

# Discussion on feature enhancement technology of audit object of power transmission and transformation project settlement based on remote sensing technology

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5700-202225178A-1-1-ZN Researches on Intelligent Techniques Based on Multispectral Remote Sensing for Supervising Environmental Protection and Soil and Water Conservation of Electricity Transmission Lines

**Abstract.** In the rapid development of social economy and science and technology, the construction management of power transmission and transformation project began to widely use modern science and technology theory, the most representative of which is remote sensing technology. According to the data obtained by UAV digital policy image and digital surface model, soil and water conservation measures and engineering prevention and control monitoring are proposed in the integrated analysis and calculation research, which can provide technical support for the construction management of power transmission and transformation projects. Therefore, on the basis of understanding the technical content of transmission and transformation engineering line construction, this paper mainly explores the transmission and transformation engineering monitoring system based on low-altitude remote sensing technology of drones and builds an intelligent transmission and transformation engineering settlement audit platform according to the current development status of transmission and transformation engineering completion settlement audit. The final practice case proves that the remote-sensing technology based power transmission and transformation project settlement audit effect is stronger, which meets the needs of power transmission and transformation project construction management in the new era.

**Keywords:** Remote sensing technology; Power transmission and transformation projects; Settlement audit; Preliminary preparation; Audit procedure.

## 1. Introduction

In the rapid development of market economy, there are different degrees of progress in all fields of our country, especially in the field of power engineering, which is a basic energy facility, the theoretical knowledge and technical means are becoming more and more mature. High-voltage transmission lines can effectively connect power plants around, and use substations to transmit and distribute electric energy for people, which is the basic component of power system construction and management, and also the connecting hub of the overall power project construction and development. It can be seen that the power transmission and transformation project should be managed in strict accordance with the construction drawings, on the basis of ensuring the construction quality and construction progress, orderly completion of various construction contents, while fully considering the actual situation of the construction environment, and put forward effective solutions for specific problems. As the final link of the construction management of power transmission and transformation projects, completion settlement plays an important role in the entire construction period, which directly reflects the economic benefits of project construction investment. When determining the project cost, it is necessary to think comprehensively according to this link, and the actual audit results will also have a direct impact on both sides of the project construction. Therefore, construction enterprises must attach great importance to the completion

settlement audit link. In essence, the completion settlement audit refers to the legal and compliance settlement analysis of all costs of power transmission and transformation projects. Among them, project construction costs include project approval, equipment procurement, engineering design and other aspects of the content. In order to ensure that the completion settlement is more accurate and effective, it is necessary to deal with the problems during the settlement in time, choose scientific and effective technical procedures, and pay close attention to the document information contained in the completion settlement audit. After the completion of the settlement audit of the power transmission and transformation project, the preparation of relevant documents should be regarded as the research basis to lay the foundation for the subsequent project cost. Nowadays, most of China's power transmission and transformation projects will take the power quota measurement system as the basic basis when calculating the cost expenditure. Therefore, during the settlement audit, the approval standard of the project cost includes the power quota and Yuguizhai. In the completion settlement audit process, auditors should have rich professional knowledge and work experience, and fully grasp the quota and project cost. Understand as much as possible the engineering quantity calculation rules of power transmission and transformation projects, choose a scientific way to analyze carefully during the audit, only in this way can ensure the accuracy of settlement audit.[1-3]

The application of remote sensing technology during the audit of project settlement will treat the UAV as an aerial platform, obtain image data by carrying sensors, transfer the image data to the computer platform for effective processing, and finally obtain information according to specific needs and make relevant ways. In the construction and development of modern society, the application of UAV remote sensing technology in the field of power transmission and transformation engineering monitoring is more and more, on the one hand, it can improve the timely understanding of the information of production and construction projects, on the other hand, it can guide the power transmission and transformation engineering to the direction of digital and scientific innovation and development. Compared with the traditional manual monitoring mode, remote sensing technology can easily obtain the image data of the specific period and specific spatial resolution of the project, and provide an effective basis for the follow-up settlement audit. It should be noted that at present, there are few studies on the application of UAV remote sensing technology to the monitoring work of power transmission and transformation engineering, and no mature technical scheme has been proposed based on the requirements of monitoring procedures and standards. Therefore, Chinese scholars should continue to explore related topics in order to master more valuable data information.[4-6]

