

Application of Remote Sensing Technology in Land Regulation in Mining Area

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Abstract

By analyzing the wide application of remote sensing in land remediation in mining areas, this paper combs the development context of land remediation remote sensing monitoring, and gives the development trend of land remediation remote sensing related technology and application. This paper summarizes the remote sensing image preprocessing, acquisition technology, monitoring technology and countermeasures, and puts forward the key difficulties and development direction in the future, so as to provide scientific reference for the development of remote sensing monitoring of land remediation.

Keywords

Application , Remote Sensing Technology, Land Regulation .

1. Introduction

While contributing to economic development, the development of mineral resources has also caused serious damage to land resources and ecological environment. It is estimated that more than 6.67 million hectares of damaged land caused by natural disasters and production and construction have not been reclaimed in China, and about 306000 hectares of damaged land are added every year, of which more than 60% are cultivated land or other agricultural land, It seriously threatens food and ecological security. Land reclamation and ecological reconstruction have become important measures to promote the construction of ecological civilization, and remote sensing technology has become one of the important means to find out the bottom number of damaged land, verify and evaluate the effectiveness of reclamation, effectively identify and extract damaged land information, and continuously track the management and protection of reclaimed land.

Land remediation is one of the effective means to alleviate the contradiction between people and land, solve land use problems and ensure national sustainable development. China is vigorously promoting the land remediation policy [1]. Traditional land information acquisition and monitoring of land improvement projects mainly rely on artificial field measurement, which can not meet the requirements of relevant work on timeliness, cost and accuracy. However, China's land improvement monitoring is in the process of changing from traditional information acquisition to modern intelligent monitoring. Remote sensing technology has the characteristics of high efficiency, high precision and low cost, Become a strong support for land regulation and supervision. Since the Third Plenary Session of the Eleventh Central Committee, China has made use of remote sensing technology to realize regular and continuous

investigation, prediction and prediction for the monitoring of changes in land use types and cultivated land quality in land regulation [2]; In recent years, the Ministry of natural resources has formed a land remediation management pattern of "Ministerial supervision, provincial overall responsibility and city and county organization and implementation", and made full use of remote sensing technology to realize the effective supervision of land use status, land quality and urban cadastre in the land remediation area [3]; The comprehensive implementation of the "one core, two deep and three systems" land and resources science and technology innovation strategy has also widely applied remote sensing technology to the construction of the "Trinity" supervision system of cultivated land, provided real-time and accurate technical support for land remediation, and established a remote sensing dynamic monitoring system for soil characteristic inversion, large-scale basic information acquisition and regulation of remediation process [4], It has far-reaching significance for the full implementation of land remediation projects.



Fig. 1 Remote sensing monitoring diagram

2. Research progress of remote sensing monitoring system for land remediation

Remote sensing monitoring of land remediation is an important part of land remediation. The system framework is shown in Figure 2, which is mainly divided into data acquisition layer, data processing layer, data analysis layer and monitoring application layer. The key technologies covered include: Multi-source Remote Sensing acquisition technology, remote sensing image preprocessing technology, remote sensing image classification technology and remote sensing quantitative inversion model. These technologies and methods have made some research progress, but they are still the research hotspot and difficulty of remote sensing application in land remediation.

2.1. Research progress of remote sensing image preprocessing technology

Atmospheric correction, orthophoto correction, geometric registration, image enhancement, image fusion, image clipping and image mosaic. For different types of remote sensing data, the emphasis of data preprocessing is different. Noise reduction, image registration and image fusion are the key steps to obtain the background data of land remediation remote sensing monitoring, and they are also the research hotspots in the field of remote sensing image processing in land remediation monitoring.

Noise affects the analysis process of remote sensing image and the accurate acquisition of interference information. Therefore, noise reduction is of great significance to improve the quality of remote sensing data in land remediation area. The mainstream image noise reduction

methods are mainly divided into three categories: traditional filtering methods, in which the better processing ability of median filter for scattered noise has been widely verified, but its noise reduction ability is significantly reduced in the face of more serious and concentrated salt and pepper noise [6]; The filtering method based on wavelet theory has good and stable noise reduction performance, but its principle and algorithm are complex; Improved traditional filtering methods, such as a variety of improved median filters [7], are difficult to retain image details completely while reducing noise. Therefore, two effective improvement ideas are proposed: ① improve the improved median filter [8], such as removing the extreme value of the median filter window, and improve the calculation rules of the gray value of the central pixel by setting the difference threshold, so as to improve the recovery ability of the target signal under serious noise interference; Or combine a variety of hybrid improved median filters with fuzzy neural network to integrate the advantages of a variety of filters and improve the filtering performance; Or combine artificial intelligence with fuzzy filter to realize the automatic optimal acquisition of filter threshold. ② The multi-scale hybrid application of a variety of wavelet transforms, such as the combination of wavelet transform and curvelets transform [9], the combination of wavelet transform and directional filter [10], the denoised image has better visual effect and peak signal-to-noise ratio, which has become the focus of image denoising research at present.

