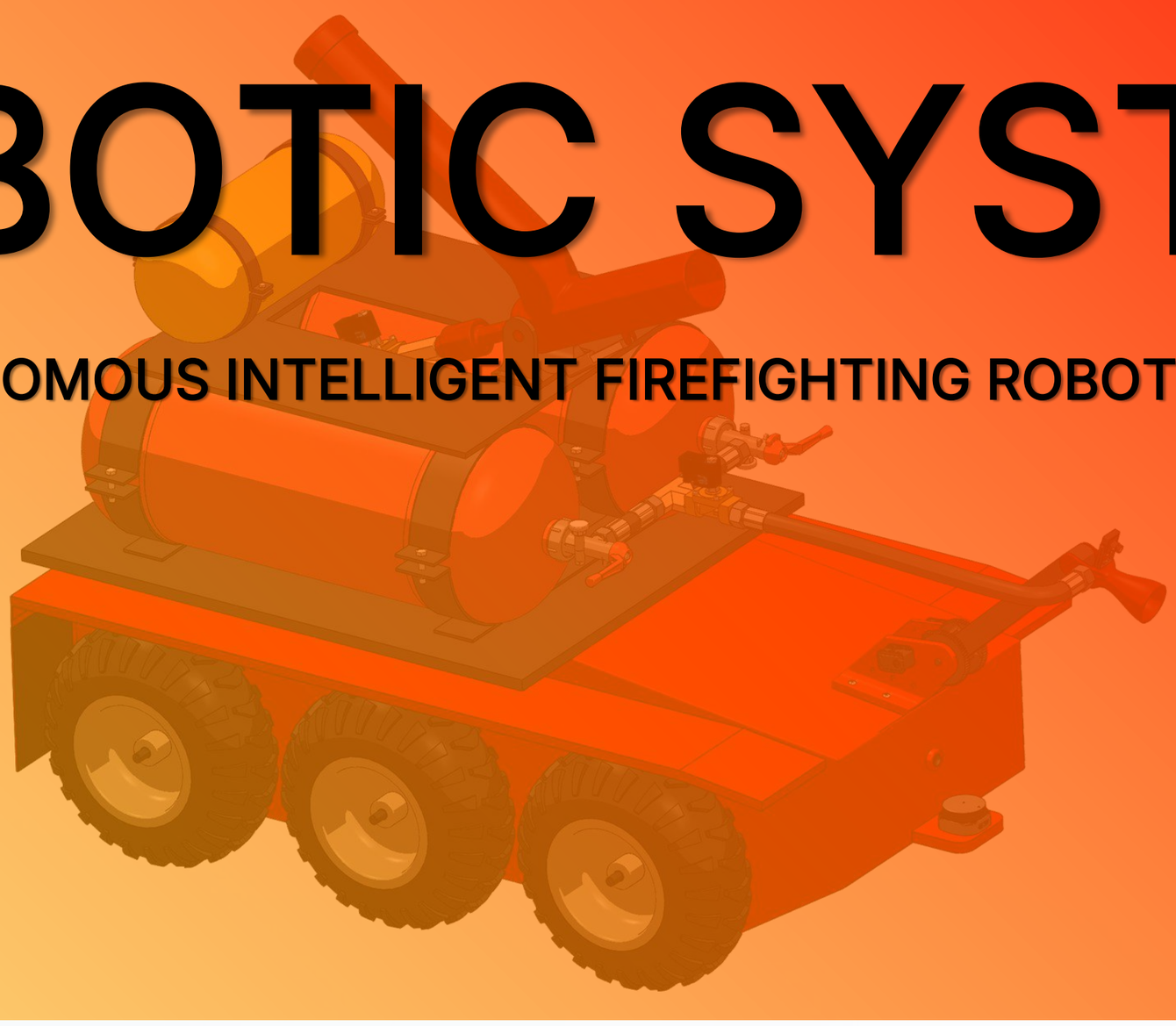
FIREFIGHTING ROBOTIC SYSTEM

An AUTONOMOUS INTELLIGENT FIREFIGHTING ROBOTIC SYSTEM



Firefighting is a dangerous task, and many people and firefighters lose their lives fighting the fire, especially if the fire becomes bigger and expands in the building. Firefighters take time to arrive at the scene, resulting in the fire getting much bigger and damaging the equipment and materials in the place. Regular firefighting systems will fill the place with water and ruin the whole building, which may damage electronic devices such as computers and screens.