## **2. Method**

### **2.1 Technical Route**

During the construction and management of power transmission and transformation projects, UAV remote sensing technology is used to obtain full-coverage policy photos of a certain overlap of the project area, and software is used to generate full-coverage digital official images and digital surface models of the project area. Finally, according to these data, the actual disturbed land area of the project, soil erosion situation, soil erosion hazards and soil and water conservation measures are defined. It can facilitate auditors to conduct settlement audit analysis and comprehensively evaluate the efficiency and quality of project implementation. The actual technical route is shown in Figure 1 below:[7-9]

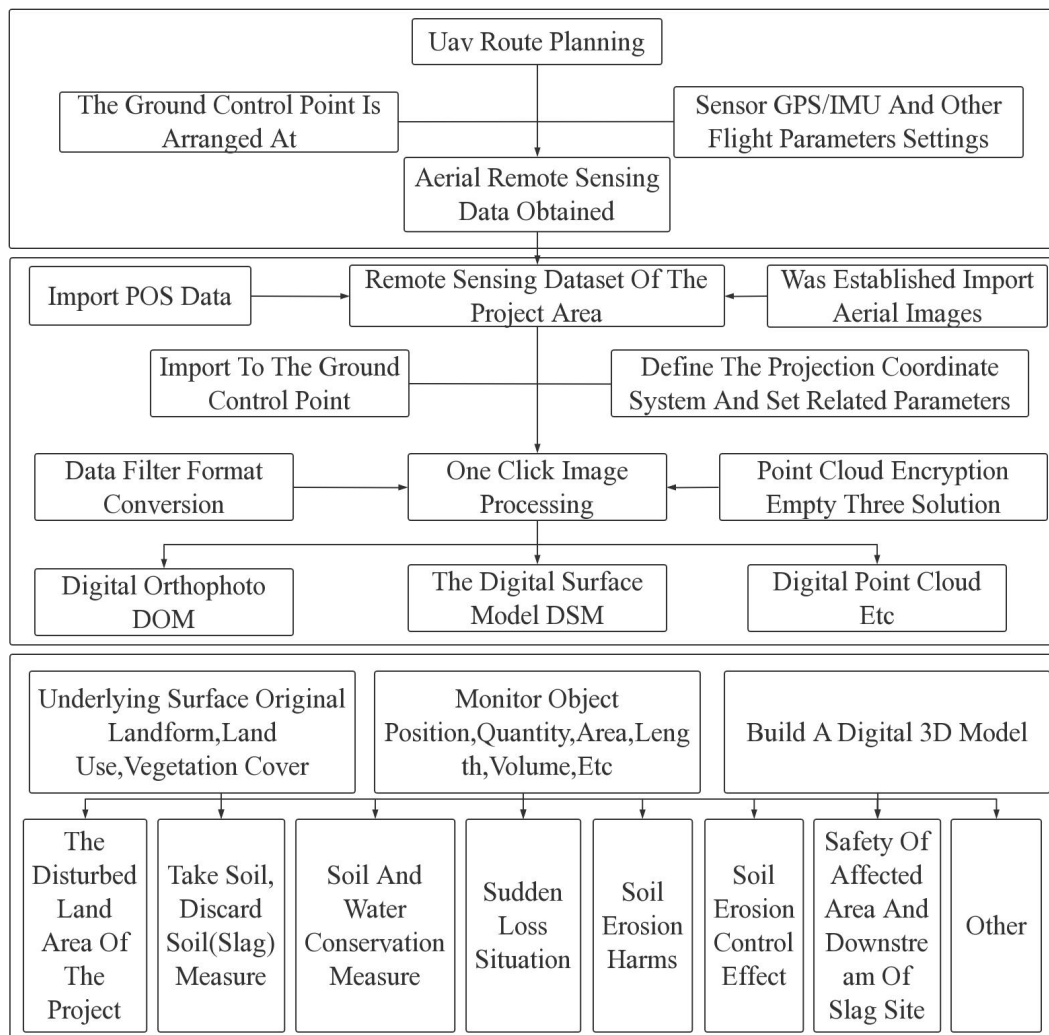


FIG. 1 Architecture diagram of remote sensing technology route

## 2.2 Audit Content

At present, the settlement audit content of power transmission and transformation projects is divided into two aspects: on the one hand, the settlement data is carefully reviewed, the operation procedures are scientific and perfect, and the documents are submitted in strict accordance with the requirements of the regulations to ensure the legal compliance of the documents and operating procedures. On the other hand, carefully review the contents of the settlement audit, such as the project contract and entrustment agreement, the change of project funds during the construction period, the price difference of materials and equipment, the contract problems during the construction period and their impact on the project cost.

## 2.3 Audit Procedure

The power transmission and transformation project settlement audit is mainly divided into three stages: first refers to the preparation, second refers to the audit, and finally refers to the approval. In the final link of the audit, it is necessary for all engineering construction units to participate in the meeting, scientifically solve the audit problem, and after the end of the meeting, it is necessary to implement the opinions of the meeting to improve the completion report. According to the audit process shown in FIG. 2 below, the competent department of the construction project shall submit

the settlement data to the audit department according to the requirements after filling in the project settlement submission form. After accepting the data, the audit staff shall arrange various audit tasks, on the one hand, determine the cost consulting unit according to the regulations, on the other hand, organize the internal auditors to carry out the audit work. Finally, we will jointly submit preliminary audit opinions, solicit the opinions of the competent department of the construction project and the construction unit, and then submit them to the auditors for re-examination and amendment, and finally draw the audit report or audit opinion. In addition, the competent department of the construction project shall conduct financial settlement in strict accordance with the requirements of the regulations after obtaining the audit report and settlement information, and finally organize and file the audit information.

