

Discussion on application of artificial intelligence robot in fire prevention and rescue

Changpeng Liu, Guangdong Sun, Zhuolin Li, Qingsen Zhong
Guangdong University of Science and Technology, Dongguan 523000, China

Abstract: With the development of science and technology and the progress of society, fire has become a common and serious disaster. The traditional means of fire prevention and rescue in some cases have a certain degree of limitations, therefore, the application of artificial intelligence robot in fire prevention and rescue has attracted much attention. Artificial intelligence robot has the ability of autonomous perception, decision-making and execution, which can effectively deal with fire accidents and provide new solutions for fire prevention and control. The purpose of this paper is to systematically discuss the application of artificial intelligence robot in fire prevention and rescue, analyze the robot's perception ability, decision-making ability and execution effect in the fire scene, and put forward the methods and suggestions to solve the relevant problems. Its significance is to provide new ideas and technical support for fire prevention and control work, improve the efficiency and safety of fire prevention and rescue.

Key words: Artificial intelligence; Robot; Fire prevention and rescue

I. Overview of artificial intelligence robot technology in fire prevention and rescue

Artificial intelligence robot technology in fire prevention and rescue refers to the use of artificial intelligence technology and robot technology to develop a robot system that can carry out early warning, rescue, fire fighting and other work when a fire occurs. These robots can independently judge the fire scene and perform the corresponding tasks through the ability of perception, reasoning and decision making. The following is a discussion on the application of artificial intelligence robots in fire prevention and rescue.

1. Fire warning: Artificial intelligence robots can sense the occurrence of fire in real time through fire sensors, smoke sensors and other equipment, and issue alarms to relevant departments in time to provide information such as the location and degree of fire occurrence to assist in the rapid disposal of fire.

2. Fire scene detection: equipped with all kinds of sensors and cameras, artificial intelligence robots can enter the fire scene, efficiently detect the fire source, smoke density, temperature changes, etc., provide detailed fire scene information for rescue workers, and help formulate reasonable fire fighting and rescue plans.

3. Autonomous fire extinguishing: According to the situation of the fire scene, the artificial intelligence robot can independently make decisions and perform fire extinguishing tasks. For example, the robot arm equipment is used to extinguish the fire and inhibit the spread of the fire; The use of water guns or spray devices carried by robots to spray water; And the use of robots for personnel evacuation.

4. Search and rescue “: Artificial intelligence robots can carry cameras and special equipment into the fire scene, real-time monitoring of the fire area, looking for trapped people, and assist rescue workers to carry out rescue operations to improve rescue efficiency and safety.

5. Late fire work: After the fire is put out, artificial intelligence robots can undertake cleaning and reconstruction work, such as cleaning up residual fire items, blocking leaking pipes, etc., to reduce the human burden.

In short, the application of artificial intelligence robots in fire prevention and rescue can provide real-time fire information, perform fire fighting and rescue tasks, improve rescue efficiency and safety, reduce the risk of personnel, and provide strong support for rapid response to fire incidents. In the future, with the continuous progress of artificial intelligence technology and robot technology, the application prospect of artificial intelligence robot in fire prevention and rescue will be broader.

II. The application of artificial intelligence robots in fire prevention

1. Fire warning and monitoring

In terms of fire prevention, AI robots can collect and analyze a large amount of information from historical fire data, environmental parameters, building structures and other aspects through AI algorithms and big data analysis to help identify potential fire risk areas and fire causes, and provide early warning and decision support for fire departments and related agencies. Based on the fire warning algorithm, the artificial intelligence robot can be equipped with fire warning equipment in key areas such as buildings, enterprises and institutions, and public places, and carry out real-time linkage with the fire center or management personnel, in case of abnormal conditions (such as smoke, temperature rise, etc.), the robot can quickly and accurately warn and trigger alarm measures. Equipped with sensors and cameras, the artificial intelligence robot can monitor the environmental parameters inside the building in real time, such as temperature, humidity, gas concentration, etc. Once an abnormal situation occurs, the robot can issue an alarm in time, provide real-time information when the fire occurs, and help the fire personnel better respond to the fire. Through the application of artificial intelligence robot in fire prevention, the fire risk can be discovered in advance, the probability of fire occurrence can be reduced, and the early warning ability and response speed of fire can be improved. This will improve the level of fire prevention and control and personnel safety to a certain extent.

2. Fire risk assessment and fire prediction

In fire prevention, artificial intelligence robots can be applied to fire risk assessment and fire prediction, the specific applications are as

follows:

(1) Fire risk assessment: Artificial intelligence robots can assess the risk of fire by collecting various data such as buildings, equipment and materials, and using machine learning algorithms for data analysis. The robot can use sensors to detect the status of buildings and equipment, such as the temperature of electrical equipment, the status of batteries, etc., while combining historical data for analysis, accurately evaluate the fire probability and risk level, and put forward corresponding preventive measures and improvement suggestions.

(2) Fire prediction: Based on historical fire data, environmental factors, personnel density and other data, artificial intelligence robots can use data mining and machine learning algorithms for fire prediction and analysis. By monitoring and analyzing the data in real time, the robot can detect the potential fire trend, predict the area and time of possible fire, and take corresponding fire prevention measures in advance. This helps improve the accuracy and efficiency of fire prevention.

(3) Guide fire prevention measures: Based on fire risk assessment and prediction results, AI robots can provide relevant advice and guidance to help develop and implement effective fire prevention measures. The robot can provide detailed prevention programs and necessary training to relevant personnel according to the specific situation, so as to improve the work effect and efficiency of fire prevention.

