GA900

UAV Forest Patrol & Fire Alarm System

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UAV Forest Patrol & Fire Alarm System	**GA900**

Description:

Checking is an essential part of forestry administration, forestry is a big forest resources in our country, but also multiple national forest fire, the fire rescue cost a great deal of manpower and material resources and financial resources, forest fire on the forest resources and ecological environment caused incalculable loss, and the traditional manual operation cannot effectively prevent fire, real-time monitoring of the fire situation.

Traditional forestry resources monitoring and inspection work, labor intensity is high, labor cost is high, efficiency is low, and it is difficult to quickly control the overall situation; but the satellite inspection period is long, the time efficiency is poor, the spatial resolution is poor, cannot satisfy the real-time request.

Traditional manned aircraft have improved the problems of timeliness and manual patrol inspection, but in the harsh environment such as forest fire, flight safety will be seriously threatened, and it is greatly affected by the environment, airspace and so on, and the maintenance cost is high, so it is difficult to meet the needs of daily patrol inspection of forestry. It has become an urgent and urgent task for forestry management to seek a new high-tech means to be applied in forest resource monitoring, forest fire prevention and forestry law enforcement.

GA900 is a new type of powerful and reliable uav forest patrol and fire early warning system launched by Aup Tiancheng. It can patrol the forest situation, and can warn the occurrence of fire in advance, prevent from unburned, reduce the disaster area and disaster loss of fire.

At the same time, it can also mount fire extinguishing powder and other fire extinguishing equipment for fire extinguishing;

In addition, it also mounts the long-range propaganda device, may carry on the scene command, dispatches the scene staff.

Features:

- **Fire early warning:** Through constant wave ultra-infrared imaging, fire spots can be found in advance to prevent from non-ignition.
- **Forest inspection:** fast, accurate, large-scale and real-time.
- **Built-in megaphone:** It can conduct on-site command and dispatch on-site staff.
- **Fire extinguishing powder can be mounted:** participate in on-site fire fighting.
- **Easy to use:** Simple training is required for accurate operation.；
- **On-site testing:** the equipment and other accessories required for testing are all packed in the instrument case of about 40 inches of luggage.

Application

- Forest-police
- Fire police

Model	Feature
GA900	Multi-rotor UAV, flight time 20 minutes
GA900 Pro	Multi-rotor UAV, flight time 1 hour
GA900 FW	Fixed-wing uav, vertical take-off and landing, oil and electric hybrid, flight time up to 8 hours

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1. Product background

Forestry patrol is an indispensable part of forestry management. my country is a country with large forest resources, but it is also a country with frequent forest fires. Fire rescue consumes a lot of manpower, material and financial resources. Forest fires have caused incalculable forest resources and ecological environment. However, traditional manual operations cannot effectively prevent fires and monitor the fire situation in real time.

Traditional forestry resource monitoring and patrol work is labor intensive, labor cost high, low efficiency, and difficult to quickly control the overall situation; while satellite patrol cycle is long, timeliness, and spatial resolution are poor, which cannot meet real-time requirements.

Traditional manned aircraft has improved the timeliness and manual patrols. However, in harsh environments such as forest fires, flight safety will be seriously threatened, and will be greatly affected by the environment and airspace, and the maintenance costs are high and difficult to meet the daily patrol requirements of forestry.

Seeking for a new high-tech method to be applied to forest resource monitoring, forest fire prevention and forestry law enforcement has become an urgent and urgent issue in forestry management.

FIG. 1 Forest patrol and fire early alarm system of UAV

2. System composition

This scheme can control the flight of UAV by remote control and military-grade intelligent ground station. Through the hd image transmission system, the forest surveillance video can be transmitted back to the ground station and the command center in real time, providing effective on-site information for the command department in the first time.

