

# Research on the application of UAVs in the security of major events

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**Abstract.** UAVs have developed rapidly in the police due to their mobility, concealment, wide field of vision, shocking, and other attributes, especially in emergency response, aerial investigation, security guards, social security management, and emergency rescue. And other aspects have played advantage and improved work efficiency. As the application of police drones in various police department departments becomes more and more extensive, some problems are increasingly exposed and highlighted in actual combat applications. It is urgent to standardize and improve the application of police drones to improve the Three-dimensional combat capability effectively. The article analyzes this. The construction of an efficient UAV application system for the security of significant events is the functional requirement of the police in the new era. It is an essential means to improve social security's comprehensive prevention and control capabilities and realize the integration of air and ground for significant events. This paper mainly discusses building a UAV public security prevention and control system from the aspects of construction background, requirements, key protection locations, and critical technologies.

**Keywords:** UAV; major events; security; application.

## 1. Introduction

In order to better protect the safety of the people, further enhance the core combat effectiveness of the police, and expand the scope of police protection, the drone security prevention, and control system came into being. The UAV public security prevention and control system adopts distributed network arrangement of multi-source heterogeneous sensors to achieve seamless detection coverage of low-altitude airspace[1]. Through wired, wireless, and other communication networks, target detection, data fusion, target identification, threat assessment, comprehensive processing, etc. The system can integrate the overall efficiency of each device and achieve rapid deployment, timely response, and comprehensive protection in the case of limited police conditions. Under the background of the rapid development of drones and the intensifying phenomenon of various "black flying drones," the security prevention and control system of drones is an important factor for the police to deal with the security of key areas, maintain national political and social stability, and build low-altitude airspace security [2].

## 2. Requirements for the construction of the prevention and control system for drones in the security of major events

There are many factors, such as cross-business, cross-department, cross-system, cross-network, etc., in the construction of a UAV public security prevention and control system. Therefore, it is required to realize networked and multi-level information sharing in the process of its construction and realize intelligence, Efficient synthesis of command and disposal [3].

### 2.1 Distributed collaborative processing capability and scalability optimization

For the public security prevention and control needs of UAVs in key areas, defense areas, and temporary sites of major events, a distributed and gridded UAV security prevention and control system should be built, and each grid site can quickly report the target through an efficient communication network. Information and control instructions are issued, and at the same time, the

police forces in the area and nearby are called in a centralized manner to improve the cooperative processing ability of UAVs. Through the open network architecture, more mature and effective detection and disposal equipment can be incorporated into the integrated command and control system, thereby improving its ability to continuously expand and optimize[4].See picture 1.

