

Application of UAV in Fire Emergency Communication Support

Liguo Xue¹, Yue Chang²

¹Lvliang Fire Rescue Brigade, Lvliang 033000, Shanxi, China

²Department of Mining Engineering, Lvliang University, Lvliang 033000, China

Abstract: Fire emergency communication is an important guarantee condition for the orderly and rapid development of fire emergency rescue work. However, the complexity of emergency rescue environment and the weakness of communication support force increase the difficulty of fire emergency communication support and affect the effect of communication support. Considering the importance and necessity of communication support in fire emergency rescue, as well as the gradual maturity of UAV technology, more and more fire emergency rescue work has introduced UAV technology, with the help of UAV to improve the support of emergency communication. This paper summarizes the practical application situation and advantages of UAV technology in fire emergency communication support, and elaborates the problems that need attention in the application of UAV in fire emergency communication support, so as to provide the corresponding reference for the application and development of UAV in fire emergency communication support.

Keywords: UAV technology fire emergency communication support.

1. Introduction

In recent years, with the research and application of related technologies, the functional attributes of UAV are constantly improved, and its application scope is also gradually expanding, seemingly becoming a new type of intelligent equipment. In view of the advantages of UAV in space operation and flexible maneuverability, fire emergency rescue subjects try to introduce UAV technology in some relatively complex rescue environments, and carry out high-altitude reconnaissance, search and image data collection by UAV, which effectively promotes fire emergency rescue work [1]. Of course, in addition to the important role of drones in collecting information, they are also playing an increasingly obvious role in guaranteeing communications. Compared with ground communication facilities and satellite communication facilities, UAV has become the primary choice for communication support in fire emergency rescue due to its high altitude operation, strong mobility and low professional requirements. Research on the application of UAV in fire emergency communication support can promote the use of UAV in a wider range of fire emergency rescue activities, so as to improve the comprehensive strength and effect of fire emergency rescue [2-3].

2. Application Status of UAV in Fire Emergency Rescue

Under normal circumstances, fire emergency rescue is extremely dangerous, in the face of a variety of uncertain factors, add a certain degree of difficulty to the rescue work, rescue efficiency is lower, but also make the personal safety of fire personnel can not be guaranteed. In the face of these problems, fire and rescue departments are also exploring solutions. The discovery and use of UAV alleviates the problems previously faced, provides more help for fire emergency rescue, improves rescue efficiency, reduces rescue time, and protects the lives of disaster victims and their own safety [4]. For example, in the face of fierce fire or rescue

personnel have no way to enter the area, can be used to replace the staff to complete the disaster view, fire situation, site information processing and other series of work, in the drone search is completed, the information is transmitted to the fire rescue personnel here, fire workers in the understanding of the disaster information, Can better judge the disaster situation, plan a reasonable rescue route and rescue plan. Especially in the current environment, the buildings are more compact, the population is more dense, and the construction of commercial streets is highly concentrated. When a fire breaks out, the scene situation will be very chaotic, with too many people, complex environment, and products like fireworks may be sold in shops, which will increase the difficulty of rescue. The most important thing for fire emergency rescue is time, and the waste of every minute and second may cause unpredictable casualties. However, in front of many complex fires, fire personnel cannot enter the scene or need a long time to prepare to overcome numerous difficulties. Due to the large amount of time spent, certain casualties are bound to be caused [5]. Attach importance to and strengthen the research of UAV in fire emergency rescue, attach importance to the relationship between UAV and regional environment, choose the appropriate type of UAV by analyzing the environment of different regions and cities, plan more accurate flight orientation and flight altitude, so as to thoroughly analyze the fire situation and provide both efficient and accurate information. Lay a foundation for fire protection personnel to formulate scientific and correct rescue plan, and carry out rescue activities better.

3. Advantages of UAV in Fire Emergency Rescue

With the increasing maturity of UAV technology, the functions of UAV are gradually increasing. There are more options for the functional requirements of UAV, which can meet the needs of different fire emergency rescue work. There are many types of UAVs, such as military UAVs and civilian UAVs; Select according to the task height, ultra-low altitude, low altitude, hollow UAV, etc.