At the same time, decision makers can control the UAV from the cloud and issue command orders.
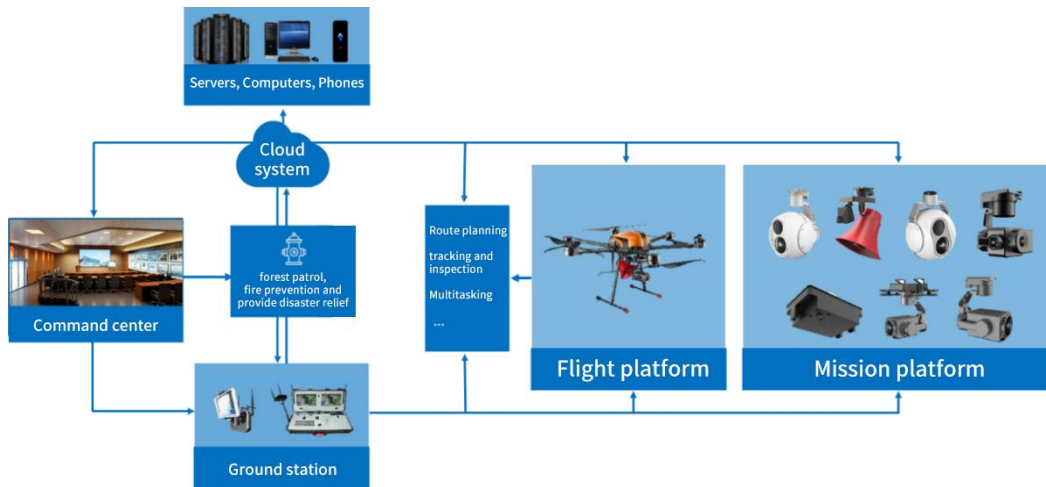
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FIG. 2 Functional block diagram of FOREST patrol and Fire Alarm system of GA900 UAV

3. System advantages

Disadvantages of traditional manual patrol on fire fighting	Advantages of UAV in fire prevention and fire fighting
Manual patrol is inefficient.	The drone is equipped with a zoom camera, which can observe the ground fire field in real time at an altitude of 300~1000 meters.
High personal safety risk factor for inspectors.	Multi-rotor drones have low requirements for take-off sites and do not require personnel to climb mountains.
Manual patrol cannot identify the fire point in advance.	Equipped with thermal infrared camera, it can warn of fire in advance.
In the event of a fire, traditional observations cannot grasp the overall situation and observe the direction of the fire.	The drone can hover at a fixed point to observe the fire situation globally.
Traditional firefighting command requires on-site coordination and delays the progress of firefighting.	The 4G cloud platform command system has no distance limit.

4. Industry advantage

● GA900 UAV Cloud Platform Management System Forest Fire Prevention Solution

(1) Daily Forest Patrol

GA900 is equipped with a 30x zoom camera: This forest fire prevention solution can adopt unmanned aerial vehicle to collect forest farm video and audio information, and can be connected to the forestry monitoring private network. Combined with the original monitoring and command system, it can realize the real-time view, storage and playback of UAV video signals, and can be called by command authorities at all levels

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(2) Fire fighting, emergency command

UAV participates in forest fire fighting and patrol.

- GA900 forest region fire prevention solution, beidou satellite, navigation system, thermal imaging digital image transmission technology, hd video transmission system and other high-tech integrated application in forest resource management. It is equipped with visible light and infrared detection mission payload to observe the ground fire site in real time at a height of 100~1000 meters from the ground, and transmit the acquired image data to the ground in real time, so as to facilitate the ground fire department to respond timely. Hidden fire detection and extinguish, observation naked eye can not observe the fire site dark fire, equipped with infrared detector, can penetrate smoke to detect the surface temperature.

- Advanced infrared detection payloads obtain complete ground temperature distribution images of the fire scene and transmit them back to the ground in real time; visible light mission payloads obtain real-time images of fire damage assessment, and can also obtain more detailed image data of key areas.

- The far-infrared detection load can detect the place where a fire is about to occur in advance and warn the fire in advance.

