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360 Degree Rotating Fire Protection System

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ABSTRACT: Fire monitors and sprayers are an amiable and controllable high-capacity water jet used to deal with large fires. Unlike Fire extinguishers, Fire Monitors are permanently installed and cannot be moved. While traditional fire monitors systems need a human operator to change the direction of the water jet and aim it appropriately, this fire monitor has been equipped with RF control. Thereby allowing the user to operate it from a safe distance. The system makes use of a Motor coupled with a powerful sprayer motor with piping system and onboard wireless fire sensing sensors to run this system. Another motor is used to control the nozzle direction movement. This demo version is made to be remote controlled from few meters but future version will operate remotely from fire dept. Fire monitors and sprayers are an amiable and controllable high-capacity water jet used to deal with large fires. Key Words: Motor, Spray, Nozzle, Fire extinguishers, Remote Controller

KEYWORDS: Machine, manual collection, waste collection, sensors, GPS, solar based.

I. INTRODUCTION

The increasing occurrence of large-scale fires in modern society significantly impacts society and communities in terms of remarkable losses in human lives, infrastructures and properties. Depending on burn severity, wildfires also impact environment and climate change, increasing the released quantity levels of CO₂, soot and aerosols and damaging the forests that would remove CO₂ from the air.

This results in extremely dry conditions, increasing the risk of wildfires. Furthermore, forest fires lead to runoff generation and to major changes to the soil infiltration. To this end, computer-based early fire warning systems that incorporate remote sensing technologies have attracted particular attention in the last decade.

Fire Detection Challenges usual fire protection systems installed in buildings have the following limitations as 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. While this sprayer gun can spray water in desired qty only at fire outbreak point to stop fire without ruining complete office furniture and electronics.

This demo version is made to be remote controlled from few meters but future version will operate remotely from fire dept.

Portable fire extinguishers serve as an important line of defense and life safety device helping to protect people and property from fire in all built environments including workplace settings, areas occupied by the general public, vehicles, marine areas, and aviation.

II. LITERATURE SURVEY

This project entitled —Design and Fabrication of Fire Fighting Autonomous Robotic System Equipped with Sensitive Sensors for Fire Alarm and Detection, Avoidance Behavior Mechanism and SMS Messaging Capability—. The title was based on the functions and objectives of the study. However, this project was similarly alike to other robots but this innovative robot was the researchers own idea. The features were pondered by the researchers technically focusing on the components contributions when assembled as one robot. The Design and Fabrication of Fire Fighting Autonomous Robotic System Equipped with Sensitive Sensors for Fire Alarm and Detection, Avoidance Behavior Mechanism and SMS Messaging Capability has additional features that make it unique to others. It was installed with an alarm system that notifies the owner that flame has occurred. Moreover, it has an auxiliary function like ultrasonic

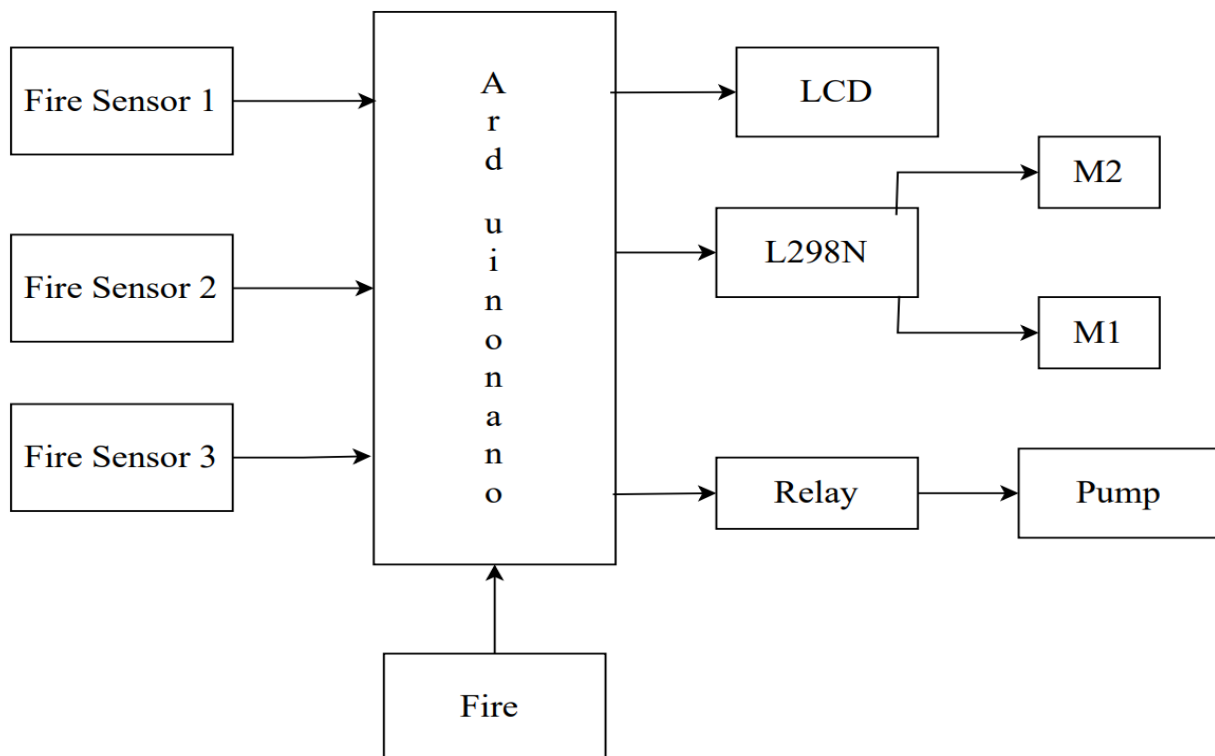


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sensor, flame sensor and a smoke sensor that detects the flame combustion. Robot is a machine that resembles a human being and mimics various complex tasks. Now, let us have a good look at existing firefighting robots. The following robots below are the characteristics of the previous robot that have been similar with this robot project and used in the literature reviews

