

IN THE RESOLUTION OF EMERGENCY SITUATION'S ROLE OF ROBOTICAL EQUIPMENT

D. S. Soatboyev
Independent Researcher

Sh. E. Kurbanbayev
Doctor of Technical Sciences, Professor, Research Institute of Emergency Problems and
Fire Safety of the Ministry of Emergency Situations of the Republic of Uzbekistan

Abstract

The research work briefly describes the level of effectiveness of remote-controlled robotic tools today. As a result of the research carried out within the framework of this research work, a model of a mobile robotic device with remote control, designed for emergency response and monitoring of the situation, was developed and studied as information for the purpose of making additions to it. Research and test results confirmed that the capabilities of the developed mobile robotics tool after modification differ from the initially established technical indicators for the better.

Keywords: Mobile robotics, remote control, Stationary robotics, ultraviolet, infrared sensors, audio-auditory device, water fire monitors, foam sprayers, powder fire extinguishing module (TUNGUS), handle, visual cameras, infrared cameras, gas concentration sensors and rangefinders, localization, manipulation, emergency, fire, monitoring, rescue.

Introduction

In the New Uzbekistan, which is developing in the spirit of today and striving for high goals, significant work is currently being carried out to develop science and introduce innovations. In this regard, to date, a number of laws, decrees, and resolutions have been adopted in our republic, including the Laws "On Science and Scientific Activity" and "On Innovative Activity," Among them are the decrees and resolutions "On Approving the Concept for the Development of Science until 2030," "On Additional Measures for the Commercialization and Enhancement of the Effectiveness of the Results of Scientific and Scientific-Technical Activities," and others [1-4].

Currently, extensive work is being carried out in the Ministry of Emergency Situations to enhance science, develop scientific research and innovation, and create new conditions for talented young scientists. Due to the fact that employees (rescuers) of the Ministry of Emergency Situations regularly encounter dangerous conditions in the elimination of emerging emergencies and the preservation of human lives, the need to use remotely controlled robotics

in their elimination is increasing, and information about robotics is being studied more and more deeply every day.

Artificial intelligence, which is becoming a symbol of today, as well as the aforementioned Robotics, is a mechanical device that perceives the environment through sensors, is controlled by computer programs based on its environment, and is controlled by a human operator.

Based on the literature, let's take one of the studied data as an example. In 2011, in the USA alone, 70,090 firefighters were injured while performing their duties, of which 61 died [5-6].

In many developed countries of the world, various robotic systems, i.e., robotics, are being developed to support rescuers from various fires and other emergencies affecting structures, vehicles, aircraft, ships, and wild areas. In addition to the wide range of fires and other emergencies, the functionality of robotics can be modified to assist rescuers in tasks such as fire assessment, identification of trapped people, finding the fire source, monitoring conditions, limiting the spread of fire, and eliminating it.

There are two main types of robotic tools developed for fire and other emergencies: **stationary** and **mobile** systems.

Stationary robotics tools - automated fire monitoring devices, used in areas with increased fire risk and requiring rapid extinguishing.

Examples include aircraft landing areas, warehouses, i.e., product storage areas, tunnels, and other similar places. In this system, robotic devices with installed ultraviolet and/or infrared sensors are used to detect fires and correctly direct fire extinguishing equipment (Fig. 1 [7]).



Figure 1: Stationary Robotics Tool

Mobile robotics tools - an innovative device with many more advanced features, remotely controlled by operators, for accessing, monitoring, helping to eliminate emerging hazardous situations, and performing a wide range of tasks in places inaccessible to rescuers (Figure 2 [8]).



Figure 2: Mobile robotics tool

Mobile robotics equipment mainly includes remotely controlled internal fire extinguishing devices, surveillance cameras, audio-audit devices, and several other necessary equipment. Mobile robotics are mainly divided into two types: wheeled and/or chain (tracked). Some of their features are as follows:

- moves at an average speed of 2.4-20 kilometers per hour;
- average weight 450-9300 kilograms.

One of the main tasks of mobile robotics is firefighting. Robotics also receives power from batteries or diesel engines. Installed fire extinguishing devices (modules) include water fire monitors, foam sprayers, powder fire extinguishing module (TUNGUS), sprayers in articulated arms with a wide range of motion, and handles for creating water fog.

In addition to the remote control capabilities of mobile robotics, these systems use wireless communication to transmit data from sensors on board the robot to the operator to assist in navigation and firefighting. Sensors in robots include visual cameras, infrared cameras, gas concentration sensors, and rangefinders that help avoid obstacles.

Although advances in the field of artificial intelligence, that is, the use of robots, are accelerating in limited, chaotic internal environments, it is difficult to use robots to move through unknown spaces and still requires a certain level of human activity. Moreover, object identification, localization, and manipulation is a complex task, which still requires a human operator and large computing power, especially for performing tasks on unknown objects.

In the future, the use of robotic tools in fire and other emergencies will depend on the robot's durability, sufficient sensors for observing and perceiving the environment, task capabilities, cost, degree of autonomy, and speed of movement.

References

1. Law of the Republic of Uzbekistan dated October 29, 2019 No. 3PY-576 "On Science and Scientific Activity."
2. Law of the Republic of Uzbekistan dated July 24, 2020 No. 3PY-630 "On Innovation Activity."
3. By Decree of the President of the Republic of Uzbekistan dated October 29, 2020 "On Approval of the Concept for the Development of Science until 2030" Decree No. UP-6097.
4. Resolution of the President of the Republic of Uzbekistan dated July 14, 2018 No. PP-3855 "On Additional Measures for the Commercialization and Enhancement of the Effectiveness of the Results of Scientific and Scientific-Technical Activities."

5. M. J. Carter and J. L. Molis, 2012, "US Firefighters Injuries-2011" NFPA, Fire Analysis and Research Division.
6. R. F. Fahy, P. R. LeBlanc and J. L. Molis, 2012, "Firefighters' Deaths in the United States-2011" NFPA, 2012.
7. <https://www.ecs-sko.ru/catalog/factory/16095/>
8. <https://russian.alibaba.com/product-detail/Leading-Reliable-Fire-Fighting-Robot-60684990680.html>