- Equipped with throwing device, fire bomb and small water bag to extinguish the remaining embers and prevent reignition.
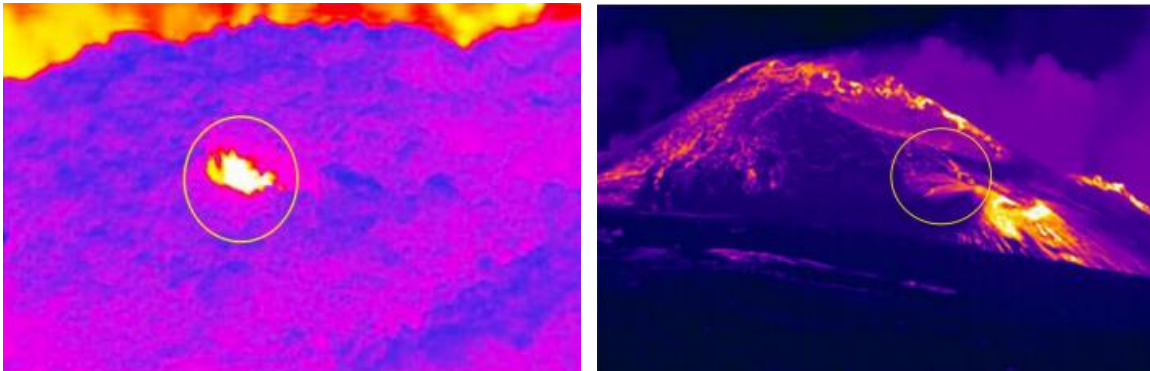

FIG. 3 Fire alarm function of GA900. All circles in the figure are areas without open fires, but fires will occur soon.

(3) Forest surveying and Mapping Survey (optional)

Can increase forest according to the demand of surveying and mapping function, can increase five lens tilt the camera, surveying and mapping camera haeundae tasks such as load, deployed 3 d mapping software and unmanned aerial vehicle (UAV) management platform software, such as the UAV reconnaissance system of forestry forest fire monitoring data access network and large data platform, realize the key target of surveying and mapping to generate 3 d data import forest fire prevention command system big data platform, the bidirectional data transmission, etc.

- Realize the function of "image transmission, data interaction, remote control, network sharing", the system upgrade space is large, upgrade is easy.

5. Solutions and program design

(1) Solution hardware equipment

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According to the actual situation of the project, the GA900 six-rotor UAV is selected to carry 30x zoom, thermal infrared, loudspeaker and throwing equipment, as the hardware system of forest patrol and forest fire prevention.

GA900 rotor UAV adopts carbon fiber and aluminum alloy composite structure design, integrates ASRM three redundant and highly reliable flight control system, high performance airborne computer, high efficiency power system and large bandwidth data link.

It can carry a variety of mission payloads such as 30x zoom camera series, infrared camera series, dual-light pod series, visual thrower series, visual loudspeaker series, etc

(2) 30x zoom holder camera

The 30-fold zoom camera has a 30-fold optical zoom, with a total pixel of 2.16 million. The 61° ~ 2.3° field Angle provides a wider space for video shooting, and can clearly present scenes 100 meters away.

The body adopts aluminum alloy structure design, light volume, combined with professional cradle head control technology, image stabilization accuracy up to ±0.01°, even in the farthest focal segment also has excellent image stabilization effect. It can be mounted quickly and flexibly on UAV flight platform.

The zoom holder camera has the following characteristics:

① Equipped with a professional 30x optical zoom camera;
② Mechanical three-axis image stabilization;
③ Leading dedicated decoupling attitude algorithm;
④ Highly optimized servo motor vector control algorithm;
⑤ Control frequency up to 8000 Hz;
⑥ ±0.01° image stabilization accuracy;
⑦ All aluminum alloy structure design, light and strong, good heat dissipation performance;
⑧ Support tracking;
⑨ Network video output interface;
⑩ Support quick release.

