



Industrial Consultancy & Sponsored Research (IC&SR)

Intelligent fire-fighting robot and method thereof IITM Technology Available for Licensing

PROBLEM STATEMENT

- Generally, it is noted that existing fire-fighting systems that replace humans include mobile self-contained & remote-controlled robots which are capable of safely operating in a combustible atmosphere.
- Such robots in general include non-sparking & non-arcing electro-mechanical & electronic components including a positively pressurized enclosure that houses the electro-mechanical & electronic components to prevent intrusion of the combustible atmosphere into the enclosure.
- However, these clamping mechanisms are not **flexible enough to adapt to different object dimensions** for providing a precise grip over the objects and existing robots **do not provide** accurate and better gripping of the objects on the robot's path.
- Hence, there is a need to mitigate above challenges & provide **efficient solution**.

INTELLECTUAL PROPERTY

IITM IDF Ref. 2143; Patent No: 411358

TECHNOLOGY CATEGORY/ MARKET

Technology: Fire fighter robot;

Industry: Industry; **Applications:** Industrial Application, Fire fighter robot;

Market: The global **Fire fighter robot** market is projected to grow at a **CAGR of 9.7%** during 2023 to **2031**;

TECHNOLOGY ALONG WITH IMAGE

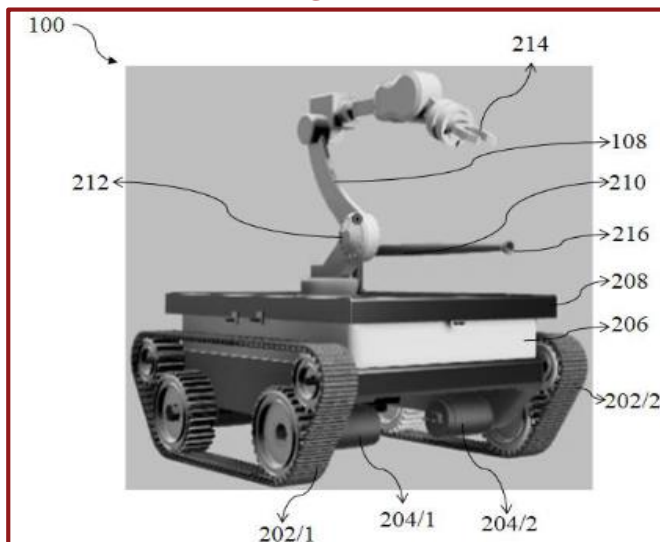
- The present invention describes an **intelligent and autonomous fire-fighting robot** and method for moving in a hazardous field, detecting fires, and thereby extinguishing the fires.
- Said fire-fighting robot comprises a **motion unit** to move around in the hazardous field, a **camera unit** with **multiple cameras** to capture multiple frame images, and

a **fire sensing unit** to detect the presence & depth of fires, &

a **control unit** with artificial intelligence that **activates at least one robotic arm** and **fire extinguishing unit** based on inputs received from the camera unit & the fire sensing unit. (Refer fig.1)

Said method is used for **detecting and extinguishing** fire & is **capable of removing obstacles** during the operation from the robot's path without human intervention, shown in Fig.2. The intelligent & autonomous fire-fighting robot is shown hereinbelow:

FIG. 1



Reference Numbers:100-Fire Fighting Robot; **202/1,202/2**-a pair of moving tracks connected to driving units(**204/1, 204/2**); **214**-gripper end effectors; **208**-cover, **206**-enclosure, **212**-arm controlling motor, **216**-hose, **210**-handle, **108**-Robotic arm.

TRL (TECHNOLOGY READINESS LEVEL)

TRL- 4, Proof of Concept ready& validated.

RESEARCH LAB

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TECHNOLOGY IMAGES

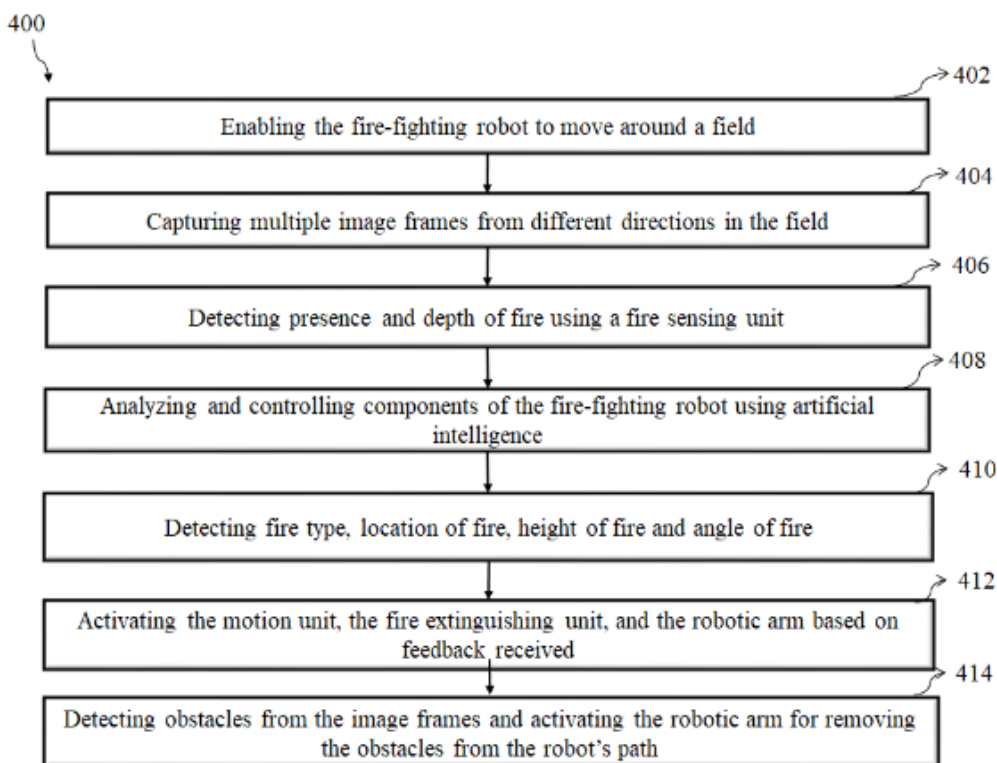


Figure 2: Illustrates a method for extinguishing the fire using the fire-fighting robot

KEY FEATURES / VALUE PROPOSITION

❖ Technical Perspective:

1. Provides an **autonomous fire-fighting robot** that is **waterproof & temperature resistant** & Said fire-fighting robot comprises **oxygen mask**.
2. Facilitates the **autonomous fire-fighting robot** that implements an **inverse kinematics algorithm** to **determine joint angles** and **positions of gripper end effectors** of a robotic arm comprised in the robot.

❖ Industrial Perspective:

1. Provides said robot that moves in any **kind of terrain & uneven surface** for monitoring & locating fires in a site, & operates **effectively, quickly & safely**.
2. Designed robot can **effectively aid firefighters** & thereby **mitigate** the effects of an accident. **Hence, a quick & efficient response** can be achieved **at the right time** which could **save multiple lives**.
3. Easily deploying the designed fire-fighting robot **at desired locations** either in **single or multiple based on the requirement**, where the location site must be monitored for fire accidents.

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