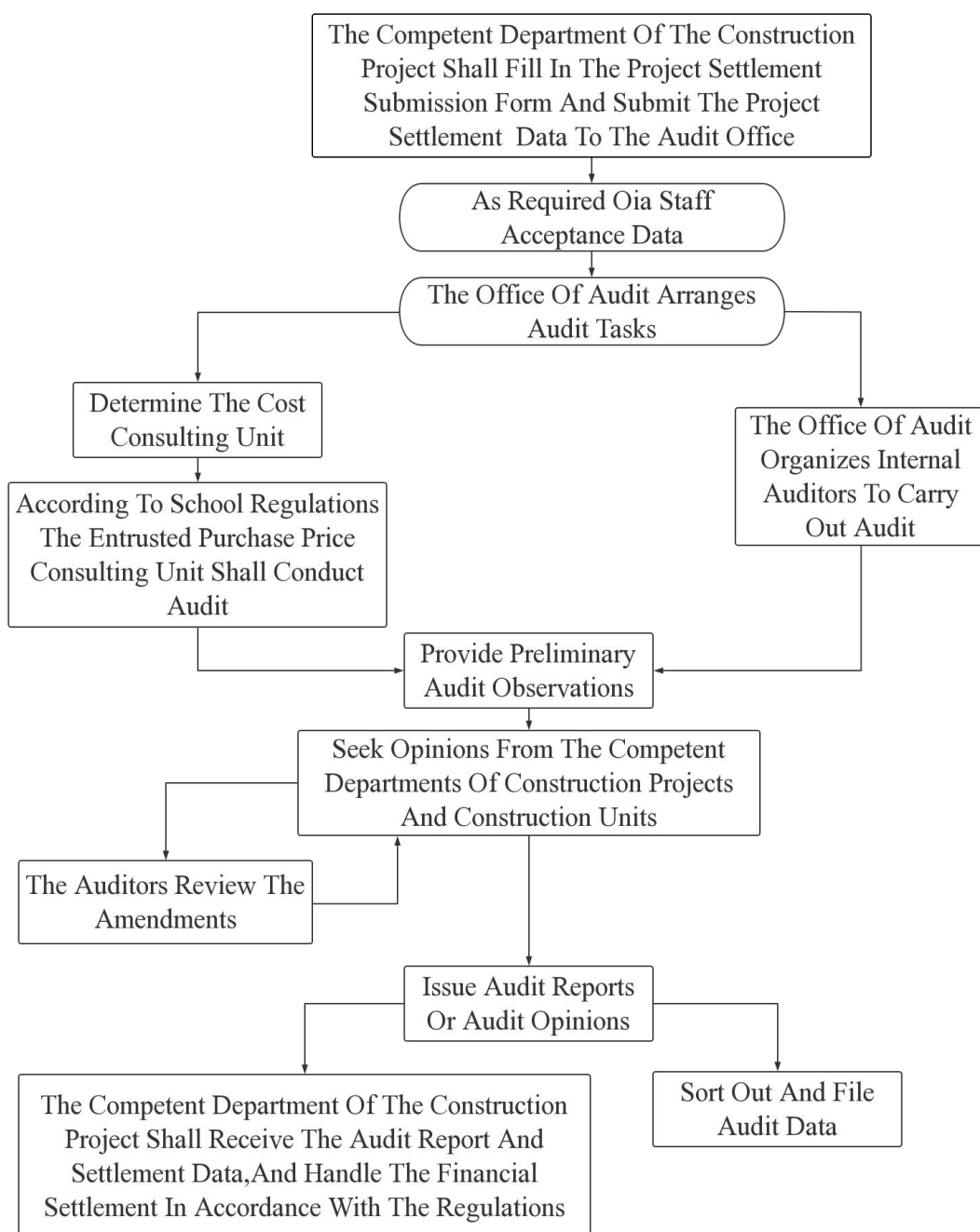


Figure 2. Flow chart of settlement audit

## 2.4 Audit Method

As the settlement audit of power transmission and transformation projects contains a large number of technical and policy issues, practical work needs to deal with a variety of data, and the work requirements at different stages are relatively high, so in order to improve the efficiency of settlement audit, legal and compliance audit methods should be selected, which can be divided into the following types: First, comprehensive audit. The biggest advantage of this approach is that the audit quality and accuracy are higher. Auditors should take the project power quota, project list, contract, project total amount, etc. as the research basis, and strictly review the data according to the completed drawings. Because the power transmission and transformation project contains a lot of information files, the audit department needs to invest a lot of time and energy, and the actual work efficiency needs to be improved. Second, focus on auditing. The advantage of this method is that the workload is smaller, which can effectively reduce the consumption of resources and improve the efficiency of audit work. According to the previous work experience and actual work situation, the auditor should focus on the review of key project content, such as cable factory, earthwork, foundation treatment, etc., but this work lacks comprehensiveness, and is prone to errors during the audit; Finally, compare audit. This method is to comprehensively analyze the contents of the previous project audit, and quickly discover the hidden differences after establishing scientific and effective statistical charts. The practical audit work is highly targeted, the overall operation efficiency is high, and the excessive loss of capacity and financial resources can be effectively controlled.[10-13]

## 3. Result analysis

### 3.1 Case Analysis

In this paper, the monitoring process of 500kV power transmission and transformation project in a certain area is taken as an example, and the low-altitude remote sensing technology of UAV is used for monitoring and analysis. Since the project construction covers a large area and the line base is too scattered, traditional manual on-site monitoring not only consumes a lot of time and energy, but also cannot guarantee the overall work efficiency. Therefore, according to the characteristics of the project, the construction unit selects the technical advantages of UAV with high resolution and full coverage, and uses the low-altitude remote sensing monitoring data information of UAV in different construction stages. Among them, the soil and rock work information of the project is shown in Table 1, and the soil and water conservation index is shown in Table 2:

Table 1 Information of project earthwork

| Prevention and control zoning                           | Disturbed land area in different construction periods |         |         |         |
|---|---|---------|---------|---------|
|   | 2018-07   | 2018-12 | 2019-05 | 2019-11 |
| Station area  | 3.45  | 3.45    | 3.56    | 3.56    |
| Entrance road area                                      | 0.17  | 0.17    | 0.17    | 0.17    |
| Construction production and living quarters             | 0.85  | 0.96    | 0.96    | 0.96    |
| Cable construction area outside the station             | 0.89  | 0.89    | 0.89    | 0.89    |
| Tower foundation and tower foundation construction area | 0   | 0.52    | 0.65    | 0.65    |

|           |      |      |      |      |
|-----------|------|------|------|------|
| amount to | 5.36 | 5.99 | 6.23 | 6.23 |
|-----------|------|------|------|------|

Table 2 Analysis of soil and water conservation indexes

| index   | computing formula  | Calculation result |
|---|--|--------------------|
| Soil erosion control degree                   | Soil erosion control standard area/total soil erosion area $\times 100\%$                    | 99.5%              |
| Soil loss control ratio                       | Allowable soil loss/average annual soil loss per square kilometer after treatment            | 1.67               |
| Recovery rate of forest and grass vegetation  | Forest and grass vegetation area/recoverable forest and grass vegetation area $\times 100\%$ | 99.8%              |
| percentage of the forestry and grass coverage | Forest and grass vegetation area/total project area $\times 100\%$                           | 65.8%              |

From the perspective of practical monitoring, UAV low altitude remote sensing technology can quickly obtain data information at any construction stage of the project, and the actual monitoring accuracy meets the basic requirements. At the same time, remote sensing technology will use the spatial analysis and calculation function of ArcGIS software to understand the spatial distribution of construction disturbances in different regions, and dynamically analyze the area changes during construction according to the monitoring results at different stages. In terms of monitoring of soil and water conservation measures, it can quickly understand the location and quantity of the actual implementation measures, master the data information of soil and water conservation measures and the linkage effect of images, so as to facilitate auditors to collect soil and rock monitoring data, so as to review and judge the scientific and normative construction plans as soon as possible.[14-15]

### 3.2 Application Measures

According to the analysis of practical cases, the following measures should be taken to audit the settlement of power transmission and transformation projects based on remote sensing technology: First, improve the audit content. During the settlement audit, it is necessary to carefully analyze the amount of project construction, regard the engineering quantity audit as the important and difficult point, and require the participation and confirmation of the participating units, so as to ensure the standardization and perfection of the data information. For example, focus on reviewing the construction drawings that do not clearly mark the amount of work, scientifically divide the quantity of work and the design quantity, review and analysis in strict accordance with the requirements of the contract, if there is a problem in the audit of the quantity, then report to the relevant departments in time, so as to reflect the positive role of the settlement audit; Secondly, we should deal with external environmental risks scientifically. The settlement audit of power transmission and transformation projects will be affected by external factors, so it is necessary to strengthen control efforts according to previous work experience during the audit. For example, some contracts do not specify this part of the content, there will be differences during the settlement audit, which needs to do a good job of negotiation during the audit, to ensure that the construction unit to jointly carry out audit and analysis, from cooperation negotiations and other aspects to solve the problem; Finally, establish a professional engineering cost consulting structure. When selecting a professional engineering cost consulting institution, it is necessary to improve the comprehensive

audit ability of the enterprise and design a separate cost consulting department to ensure that the actual audit work is scientific and normative.

## Conclusion

To sum up, the completion settlement audit of power transmission and transformation projects is very important for the construction management of power transmission and transformation projects, which contains a lot of engineering information and technical means, and has a profound impact on the economic benefits of gyms. Although there are still many problems in the settlement audit of power transmission and transformation projects in China, the efficiency and quality of the completion settlement audit have been improved after the integration and application of modern information technology, the construction management level of power transmission and transformation projects has become higher and higher, and the construction enterprises have obtained more and more economic benefits, which is crucial for the innovation and development of construction enterprises. Therefore, in the future, China's power transmission and transformation projects should continue to explore the settlement audit work based on remote sensing technology, and pay attention to ensuring that the audit object is targeted and perfect, so as to grasp more valuable data information.

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