3.1. High Security

The application of UAV is very high, which can cope with a variety of complex environments. The use of UAV rescue can reduce the opportunity for personnel to enter the accident site in person, avoid the risk of fire personnel being damaged by smoke or trapped in the fire site, and ensure the safety of staff. In the face of various unstable environmental factors, the UAV can be adjusted in time to successfully complete various tasks. Shorten the emergency rescue time and reduce the occurrence of more accidents.

3.2. Simple Operation

The structure of UAV is simple, the operation is very simple, convenient for the relevant staff to learn, do not use too much energy to learn how to use or find professionals, after simple study and research can fully master the use of skills, especially in the UAV type is more and more extensive, involving more and more fields, can meet the needs of various situations. Take multi-rotor UAV as an example. It can fly by remote control or complete automatic flight according to the previously specified route, which is simple and convenient without too much human intervention. In addition, it can also make use of its technology and function according to the needs of rescue personnel to achieve visual control of fire, a broader field of vision, investigation and analysis of all sides, access to more adequate information resources, more conducive to the development of fire rescue work.

3.3. Information Transmission

During the rescue work, the information transmission and communication in the rescue process is an extremely critical step, but it is also the most difficult task. The environment at the rescue site is usually complex, which makes the safety of the fire personnel can not be fully guaranteed, not to mention the information transmission is even more difficult. However, the application of UAV can well solve this problem. The UAV will send the collected information, video, audio and other information to the fire command center in the first time through the wireless transmission of communication. After receiving the detailed information of the fire accident, the fire control center can conduct a deeper analysis and obtain more accurate information. Work out a suitable rescue plan [6-7]. In addition, it can also install loudspeakers and other loudspeakers on the UAV, which can transmit rescue information outside the accident to the accident site, calm the trapped people's emotions, maintain the order of the scene, provide a better rescue environment for the rescue work and speed up the rescue progress.

4. Problems Needing Attention in The Application of UAV in Fire Emergency Communication Support

Although the application of UAV in fire emergency communication support can improve the support force and effect of communication in emergency rescue and improve the accuracy and effectiveness of rescue work, there are some technical limitations of UAV at present. Therefore, in the application process of UAV, the rescue subject should be based on the reality

Situation for flexible application.

4.1. Improve the stability of UAV

Affected by the limited remote sensing platform technology,

the accuracy of images collected by UAV is weaker than that of satellite remote sensing technology, which cannot provide high-definition images for on-site rescue personnel, increasing the time and difficulty of rescue information processing [8]. At the same time, the characteristics of small size and light weight of UAV make it easy to be affected by air fluidity and other factors in the flight process of vibration, resulting in unstable audio and video information. Based on these problems in freshness and stability, it is necessary to improve the stability of UAV operation and ensure the clarity of information collected by UAV from the perspective of carrying equipment and related technologies.

4.2. Reasonable arrangement of UAV

The arrangement of UAV mainly includes quantity arrangement and position arrangement. In terms of quantity, although the use of more UAVs can increase the port of site information collection, it also increases the workload of information identification and prolongs the implementation of rescue work. Therefore, according to the actual situation of rescue site operation, the number of UAVs should be jointly launched to ensure the communication support function of uAVs and improve the operation efficiency of uAVs. In terms of location arrangement, on-site emergency rescue personnel should arrange corresponding UAVs in different positions according to the actual situation of the rescue site, and reasonably set the functions of UAVs, so that UAVs with various functions can be coordinated and meet the actual needs of rescue [9-10].

4.3. Cultivate professional UAV operators

Fire emergency communication is usually a support work carried out in very complex situations with urgent communication needs. Only by using professional personnel to operate the UAV, can the position of the UAV be accurately arranged in the shortest time and the functions of the UAV be well adjusted. Therefore, in peacetime UAV emergency communication drills, it is necessary to consciously train professional UAV operators, so as to make the operation more accurate and effective and avoid the occurrence of UAV operation errors. For example, UAV operation training and assessment can be included in the comprehensive skills training and assessment of fire emergency personnel, and the operation skills of operators can be improved by means of professional and centralized training.

5. Conclusion

With the development of artificial intelligence technology, the application of UAV in fire emergency communication support will be further developed. In particular, with the continuous upgrading and development of Internet of Things, deep learning technology and big data technology, UAV technology can better realize fire emergency communication in different environments and build a perfect emergency communication support system, so as to help fire rescue personnel carry out rescue missions efficiently.

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