(3) Megaphone

The loudspeaker is equipped with high sound quality loudspeaker. Mounted on the aircraft, it can quickly enter the operation area, which can not only check the situation of the scene in real time, but also shout to the scene. Applicable to emergency rescue and other site, complete communication command tasks.

● The functions of "image transmission, data interaction, remote control, network sharing" are realized, and the system upgrade space is large and easy to upgrade.

Solutions and program design

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Mainly have the following characteristics:

① Megaphone broadcasting distance up to 500 meters;

② Built-in high-definition camera, real-time view of the scene;

③ Manipulatable direction;

④ Real-time shouting, low latency;

⑤ Support pre-recording;

⑥ Support quick release.

(4) ATC8000 dual light pod

ATC8000 double light pod collection of 30 x optical zoom camera and thermal imaging camera at an organic whole, 25 mm with excellent image quality, environment, even at night does not need auxiliary light source can also be taken to clear images, it has a 30 x optical zoom, total pixels is as high as 2.16 million, 61 ° and 2.3 ° view Angle to provide a broader space for video shooting, to hundreds of meters outside the scene clearly presented here, even in the farthest focal length also has good stabilization effect.

Thermal imaging camera equipped with high performance 7-14 m wavelength uncooled focal plane detector, a variety of color plate mode can be switched, with excellent imaging effect. Combined with professional cradle head control technology, image stabilization accuracy up to ±0.01°. It can be used in fire control, forest public security, public security monitoring, search and rescue, environmental protection law enforcement and other industries.

Figure 6 ATC8000 dual-band camera pod

Main feature:

① Integrate a 30x starlight optical zoom camera and infrared camera in one;
② Support intelligent tracking;
③ Switch between picture in picture video;
④ Single IP video output;
⑤ Three-axis image stabilization;
⑥ Leading dedicated decoupling attitude algorithm and highly optimized servo motor vector control algorithm;
⑦ Up to 5000 Hz control frequency;
⑧ Image stabilization accuracy of ±0.01°;
⑨ Support quick release.

(5) Portable ground station

The portable ground station integrates the control handle, large-bandwidth graph and number data link and 4G data link. With the pre-installed ground station application program of the mobile device, the aircraft and the mission load equipment mounted by the aircraft can be manipulated in real time, the flight mission can be planned, and the images taken by the cradle head camera can be viewed.

Through the integrated 4G data link, aircraft data and images can be transmitted to the cloud and the background command center in real time. The portable ground station provides a user-friendly operation interface, which can greatly reduce the complexity of flight missions.

FIG. 7 portable ground control station.

Main feature:

① Real-time display of aircraft position coordinates, attitude, battery voltage and other data;

② Real-time display of high-definition images taken by the PTZ camera;

③ Remote control telemetry and image transmission distance up to 10 km (under the condition of radio visibility);

④ Supports quick operations such as automatic take-off, automatic landing, automatic return, autonomous cruise and retractable landing gear (supported by aircraft);

⑤ Support route planning, up to 200 waypoints can be edited;

⑥ Support 4 joystick control modes including American hand and Japanese hand;

⑦ Support to connect to the public security private network via 4G;

In conjunction with the remote control system of the unmanned aerial vehicle, the aerial vehicle can be monitored remotely on any networked computer, so that the back-end command center can understand on-site information in real time.