To overcome these problems, we present an intelligent autonomous robotic system that can detect the fire in the building at its outset using smart fire detectors and extinguish it immediately using a Mobile Robot equipped with fire extinguishing systems.

This innovative system offers investors access to a high-growth smart city segment. Its patented AI and robotics integration presents licensing, manufacturing, and global distribution opportunities

This system is protected by us patent No. US12311562B2 which was granted to *King Saud University* in 2025-05-27. A fully functional prototype of the system was developed and tested by the *Center of Smart Robotic Research*. This patented technology represents the future of autonomous fire protection systems

System Components

The intelligent robotic fire extinguishing system consists of two units:

1

Firefighting Robot

The robot is capable of moving independently inside a building and extinguishing the fire using a suitable fire extinguisher. The firefighting robot can be equipped with one or more fire extinguishers. The fire extinguisher nozzle is mounted on the end of a robotic arm placed on the front of the robot, and the fire extinguisher will be opened and closed automatically by an electromagnetic valve.

For large fires, the robot is also equipped with a fire extinguisher ball launcher to suppress flames from a distance.

To accurately locate the fire, the firefighting robot is equipped with a thermal camera and a video camera. The video camera can also be used for remote control if desired.

2

Intelligent Fire Detection System

The system is designed to detect the fire in the building in its early stages and send the location of the fire to the firefighting robot. This system has either smart sensors developed specifically for the system or a smart attachment to link the traditional fire alarm systems already installed in buildings to the firefighting robot. This attachment will be installed on a traditional fire alarm system and constantly reads the status, and if the system detects a fire, the attachment will send the location of the fire to the firefighting robot.

Applications

The firefighting robotic system has a wide range of applications in various environments where fire hazards pose a significant risk.



Industrial Facilities

Factories, warehouses, and chemical plants can use the robotic system to handle fire incidents in hazardous environments where human intervention is dangerous.



Commercial Buildings

Shopping malls, offices, and hotels can benefit from an autonomous fire suppression system to enhance fire safety and emergency response.



Hospitals and Healthcare Centers

Fire safety is critical in healthcare facilities where patient mobility is limited; the robotic system can provide rapid response to fire outbreaks.



Data Centers

The system can protect valuable servers and IT infrastructure by quickly suppressing fires before they cause significant downtime and data loss.



Underground and Confined Spaces

The system can be deployed in mines, tunnels, and basements where traditional firefighting methods may be challenging.



Laboratories and Research Centers

In environments dealing with volatile chemicals and high-risk experiments, the system ensures rapid fire suppression with minimal human exposure to danger.

Additional applications

include public transport and airports (subway stations, train depots, and airport terminals) and power plants and energy facilities (power plants, oil refineries, and renewable energy facilities).

Advantages of the Firefighting Robotic System

Early Fire Detection

The system will detect fires at their early stages, allowing for swift intervention before the fire spreads and causes more significant damage.

Rapid Fire Extinguishing

Enables fast and efficient extinguishing of fires at their inception, reducing the potential for extensive damage to buildings, equipment, and materials.

Fully Autonomous

The system operates autonomously, eliminating the need for direct human intervention. This reduces the risk to firefighters in potentially dangerous situations.

Non-Destructive Extinguishing Materials

Early fire detection enables the use of extinguishing materials other than water. This is especially beneficial for protecting electronic equipment and materials that could be damaged by traditional water-based firefighting method.

Compatibility with Existing Systems

The system can be integrated seamlessly with already installed fire detection systems in buildings, enhancing the overall fire safety infrastructure.

Enhanced Safety for Firefighters

The system reduces the need for human firefighters to enter hazardous environments, minimizing the risk of injuries and fatalities.

Remote Control Capabilities

In situations requiring manual oversight, the system can be operated remotely, allowing firefighters to control it from a safe distance.

Precision in Fire Suppression

The system can accurately target fire sources with extinguishing agents, ensuring effective fire control while minimizing damage to surrounding areas.

Integration with Smart Systems

The robot can be connected to building management and emergency response systems for enhanced coordination and automated alerts.

Cost-Effective in the Long Run

Although the initial investment may be not cheap, the system reduces overall firefighting costs, insurance expenses, and fire-related losses.

