

ABSTRACT

Fire is a disaster that can cause significant material losses and casualties. Therefore, the development of an automatic fire extinguishing system is essential to improve response to fires. This project aims to design and create a prototype of an automatic fire extinguisher using the Arduino Uno R3 platform. The system is designed to detect the presence of fire quickly and efficiently through integrated temperature and gas sensors.

The methodology used in the development of this system involves programming the Arduino Uno R3 to control various components such as the DHT11 temperature sensor, MQ-2 gas sensor, relay module, and water pump. The system is also equipped with a wireless communication module to enable remote control. When the sensors detect a temperature increase beyond a threshold or the presence of dangerous gases, the system activates an alarm as an initial warning and then triggers the water spray-based fire extinguishing mechanism automatically. This mechanism is designed to be directed precisely at the detected fire source.

Test results show that this prototype can detect fires with high accuracy and respond in less than 10 seconds. The system's effectiveness was tested in various fire scenarios with different temperature and gas concentration variables, demonstrating consistent detection and extinguishing capabilities. Additionally, the system is advantageous in terms of energy efficiency, as it only activates the water pump when necessary, and offers flexibility in installation at various strategic locations.

This prototype has the potential to be applied in various environments, such as households, offices, and industries, to minimize fire risks. In the future, the system can be further developed by adding features such as integration with IoT (Internet of Things) networks to enable remote monitoring and real-time notifications to mobile devices. Implementing machine learning can enhance the system's predictive and adaptive capabilities to dynamic environmental conditions. Furthermore, the use of more advanced sensors and optimization of detection algorithms can improve the system's sensitivity and accuracy.

This system is expected to provide significant contributions to automatic and efficient fire prevention and management efforts, as well as become an innovative solution in maintaining safety and security across various sectors.

Keywords: Automatic Fire Extinguisher, Arduino Uno R3, Temperature Sensor, Gas Sensor, Fire Safety System, Energy Efficiency