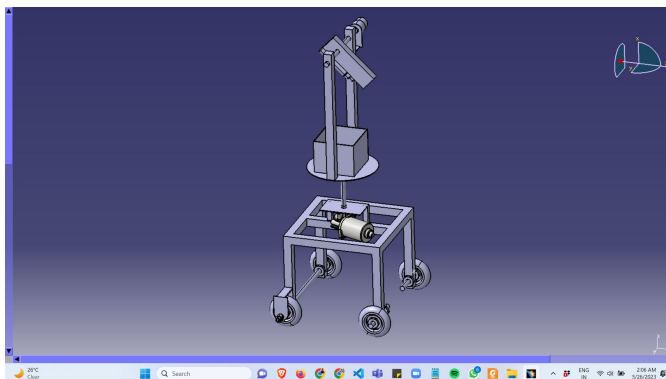
### A. Problem Statement

Rescue and firefighting efforts are regarded as extremely hazardous tasks. Rescuing and evacuating injured firemen and regular citizens from hazardous buildings is risky. Because they frequently lack prior understanding of the infrastructure of hazardous buildings, firefighters can encounter significant difficulties entering these structures to utilize automatic water cannons and identify civilians. On the job, firefighters are exposed to dangerous hazards like fires, heat, high levels of CO or CO<sub>2</sub>, as well as physical and emotional stress. Many firefighters have suffered injuries while doing routine tasks like using automatic water cannons and rescuing bystanders.

### B. Project Components

- 1) Two motors are employed in the system, along with a strong sprayer motor and pipe system. The second motors are utilized to control the nozzle direction movement. (JOHNSON'S MOTOR)
- 2) The sprayer mechanism is designed to create 360-degree water spray coverage while operating with 2 degrees of freedom. (SPRAYER MOTOR)
- 3) To send movement orders for this project, utilize a remote. The user commands are received by the system's receiver circuit, which also controls the pump motor to start and stop the spray. (ARDUINO).
- 4) Arduino UNO.
- 5) Battery
- 6) Water storage tank
- 7) Nozzle

## II. CAD DESIGN



### A. Ansys Design Analysis

Geometry



Mesh



**A: Static Structural**

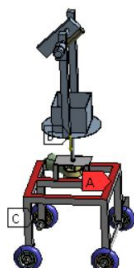
Static Structural

Time: 1. s

**A** Distributed Mass

**B** Standard Earth Gravity: 9806.6 mm/s<sup>2</sup>

**C** Fixed Support



**A: Static Structural**

Equivalent Stress

Type: Equivalent (von-Mises) Stress

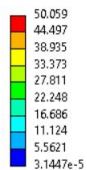
Unit: MPa

Time: 1

Custom

Max: 50.059

Min: 3.1447e-5



**A: Static Structural**

Total Deformation

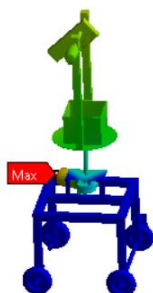
Type: Total Deformation

Unit: mm

Time: 1

Max: 0.25015

Min: 0



### III. CONCLUSIONS

Our project achieves our mission of providing quick responsive action towards any fire outbreak without any human involvement. This robot is cheap compared to other robots which also aligns with our goal to provide affordable safety equipment for all. Homes , Hospitals and Factories are safer with the installation of this robot. It is a modern way of fighting fire outbreaks.

#### IV. ACKNOWLEDGEMENT

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#### REFERENCES

- [1] D.J. Pack, A.M. Mankowski, and G.J. Freeman, A FireFighting Robot and Its Impact on Educational Outcomes.
- [2] T. AlHaza, A. Alsadoon, Z. Alhusinan, M. Jarwali, K. Alsaiif. New Concept for Indoor Fire Fighting Robot[J]. Elsevier Ltd, 2015, 195
- [3] Jiangping Fang . Research progress of fire fighting robot [J]. Fire Fighting today. 2020
- [4] K. Altaf, A. Akbar and B. Ijaz, "Design and Construction of an Autonomous Fire Fighting Robot," 2007 International Conference on Information and Emerging Technologies, Karachi, 2007.
- [5] J. Suresh, "Fire-fighting robot," 2017 International Conference on Computational Intelligence in Data Science (ICCIDS), Chennai, 2017.
- [6] J. S. C. Bose, M. Mehrez, A. S. Badawy, W. Ghribi, H. Bangali and A. Basha, "Development and designing of fire fighter robotics using cyber security," 2017 2nd International Conference on Anti-Cyber Crimes (ICACC), Abha, 2017
- [7] Liu, W.; Anguelov, D.; Erhan, D.; Szegedy, C.; Reed, S.; Fu, C.Y.; Berg, A.C. SSD: Single shot multibox detector. In Proceedings of the European Conference on Computer Vision, Amsterdam, The Netherlands, 11–14 October 2016; Springer: Cham, Switzerland, 2016; pp. 21–37.
- [8] Redmon, J.; Farhadi, A. Yolov3: An incremental improvement. arXiv 2018, arXiv:1804.02767.
- [9] Ren, S.; He, K.; Girshick, R.; Sun, J. Faster r-cnn: Towards real-time object detection with region proposal networks. In Proceedings of the Advances in Neural Information Processing Systems 28: 29th Annual Conference on Neural Information Processing Systems, Montreal, QC, Canada, 7–12 December 2015; pp. 91–99.
- [10] Ronneberger, O.; Fischer, P.; Brox, T. U-net: Convolutional networks for biomedical image segmentation. In Proceedings of the International Conference on Medical Image Computing and Computer-Assisted Intervention, Munich, Germany, 5–9 October 2015; Springer: Cham, Switzerland, 2015; pp. 234–241.





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