

# Design and Development of an Autonomous Firefighting Robot: A Comprehensive Approach to Enhancing Emergency Response Safety

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**Abstract:** *This paper presents the design, development, and implementation of an autonomous firefighting robot system based on Arduino technology. The system integrates advanced sensor technologies, autonomous navigation capabilities, and remote control mechanisms to address critical safety challenges in firefighting operations. The developed robot incorporates flame detection sensors, fire suppression mechanisms, and wireless communication through the Blynk platform, enabling real-time monitoring and control from safe distances. The primary objective is to minimize human exposure to hazardous fire environments while maintaining operational effectiveness. The system demonstrates successful integration of mechanical design, electronic control systems, and software architecture, achieving autonomous fire detection and suppression capabilities. Experimental validation shows the robot's ability to navigate through challenging environments, detect fire sources with high accuracy, and execute targeted suppression operations. This research contributes to the advancement of emergency response robotics and provides a foundation for future developments in autonomous firefighting systems*

**Keywords:** Firefighting robot, autonomous systems, Arduino technology, fire detection, emergency response, robotics, safety systems.