6. Solution software and configuration

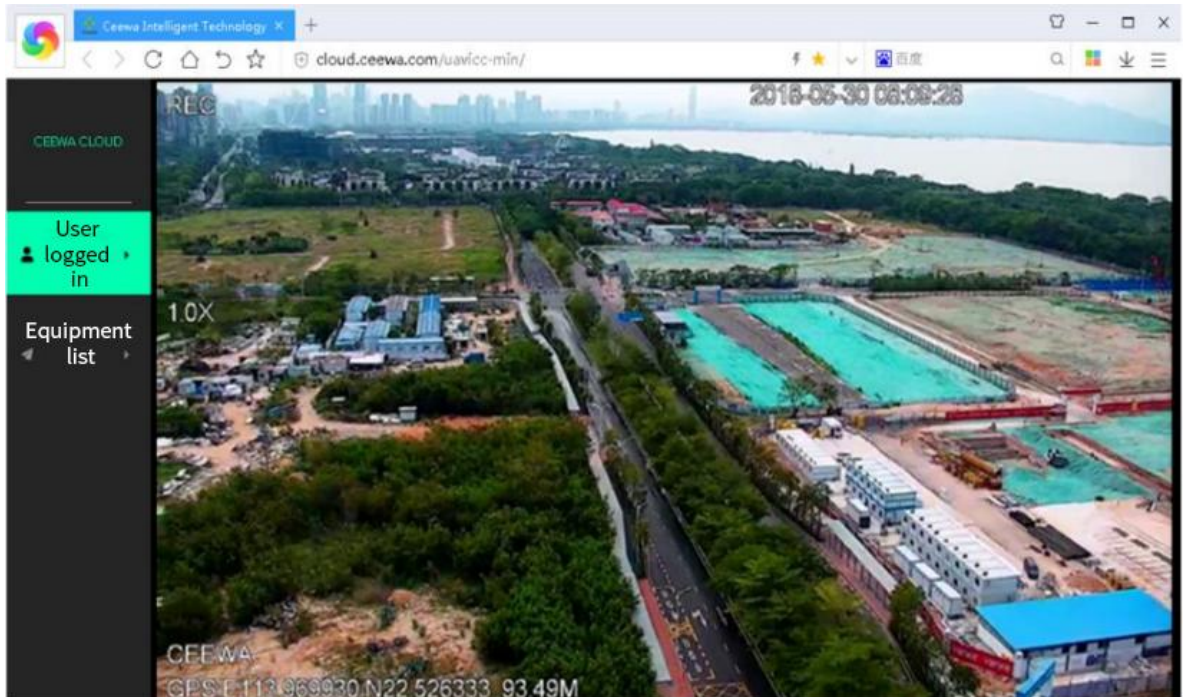### (1) Cloud platform and command and dispatch system
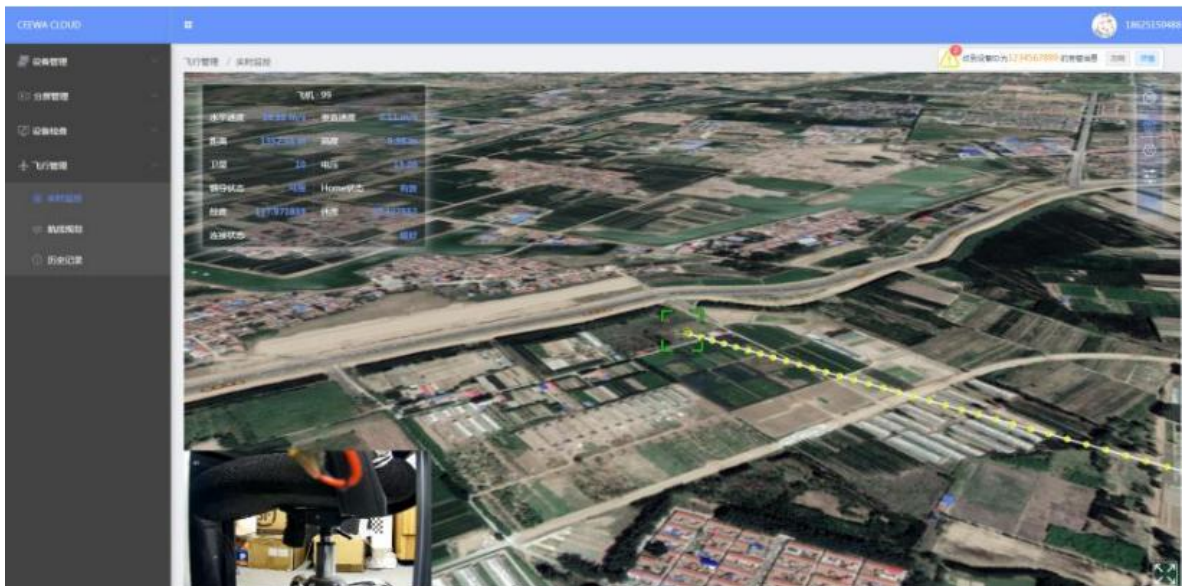
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FIG. 8 Real-time video feed back