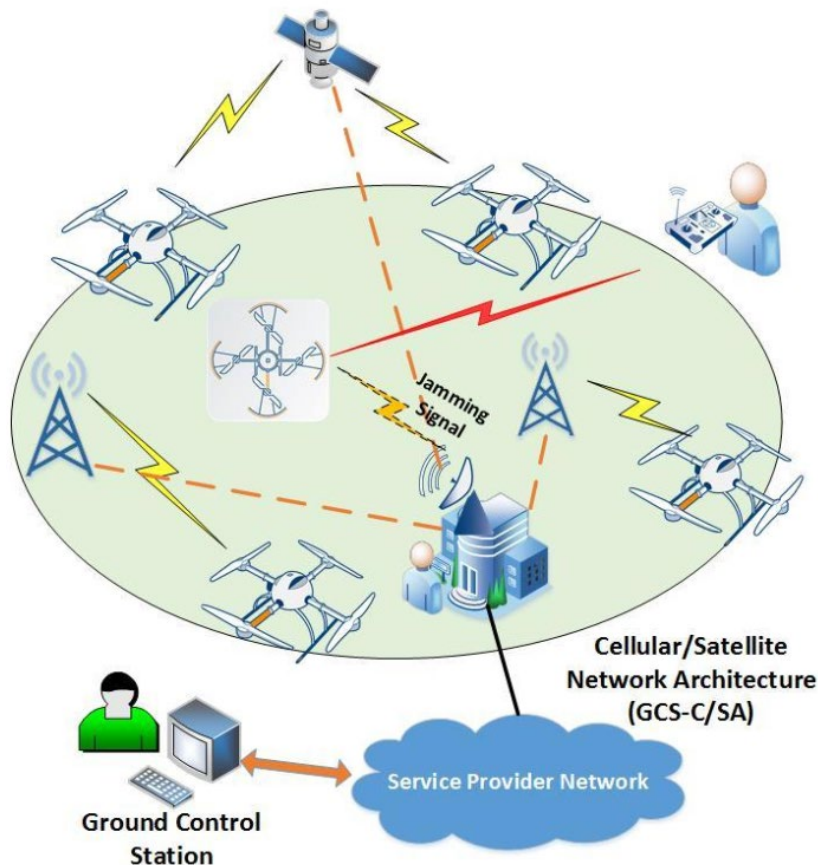


Fig. 1 UAV in security prevention and control system structure

## 2.2 Integrate the capabilities of every single set of equipment to improve the systematic detection performance

The UAV public security prevention and control system integrates UAV detection equipment (mainly including radar detection, radio detection, photoelectric detection, etc.), UAV interference suppression equipment (mainly including power suppression, smart directional suppression, decoy suppression, etc. ), capture and destroys equipment (mainly including physical capture, energy wave destruction, etc.), by optimizing the configuration of equipment and adopting a variety of technical means to jointly coordinate to build a systematic UAV public security prevention and control capability to ensure the safety of key areas [5].

## 3. Scenario application analysis of drones enabling security in major events

### 3.1 The scenario application of major event security has its own uniqueness

First, small data in a relative sense. The physical scope, guard objects, and prevention goals of major event security are basically determined, visualized, and limited. Compared with other social and public security fields, the data generation volume of the security link of major events is small, the cycle period is short, and the amplitude of increase and decrease is low, which is not enough to support advanced algorithms to build calculation models and draw credible conclusions, and it is difficult to achieve on the basis of small data collection. It is impossible to quickly provide a reliable prevention basis for full-dimensional accurate calculation. Second is the fragmentation of security

demand terminals. The security of major events involves different scenarios such as perimeter protection, hazard detection, security inspection, entry and exit control, document inspection, airspace control, encrypted communication, etc. The technical application requirements of a single link have specific and fragmented attributes, which is very important for intelligent technology. The scene embedding and landing matching of the means pose great challenges, which are equivalent to the customized scene integration and fusion applications of various AIs. Third, the capabilities of the application side and the operation and maintenance side are different. Even if the supply side of the integrated software and hardware solution is in place, manual operation or even full-time duty is required at any time in the specific aspects of the security practice application of major events. Whether security personnel can freely control new equipment, especially AI technology, largely determines the upper limit of the effectiveness of security technology for major events. In addition, companies that provide technology and equipment also need to invest in enough operation and maintenance personnel to escort security operations so as to solve various technical problems that may arise at any time. See picture 2.