III. BLOCK DIAGRAM



IV. WORKING

The system makes use of Motors coupled with a powerful sprayer motor with piping system. The 2nd motors are used to control the nozzle direction movement. The user may use a wireless remote to transmit movement commands. The receiver circuitry mounted on system receives users commands and operates the motors to achieve desired motion. Also, the receiver operates the pump motor to start and stop the spray. The sprayer nozzle can also be adjusted to adjust the water spray outlet. The sprayer mechanism is built to operate in a 2DOF operation to adjust position in x and Y directions and achieve a 360 Degree water spray coverage. Fire monitors and sprayers are an aimable and controllable high-capacity water jet used to deal with large fires. Unlike Fire extinguishers, Fire Monitors are permanently installed and cannot be moved. While traditional fire monitors systems need a human operator to change the direction of the water jet and aim it appropriately, this fire monitor has been equipped with RF control. Thereby allowing the user to operate it from a safe distance. The system makes use of a Motor coupled with a powerful sprayer motor with piping system and on-board wireless fire sensing sensor to run this system. Another motor is used to control the nozzle direction movement. A 360-degree fire fighting system is typically a fixed installation in a building or facility that is designed to detect and extinguish fires in all directions. The system consists of various components that work together to provide comprehensive fire protection. The system includes smoke detectors, heat detectors, or flame detectors that are placed strategically throughout the space to quickly detect the presence of a fire. When a fire is detected, an alarm is triggered to alert occupants and emergency responders to the situation. The system is equipped with fire suppression agents such as water, foam, or gas that are released to extinguish the fire. The suppression agents can be delivered through a network of



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pipes or nozzles that cover all areas of the space. A control panel is used to monitor the system and control the activation of the fire suppression agents. It also provides information on the location of the fire and any other relevant data.

V. OBJECTIVE

Early Fire Detection:

To quickly identify a fire in any direction through advanced sensor technology, allowing for immediate response and containment.

Automated Fire Suppression:

To automatically activate fire extinguishing mechanisms (like water spray) once a fire is detected, targeting the fire source directly with a 360-degree spray pattern.

Minimal Human Intervention:

To reduce the need for manual fire suppression efforts by automating the process, potentially minimizing risk to firefighters.

Specific Project Work Areas:

Sensor Design and Integration:

Selecting appropriate fire detection sensors (e.g., flame detectors, heat sensors, smoke detectors) with wide coverage angles.

Designing a sensor network to ensure complete 360-degree monitoring of the protected area.

Actuator System Development:

Designing a rotating nozzle mechanism capable of spraying water or other extinguishing agents in a 360-degree pattern.

Implementing motor control systems to accurately direct the nozzle towards the fire source.

Control System Design:

Developing a control algorithm to identify the fire location based on sensor data.

Implementing logic for automatic activation of the fire suppression system upon detection.

System Integration and Calibration:

Integrating sensors, actuators, and control systems into a cohesive system.

Performing calibration tests to ensure accurate fire detection and precise spray patterns.

User Interface and Monitoring:

Designing a user interface to display fire detection information and system status.

Implementing remote monitoring capabilities for real-time updates.

VI. ADVANTAGES AND APPLICATION

Advantages

- Targeted water spraying to avoid water damage in office.
- Remote controlled operation ensures operator remains safe.
- Adjustable Nozzle for Spray Tuning.
- Powerful Long Distance Water Spray.



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Application

- Useful for controlling indoor fires.
- Can provide a low cost fire protection system with limited centralized fire protection

VII. CONCLUSION

Fire has always been a devastating phenomenon but the technology advancements it become easier to tackle it. Firefighters try their best to respond quickly to case of fire and event put their lives at risk of they endeavor to save human life and protect property from the fires.

Some attempts have been made to automatic fire fighting for the navy (ship board autonomous firefighting robot). This paper describes one such solution to the problem of fire fighting with help of 360 degree fire protection system.

In conclusion there are many possible ways to put out fires but it always safer to use the constantly this idea to reduce the involvement of fire fighters thereby decreasing the risk of physical injuries and life threats. Comparing this prototype with the existing technology we implement the sensor and wireless technology.

Nowadays the firefighting technologies are fully manual. in scope of future we implement wireless technology to control the fires.

REFERENCES

- 1] Myles Durkin, Kevin McHugh, Ryan Ehid, Brian Lepus, Stephen Kropp "Firefighting Robot. A Proposal." May 5 2008.
- [2] Steel structure with a water sprinkler system fire- protection, VTT Certificate VTT-C- 4921-10, 2011.
- [3] H, J., Cajot, L.-G., Pierre, M., Fraser- Mitchell, J. Joyeux, D.
- [4] European sprinkler organization homepage, www.eurosprinkler.org
- [5] E. Krasnov and D. Bagaev, "Conceptual analysis of firefighting robots' control systems", 2012 IV International Conference "Problems of Cybernetics and Informatics" (PCI), 2012.
- [6] L. Celentano, B. Siciliano and L. Villani, "A robotic system for firefighting in tunnels", IEEE International Safety Security and Rescue Robotics Workshop 2005. Kobe, 2005.



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