FIG. 9 Drone control

Main features of cloud platform:

① Support flexible account management. One computer and one account can manage multiple drones at the same time；

② Supports remote monitoring of videos taken by drones, downloading photos, and real-time grasp of site conditions；

③ Support remote monitoring of drone flight status and health status；

④ It supports remotely sending commands to the UAV, controlling the UAV to take off and landing automatically, automatically cruise, and edit the route online,

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which truly realizes that there is no need for on-site flight operators；

⑤ Support cloud storage of mission routes, which can be directly retrieved when executed again. Realize the standardization, automation and simplification of repetitive tasks；

⑥ Support remote control camera load, remote shout, remote throw；

⑦ The cloud can store videos, photos, and flight data for easy retrieval and analysis in the future.

(2) Cloud server configuration

The server can be installed on the server of the local unit or on the cloud server.

7. Operation procedure

(1) Site survey

Landforms of Banma County

Located in the southeast of Guoluo Tibetan Autonomous Prefecture and the upper reaches of Dadu River, Banma County is located in 99°45 '~101°14' of east longitude and 32°27 '~33°18' of north latitude. It borders Aba, Rangtang and Seda County of Sichuan Province in the southeast, Seda County and Prefecture of Sichuan Province in the west and Jiuzhi County of Sichuan Province in the north.

It is 137 kilometers long from east to west and 96 kilometers wide from north to south.

The easternmost longitude is 101°14', the southernmost latitude 32°27 ', the westernmost longitude 99°45 'and the northernmost latitude 33°18'. After surveying the area, a relay station is needed to complete the UAV video back transmission.
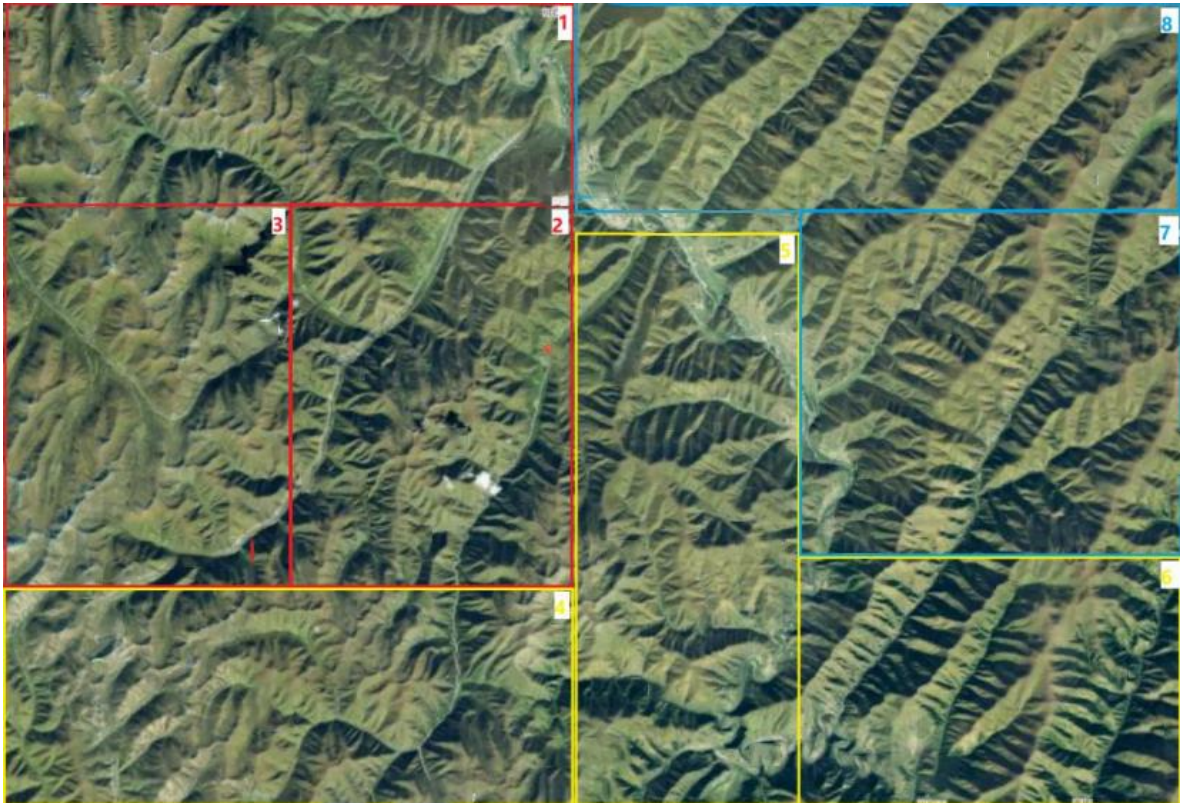
(2) Plan route