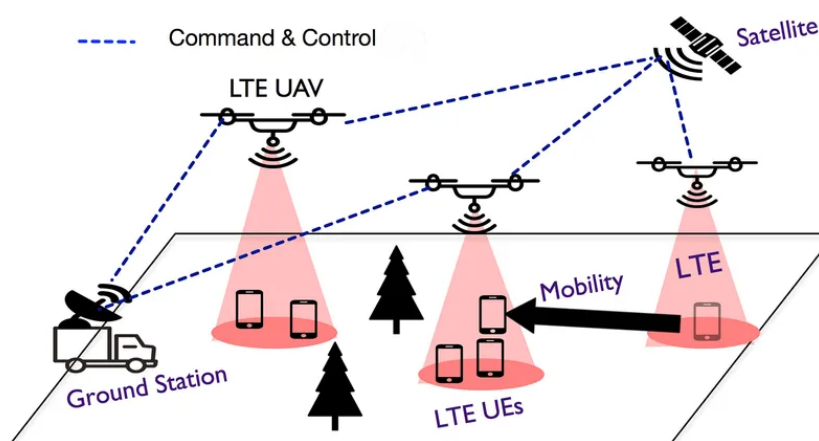


Fig. 2 Drones in Wireless Mobile Security Systems

### 3.2 Security sub-scenario applications that can be realized by mainstream UAV technology

The unique advantages of big data cloud computing technology are reflected in the aspects of mass storage, intelligent analysis, and interconnection. The unique advantages of face recognition technology are that it is fast and convenient, no contact is required, and it is not easy to detect. Its combat power output scenario lies in the identification and verification of specific personnel and risk warning. The unique advantages of intelligent monitoring technology are reflected in two points: automatic identification, tracking and monitoring, and intelligent analysis and judgment. The unique advantages of digital communication technology are reflected in strong anti-interference, easy encryption, and high reliability. Its combat power output scenarios include wireless communication, mobile command, and emergency communication support. The unique advantages of intelligent patrol control technology lie in its wide coverage, strong adaptability, and uninterruptedness. The unique advantages of bayonet intelligent management technology are reflected in unattended, intelligent traffic, efficient and fast, and its combat power output scenarios include entrance and exit control at the event site and vehicle classification management.

### 3.3 Scenario design of drones to make up for the shortcomings of security forces in major events

This design mainly points to the exploration of the combined application of "HD video + big data + cloud computing + deep learning + face recognition." For example, after the data of criminal fugitives or key security personnel are entered into the database, once this personnel appears in the major activity control area or warning area, they will be accurately captured by the camera and automatically compared through the face image database, and trigger the background early warning

prompt. Inform the security personnel to take effective precautions and even take measures such as arrest and removal as soon as possible to eliminate potential safety hazards. This quickly and efficiently makes up for the inefficiency of manual inspections and extensive management and control in the traditional security model and solves the problem of high consumption and low efficiency that the security department wastes a lot of grassroots police force in the control of key personnel. The advantage of this type of technology application lies in the long-distance "senseless" data collection, and the difficulty lies in the efficiency of data analysis and recognition in dynamic scenes and complex environments. If the accuracy of the technology can meet the requirements in a specific scenario, and the risk of error can be tolerated, then the technology is valuable.

#### 4. The structure of the application system in the security of major UAV activities

The security monitoring system of a UAV is composed of a UAV remote sensing system and wireless mobile communication technology. When the UAV runs the security monitoring system, the UAV will transmit the pictures taken at high altitude to the remote sensing system through the wireless network, and the remote sensing system will then issue the corresponding commands to the UAV through the wireless mobile communication technology. The structure of the UAV includes the body of the aircraft, the navigation system, the power supply system, the global positioning system, and the high-definition camera system. See picture 3.

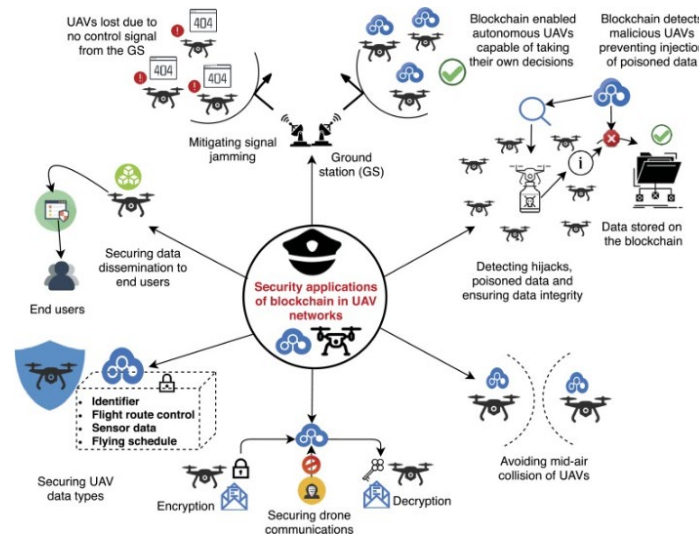


Fig. 3 Application system in security of major events of drones

##### 4.1 Flight control system

The flight control system of the UAV is equivalent to the human brain. The instructions sent by the flight control system to the UAV can directly affect the stability of the UAV during flight, as well as the information the UAV conveys to the ground during the flight state. Timeliness and accuracy of relevant data. It can be seen that the flight control system of the UAV can affect the actual effect of the UAV when it performs the task.

##### 4.2 Data link system

The data link system of the UAV is closely related to the transmission of remote sensing instructions of the UAV and the function of receiving and sending information during the flight of the UAV. The data transmission of the UAV mainly includes video images and status data collected by the UAV in the flight state, and the UAV transmits the relevant information collected to the ground receiving personnel for the use of the background personnel; the UAV moves through the world The communication system, code multiple access networks, and 4G wireless broadband technology are

used to receive the commands of the remote sensing system so that the UAV can achieve high-speed improvement during the operation process.