Through the application of artificial intelligence robots in fire risk assessment and fire prediction, potential fire risks can be discovered in advance, possible fire occurrence can be predicted, preventive measures can be taken in time to reduce the occurrence of fire, and scientific guidance and support can be provided for fire prevention and control work. This will greatly improve the ability and level of fire prevention and control, and ensure the safety of personnel's lives and property.

III. The application of artificial intelligence robots in fire rescue

1. Fire scene search and rescue

Artificial intelligence robots can be applied to fire scene search and rescue. Artificial intelligence robots can be equipped with various sensors and cameras to enter the fire scene, perceive and collect detailed fire scene information in real time, such as temperature, gas concentration, smoke density, etc., to provide accurate fire scene data for rescue workers. This helps determine the best rescue path and method. Ai robots can assist in the search of fire sites and the location of people by being equipped with cameras, infrared sensors and other equipment. The robot can enter the fire area, detect and identify the location of trapped people, and guide rescue workers to accurately find the location of trapped people through real-time image transmission or voice-activated guidance. Artificial intelligence robots can carry out real-time information transmission and communication with rescue workers at the scene of a fire. Equipped with voice recognition and speech synthesis technology, the robot can receive instructions from rescue workers and respond by voice to convey the situation at the fire scene, help information and rescue needs. This helps improve the efficiency of cooperation and the accuracy of command at the fire scene. Ai robots can be equipped with fire-fighting equipment, such as water guns and fire extinguishers, to independently carry out fire-fighting operations. The robot can analyze the fire according to the fire extinguishing algorithm, determine the best fire extinguishing strategy and path, and implement fire extinguishing actions. In addition, the robot can assist rescue workers in personnel evacuation and safe transfer, providing real-time guidance and assistance. Artificial intelligence robots can take on the task of loading and delivering relief supplies. The robot can carry rescue materials such as first aid kits, gas detectors and breathing apparatus according to on-site needs, safely transport the materials from dangerous areas to the places needed by rescue workers, and provide support for rescue work. The application of artificial intelligence robots in search and rescue at the scene of fires can reduce the risk of rescue workers and improve the efficiency and success rate of rescue. The rapid response ability and autonomous decision-making ability of the robot, combined with real-time fire information and rescue needs, provide important support and help for fire rescue.

2. Fire smoke identification and indoor navigation

In fire rescue, artificial intelligence robots can be applied to fire smoke recognition and indoor navigation, and can be equipped with equipment such as smoke sensors and image sensors for detecting and identifying smoke at the fire scene. By collecting real-time smoke parameters and analyzing smoke images, it can provide smoke-related rescue decisions and actions. Artificial intelligence robots can use map navigation, positioning and path planning technologies to provide indoor navigation services for rescue workers. Through map modeling and autonomous positioning, the robot can accurately identify indoor information such as floors, rooms and passageways, find the best rescue path, and lead rescue workers to accurately reach the fire scene or the location of trapped people. Combined with virtual reality technology, the robot can provide rescuers with more intuitive and real-time navigation guidance. Equipped with a headset or projection device, the robot can superimpose virtual navigation paths and signs in the real scene, providing specific and clear navigation information to help rescue workers quickly and accurately find the target location. Equipped with speech recognition and synthesis technology, the robot provides voice navigation and interactive functions. The robot can receive voice commands from rescue workers and give clear voice navigation guidance based on real-time fire information and floor structure to help rescue workers quickly find the target location at the fire scene or in the maze-like building environment. It is equipped with various sensors, such as Lidar and infrared sensors, to identify possible obstacles and dangerous areas at the fire scene. Through real-time perception and analysis, the robot can avoid collisions with obstacles, optimize rescue paths, and ensure the safety and efficiency of rescue operations. Through the fire smoke recognition and indoor navigation application of artificial intelligence robots, accurate fire information and navigation guidance can be provided to help rescue workers quickly and safely reach the fire scene or the location of trapped people. This will greatly improve the rescue efficiency and success rate, reduce casualties and property losses, and provide important technical support for fire rescue work.

3. The potential development of artificial intelligence robots in fire prevention and rescue

With the continuous progress of artificial intelligence technology, the autonomous decision-making and action ability of artificial intelligence robots in fire prevention and rescue will be further improved. Robots can learn from a large amount of fire data and practical experience through algorithms such as deep learning and augmentation learning, and make more accurate and intelligent decisions based on field conditions to improve the effectiveness and efficiency of fire fighting and rescue operations. In the future, the application of artificial intelligence robots in fire prevention and rescue may develop in the direction of multi-robot cooperation. Multiple robots can exchange information in real time through the communication network, and cooperate to complete the investigation, search and rescue tasks at the fire scene. This will greatly improve the scale and efficiency of rescue operations, while reducing the burden on a single robot.

IV. Conclusions

This paper mainly discusses the application of artificial intelligence robot in fire prevention and rescue, and discusses in detail the application of artificial intelligence robot in fire warning and rescue after fire. By analyzing the relevant research and practical cases, we show the broad application prospect of artificial intelligence robot in fire prevention and rescue. Although the application of artificial intelligence robots in fire prevention and rescue has made certain progress, there are still many challenges to be solved and many future research directions worth further exploration.

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About the author: Liu Changpeng (1973-), male, Han nationality, born in Jingmen, Hubei Province, master degree, associate professor; Research interests: Electrical control, robotics, numerical control, mold technology.