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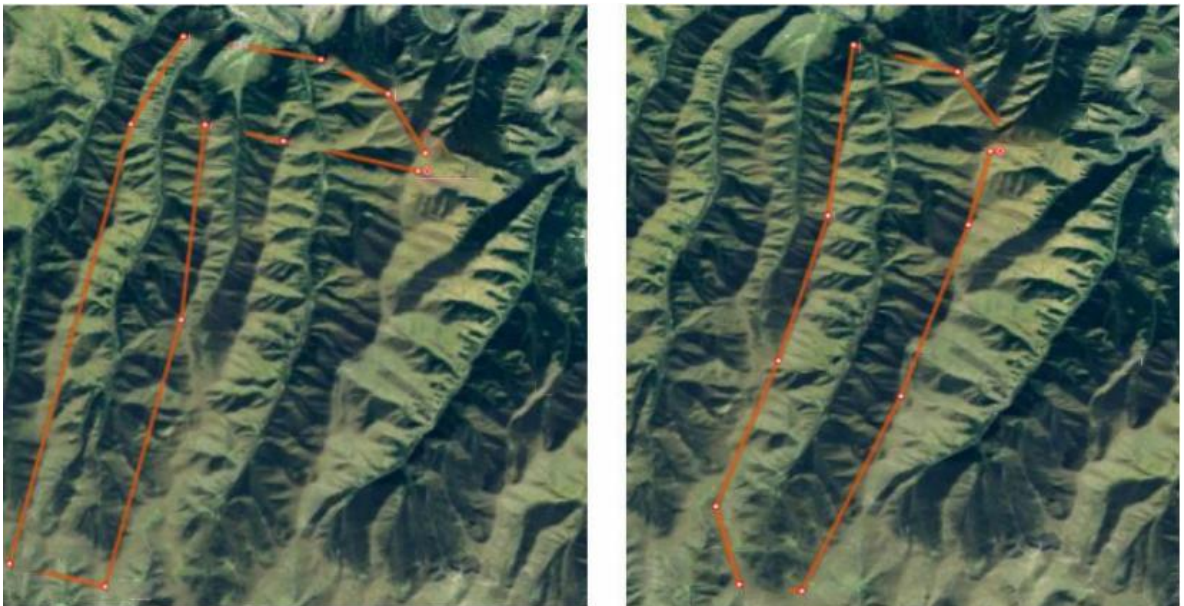FIG. 10 Simulation map of patrol area division
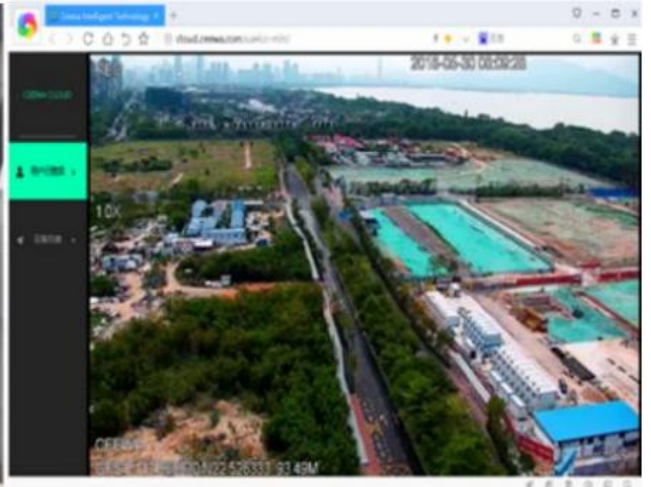