### 4.3 HD Camera System

The high-definition camera system of the UAV can transmit the pictures and video content collected by the UAV during the flight to the background of the remote sensing system or the memory card. The high-definition camera system is mainly for the collection of pictures and videos.

### 4.4 Global Positioning System

Relevant technicians can locate the location of the drone at any time during its flight of the drone. This effect can be achieved by the role of the global positioning system of the drone. When the drone is flying Due to a crash for some reason, the relevant technicians can also determine the crash location of the drone by positioning and recovering it.

## 5. Practical application of drones in security before major events

The security work in the security of major events is related to whether the security of major events can be carried out smoothly, and the preliminary security work before the event is the foundation of the entire security work and an important part of the security work. Security issues that arise during the security process. However, the early security work in the security of major events is complicated and cumbersome. Making full use of police drones can not only save the police force but also save time for preparation work and can also make security work more refined. The work of drones before major events is mainly on-site surveys and information collection. See picture 4.

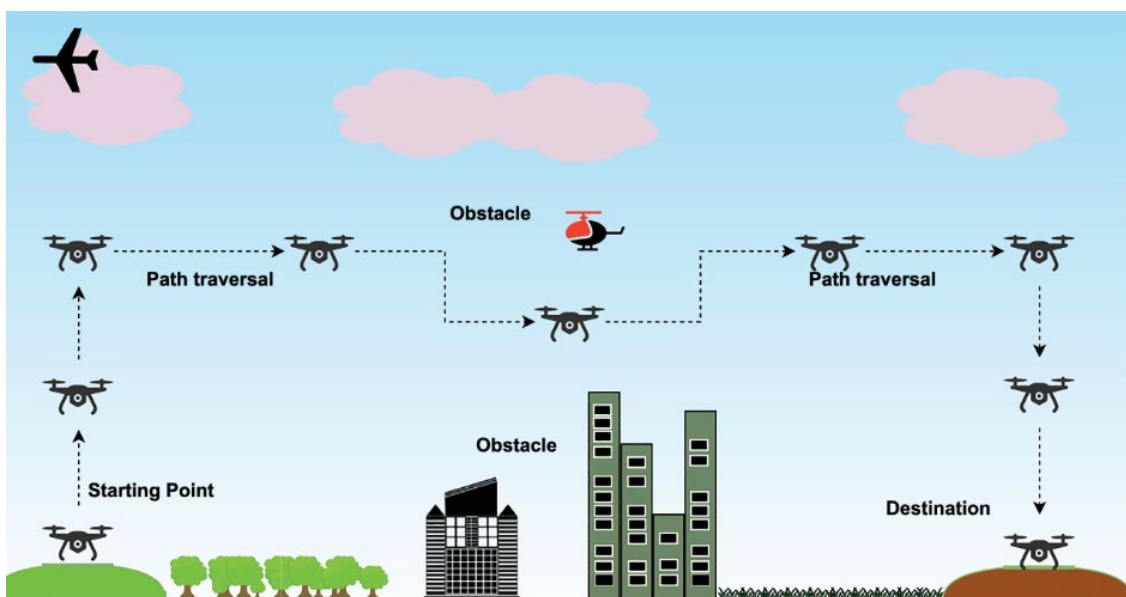


Fig.4 Drone Police Patrol System

Understanding and mastering the basic situation in the security of major events is the premise and condition of doing a good job in security work. Making full use of police drones can master the basic situation in the security of major events with half the effort. The people, things, places, and times involved in the security of the event are carried out:

### 5.1 3D modeling, division of regions

Before the event is carried out, the use of police drones live, and the actual application of police drones in the security of major events is related to whether the security of major events can be carried out smoothly, and the event is carried out. The previous preliminary security work is the foundation of the entire security work and an important part of the security work. The preliminary security work

is in place to avoid security problems in the security process. However, the early security work in the security of major events is complicated and cumbersome. Making full use of police drones can not only save the police force but also save time for preparation work and can also make security work more refined.

