

# Research on UAV Technology in the Field Of Transmission Line Inspection

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## Abstract

With the development of the times and the rise of emerging technologies, drone technology has been widely used in the field of transmission line inspection. The application of drone technology has greatly reduced the labor cost and at the same time guaranteed personal safety, which is the general trend of social development. This paper first introduces the technology of UAV, and then starts from the application of UAV technology in the field of transmission line inspection as well as its advantages and disadvantages, and gives a specific overview of the application of UAV in the field of transmission line inspection.

## Keywords

Drone, Transmission Line, Inspection.

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## 1. Introduction

With the continuous development of the national economy, the emerging technology industry is also making progress. The rise of UAV technology is also of great significance to the transformation of the times. It has a wide range of applications in various fields. People gradually realized the potential value of drone technology, and their technology development and research gradually deepened. With the increase of social demand, China's power industry has become more and more important in people's minds. In order to realize the power supply of 1.4 billion people, the construction of transmission lines in China is also very extensive. As is known to all, the stable operation of transmission lines is an important part of the normal operation of power systems. The operation and maintenance of transmission lines is also a major problem facing the power industry. As an aerial platform, the drone can overcome terrain obstacles and flexibly carry the corresponding detection instruments, which is of great significance for the inspection of transmission lines.

## 2. UAV Technology Introduction

### 2.1 UAV Technology Overview

UAV technology[1], that is, according to the needs of the mission, by using the wireless remote control device and the program control device to manipulate the drone to approach the target, and then use the control module, the information acquisition module and the related task device on the UAV platform to perform real-time data on the target. Acquisition, ranging, aerial photography, infrared temperature measurement, etc., and then transmit the collected data to the ground through the communication system to display or store[3], as shown in Figure 1.

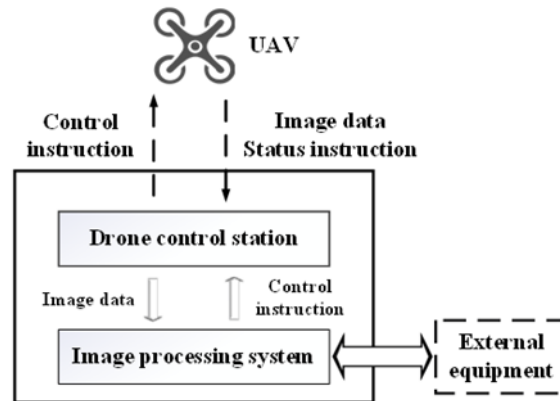


Figure 1. Schematic diagram of the drone technology

## 2.2 Drone Technology Advantages

Advantage 1: The drone has strong maneuverability and flexibility, which can take off anywhere, land anywhere, and hover in the air. Drones move quickly and quickly, speeding up work efficiency.

Advantage 2: The drone can better adapt to special terrain sections and complex lines, and can accurately measure and shoot cross-crossing, tree line distance, terrain and landform. Compared with traditional manual inspection, it can check records more carefully.

## 2.3 UAV Technology Application Scenario Introduction

At present, UAV technology has been widely used in various fields, such as surveying, aerial photography, rescue, transportation, police, transportation and transportation in daily life. UAV technology also has many applications in power systems, such as patrol of overhead transmission lines, fault finding, substation planning and location selection, transmission line design, and infrared temperature measurement of power equipments.

## 3. Application of UAV Technology in Transmission Line Inspection

### 3.1 Choice of Drone Equipment

Use drone equipment to conduct transmission line inspection. In order to ensure that the drone can complete various inspection tasks and continue to use, you should select the model of the drone that meets the actual application background. UAVs can be divided into fixed-wing and rotary-wing types according to flight characteristics. Among them, micro-rotor UAVs have the characteristics of small size, simple operation and flexible control. They can vertically take off and land, freely hover, and can adapt. A variety of natural environments, with the advantages of autonomous flight and landing capabilities, can efficiently complete tasks in daily line inspections, and can also work in complex and dangerous environments that are not suitable for human access. Fixed-wing UAVs are more complicated to operate and are not suitable for general technicians.

### 3.2 UAV inspection process

First, the operator first plans the patrol route based on the topographical factors and the relative position of the transmission line, selects the appropriate take-off point to take off the drone equipment, and starts the drone after reaching the expected inspection location. The detecting device on the equipment conducts the inspection of transmission line. During the inspection, the drone automatically adjusts the speed and altitude of the flight according to the relative position of the transmission line and the actual conditions of the surrounding environment, and finally reaches the optimal detection position. While performing various tests, the man-machine transmits the data and pictures detected in real time to the background, and displays them to the staff at the data receiving end. The staff analyzes the data and pictures collected by the drone, and the fault is generated. The reasons and a series of solutions are given to achieve accurate and efficient inspection of transmission lines.

### 3.3 UAV Operation Precautions

When using the drone equipment for the transmission line inspection, in order to ensure the application effect, the advantages of the drone are fully reflected, and some interference factors should be paid attention to during operation. Appropriate take-off and landing sites should be selected to avoid crowded and densely populated sites. Under the premise of normal equipment, the site with empty space and no no-fly sign should be taken for take-off and landing. The drone may be affected by tall buildings or birds during the inspection. In order to avoid damage to the drone equipment, the flight speed and flight height of the drone should be controlled. The rising speed is generally controlled at 1m/s, the horizontal flying speed is generally controlled at 2m/s, and the flying height is controlled at 2m above the obstacle [4]. It is not advisable to use a drone for inspections in the event of special weather such as wind, hail and rain. In order to ensure the normal operation of the drone during the inspection, the operator should memorize the operating rules of the drone, be proficient in the operation skills of the drone.

## 4. UAV'S advantages, disadvantages and development trend

The use of drones for inspection of transmission lines not only saves the cost of inspections, but also guarantees the safety of maintenance personnel. The various detection devices equipped with drones make inspections accurate and efficient, and the clean energy used by them will not Any damage to the environment, the small size of the drone allows it to operate in complex and hazardous environments that are not suitable for human access. However, due to the limitations of the prior art, the operation of the drone is susceptible to the external environment and the range of signals that can be received is limited. Due to the complexity of the operation of the drone, the cost of obtaining the relevant documents is high, and the grid companies cannot train all the operation and maintenance personnel with relevant skills, which lead to shortage of personnel in the event of an emergency[5].

With the continuous development of artificial intelligence, the application of UAV technology in the field of transmission line inspection is no longer a simple test. As the data acquisition terminal, the UAV will pass the data of the transmission line through pictures and related indicators. The transmission to the live simulation system simulates the corresponding fault scenario, and the data is transmitted to the data processing system. The processing system analyzes the fault type and the possible causes of the fault according to the big data analysis and the fault scenario [6]. Finally, a failure cause analysis report is formed and the analysis report is transmitted to the information receiving terminal for analysis and judgment by the staff. In the future, the UAV inspection technology will be more intelligent and more widely used, which not only improves the work efficiency, but also effectively protects the personal safety of electric workers.

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