FIG. 11 Route diagram

The task of the forest area is divided, and the route planning is carried out for the divided area. The plan can be completed ahead of time and directly imported into the UAV after the site for field flight.

(3) Field flight data collection

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ground station

Video real-time return
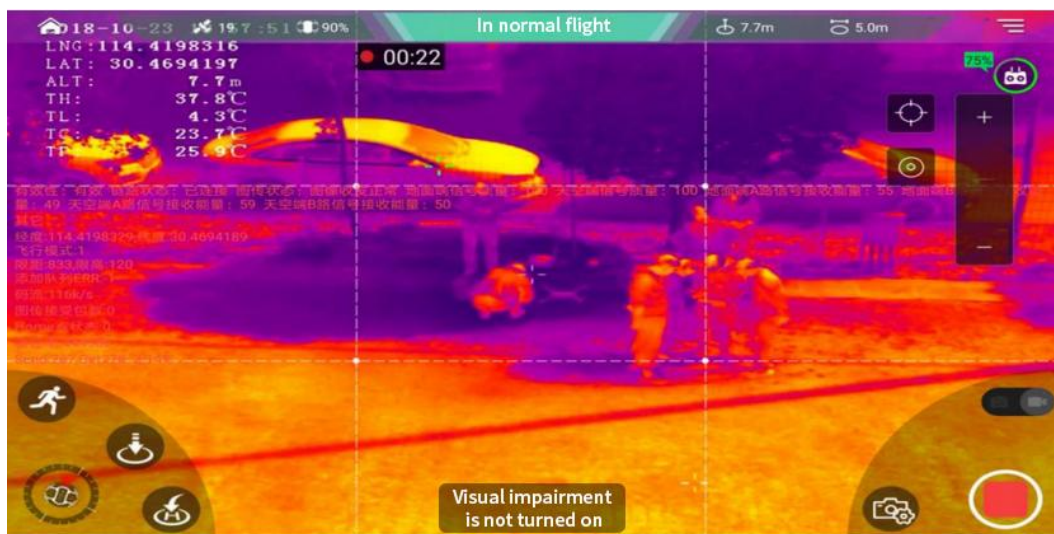

(4) Office processing submitted results

Fig.12 Thermal infrared image of fire alarm, the brighter the color is, the higher the

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temperature is, which means that an open fire is about to occur and a fire will occur.

① The forest area will be inspected by UAV regularly, and the patrol results will be sent back to the command hall in real time, so that the commanding personnel can guide the patrol work in real time;

② Analyze the distribution of forestry resources in the forest area by analyzing the patrol results of drones, understand the distribution of resources in the forest area, and analyze the types of trees and flammable areas for key monitoring;

③ For large areas of forestry, drone patrols can obtain the disease and insect disaster situation of trees in the forest area, and can monitor whether there is stolen logging;

④ Perform patrols when a fire occurs, and configure thermal infrared sensors to accurately locate the fire point, which is convenient for the rear fire prevention headquarters to formulate relevant plans.