## **5.2 Flow monitoring to prevent blockage**

When major events are carried out, security is easy to cause surrounding crowds, traffic congestion, or road congestion. Therefore, it is necessary to fully understand the road traffic conditions in advance and make predictions about the flow of people and vehicles during the event in combination with the entry and exit of vehicles and the circulation of people during the event. The police can give full play to the characteristics of police drones with strong mobility, wide field of vision, and wide coverage, collect traffic conditions in the activity area and surrounding road sections and intersections and decide whether to implement targeted traffic control through pre-judgment.

## **5.3 Safety survey to eliminate hidden dangers**

Before the activity is carried out, potential safety hazards should be eliminated to avoid endangering the personal safety of the participants and affecting the smooth progress of the activity. The police can use drones to investigate the venues and surrounding areas. For example, they can use search and explosion equipment to investigate open squares to rule out whether there are hidden dangers of explosions in the squares and surrounding areas; they can make full use of micro-drones to enter the narrow space that the surveyors cannot enter. Search, make up for the situation that the police cannot do, search for suspicious objects on the roof of the venue, prevent explosives from being set up in advance, and so on.

# **6. Practical application of UAV security in major activities**

In the security of major events, police drones can be used to conduct aerial monitoring, strengthen public security prevention and control, and grasp the scene dynamics in real-time, so that reasonable measures can be taken to prevent the occurrence of accidents such as crowd stamping, and even part of the police situation can be carried out. Pre-treatment.

## **6.1 Strengthen patrols and discover hidden dangers in time**

Use police drones to patrol and monitor the active area and surrounding areas, especially to conduct key patrols in areas that cannot be monitored by ground monitoring and police forces, including water areas, river surfaces, bridges, etc., to timely detect suspicious persons, road facilities, places, etc. It can effectively make up for the lack of ground monitoring and police force.

## **6.2 Use face recognition to discover key personnel**

In the security of major events, a small number of personnel will come to the scene to engage in behaviors that affect the smooth progress of the security of major events. In order to ensure the order of the event, the police should strengthen the identification and control of relevant personnel. The police can make full use of the characteristics of police drones with wide high-altitude vision, a large monitoring range, and flexible viewing angles to supervise the area where people gather during the security of major events. Effective control on site.

## **6.3 Strengthen countermeasures to ensure airspace safety**

The development of the times has led to the general trend of the popularization and application of drones. More and more ordinary people buy and use drones. At the same time, some criminal suspects will also use drones to carry out illegal and criminal activities. In view of the threats that drones may pose to various aspects, and focusing on the safety management and control of future drones, the police should build a safety management and control plan for the drone countermeasure system of

"regional early warning, real-time tracking, and controllable disposal." During the security process of major events, the relevant police departments should fully strengthen the drone countermeasures to ensure airspace security.

#### **6.4 Practical application of preventing crowd trampling**

The police can use police drones to conduct targeted aerial monitoring of crowded areas, entrances, and exits, parking lots, key locations, etc., so as to grasp the flow of people, traffic, and on-site conditions in real-time and transmit the on-site situation back to the command room in time, which is helpful for timely Judging the development trend of the scene, and reasonably deploying the police force, effectively implementing the combination of ground and air, and timely preventing the occurrence of accidents such as crowd stampede.

In places where the effect of terrestrial broadcasting is not obvious, the police can carry on-air shouting tools to guide and direct people in densely populated areas in a timely manner and issue broadcasts in a timely manner to inform the crowd of the correct travel route, reasonable stay time, and real-time on-site conditions.

For activities held at night, due to the dark light, it is more likely to cause panic, getting lost, congestion, etc., resulting in a stampede. The police can mount searchlights on police drones to illuminate local areas without interruption or mount lighting tools to fly. To provide personnel travel routes.

At night in large venues, it is difficult to observe the crowd density in a certain area with the naked eye, which affects the correct diversion direction of directing the flow of people. The police can use police drones equipped with thermal imaging cameras to take pictures in the area, make real-time and intuitive judgments on the density of crowds, timely and effectively command the evacuation and diversion of people, and give early warnings of possible stampedes and hidden fires.

### **7. Conclusion**

UAV application is a systematic project, with the rapid development of various technologies and the ever-changing social situation.

Technology faces both opportunities and challenges. Only by continuous learning and exploration can the application of drones in the security of major events be brought into full play, and it can truly play its due role in maintaining social order and preventing and combating crimes.

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