Technical Specifications of the Prototype

Robot

- Robot Speed: 1.6 m/s
- Robot Load Capacity: Up to 100 kg
- Equipped with two fire extinguishers

Navigation System

- Autonomous navigation using LIDAR
- Scanning Angle: 180°
- Scanning Range: 10 meters

Fireball Launcher

- Adjustable Launch Angle: From 20° to 40°
- Launch Range: From 3 meters to 5 meters
- Capacity: 5 balls
- Launch Rate: 10 balls per minute

AI Fire Detection

- Pre-trained on over 140,000 fire images
- Recognition Speed: Up to 65 frames per second

Camera Specifications

- Resolution: Up to 4K
- Frame Rate: Up to 90 frames per second
- Adjustable Field of View: 65°, 78°, or 90°



Figure of the patent prototype

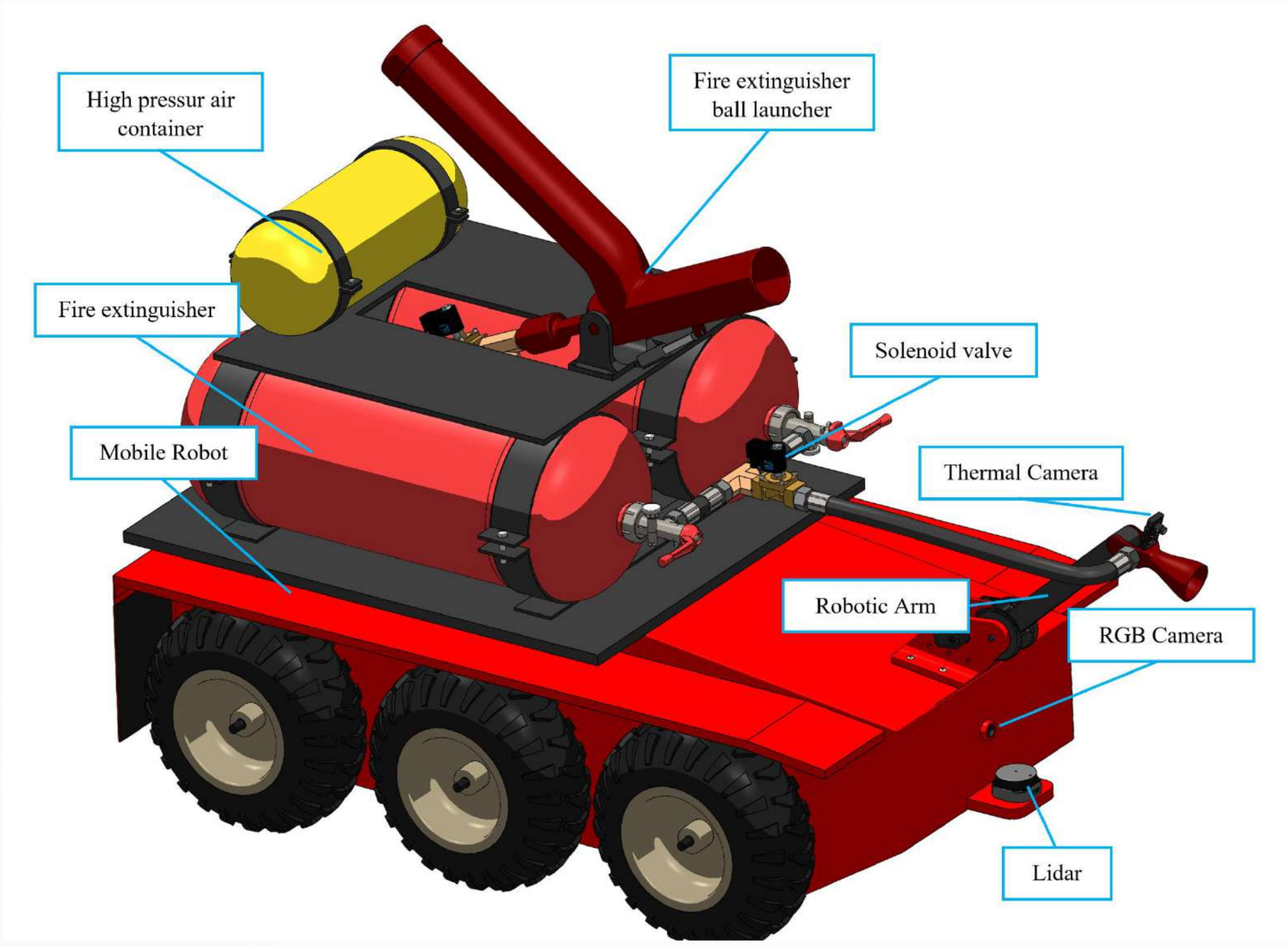


Figure of the robot and its components

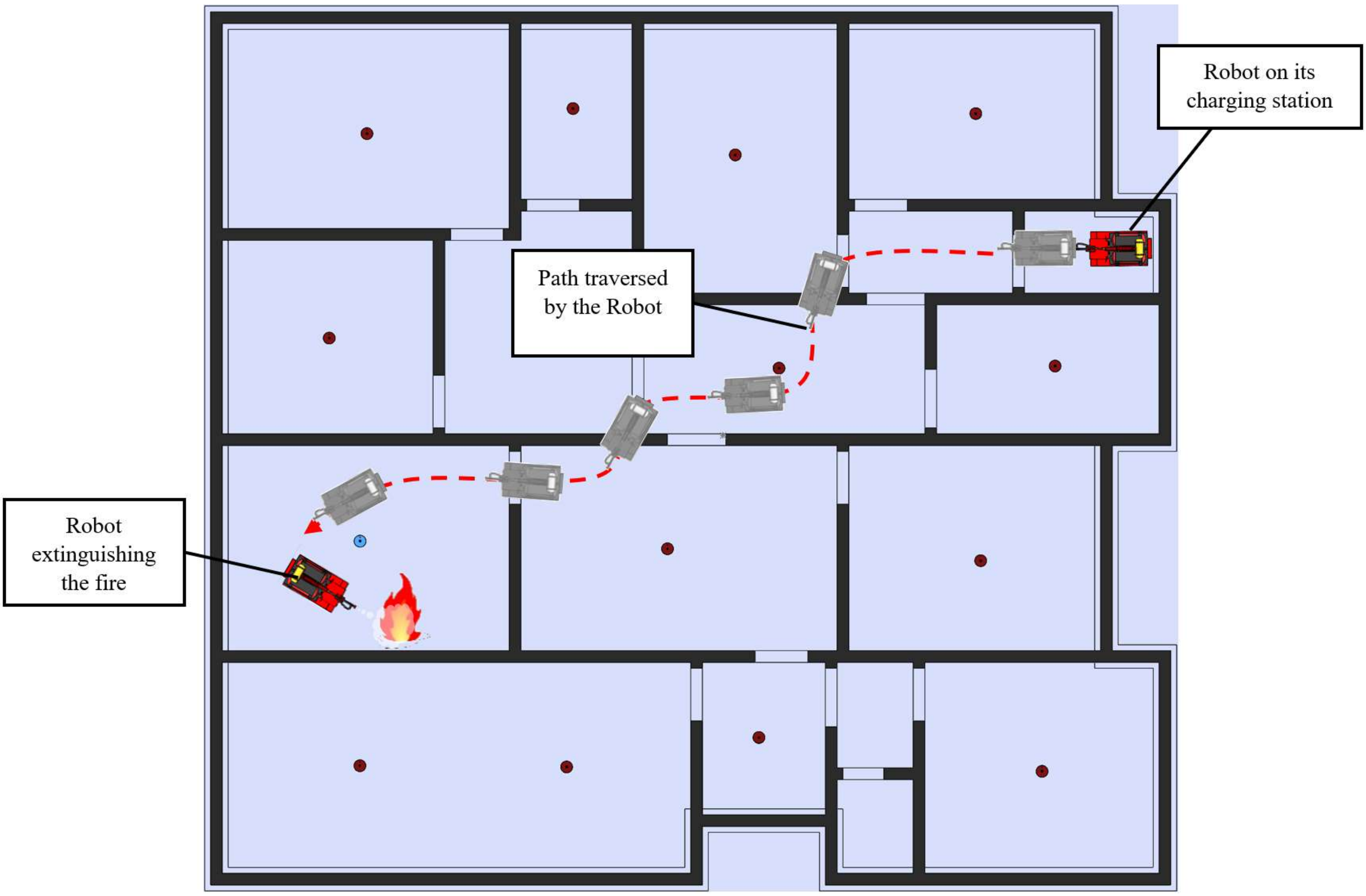


Figure of the operation of the system

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