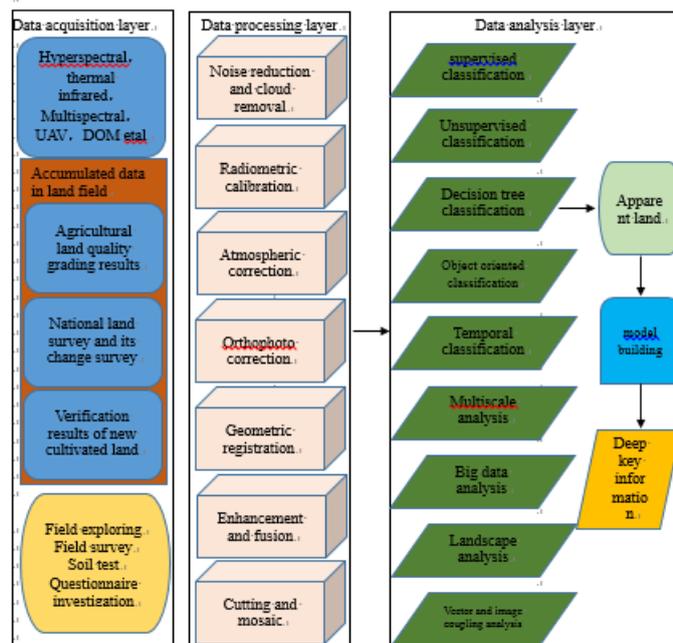


Fig. 2 Structure diagram of land consolidation remote sensing monitoring system[5]

2.2. Research progress of multi-source remote sensing acquisition technology

Multi-source remote sensing is the most important data base of land remediation remote sensing monitoring system. Remote sensing technology refers to an earth observation and space exploration technology that obtains its characteristic information through a certain sensor device without direct contact with the studied object, and extracts, processes, expresses and applies these information. It has advantages in spatial information acquisition, expands the height, depth, angle, scale and dimension of resource observation, and expands the visual sensory range of observation. It has the advantages of wide coverage, omni-directional, dynamic, real-time, economic, macro, comprehensive, fast, multi-level, multi-scale, multi temporal, multi-means, complementary fusion of multi-source data, large amount of information, all-weather (microwave and thermal infrared, etc.), not limited by ground conditions, combination of quantitative and qualitative, and reflecting the internal information

of ground features [11]. According to the platform used by the sensor, it can be divided into aerospace remote sensing technology, aerospace remote sensing technology and ground remote sensing technology, each with its own characteristics and scope of application. The research and application of the first two are more extensive. Although remote sensing can not completely replace field survey [12], the combined application of aerospace remote sensing and ground remote sensing has become the key to obtain spatial information of land resources, Especially an important way of land regulation and monitoring.

2.3. Remote sensing monitoring technology for land reclamation

In the reclamation project, remote sensing monitoring and evaluation are actively carried out for some historical industrial and mining wastelands. The following measures are mainly taken: First, strengthen the monitoring of objects and data. In terms of remote sensing data screening, it should be combined with the characteristics of monitoring objects. Due to the special circumstances left over by history, the project plot area is different. Mountainous and hilly areas are the main distribution areas of the project. There are different degrees of topographic relief in the area, and there are relatively many ground object types with broken and scattered layout. However, in the areas with obvious effect of reclamation, the general climate conditions are not ideal, and the cloud and rain weather is more frequent, which increases the difficulty of selecting remote sensing monitoring objects and data to a certain extent. Therefore, the investigation and monitoring objects have selected plots with large area and good centralized connectivity. Combined with the specific location of the monitoring object, image spatial resolution, satellite sensor parameters, cloud cover, acquisition time and other relevant parameters and indicators, the remote sensing images of high score and resource satellites are mainly selected as the monitoring data source.

Second, monitoring methods and indicators. In the technical route, conventional remote sensing images are used for interpretation. In terms of image preprocessing, the steps of Orthophoto calibration, atmospheric and orthophoto correction, image registration and clipping are strictly followed. Combined with the image histogram, the vegetation index is extracted manually, and the vegetation coverage is calculated based on the vegetation index, Select some sample areas in land use / cover classification, and develop computer programs to realize batch image data processing, so as to significantly improve the work efficiency. Take field survey and inspection, and conduct mutual verification in combination with UAV aerial image port to extract more reliable and accurate satellite remote sensing image information. The feasible technical route of annual remote sensing monitoring plays an effective supporting role in monitoring and supervising land reclamation.

3. Common problems of remote sensing technology in land reclamation monitoring

First, a long-term and stable monitoring method has not been established. In the process of land reclamation monitoring, the monitoring method is mainly based on the actual needs, and there is no real-time and comprehensive remote sensing monitoring. Although active exploration has been carried out in some aspects and certain results have been achieved, the monitoring method lacks long-term stability. Throughout the land regulation departments at all levels, there are relatively few units to carry out remote sensing monitoring of land reclamation, but they basically take the way of research at any time, and the continuity and overall planning of the work are seriously insufficient. Horizontally, the technical exchange and cooperation between land regulation departments and relevant remote sensing surveying and mapping technology departments need to be deepened, so as to promote the application of remote sensing monitoring technology in land reclamation.

Second, the related technical research of land reclamation monitoring needs to be further deepened. With China's increasingly perfect satellite technology service system, various national industries actively carry out work in the research and application of satellite remote sensing technology, and establish professional technical institutions in relevant ministries and commissions, which plays a certain role in promoting the application of satellite remote sensing technology. In the process of protecting cultivated land and ecological restoration, the use of land reclamation technology has obvious effects, but at present, the land regulation department is not deep enough in the research of remote sensing technology, which affects the practical application of satellite remote sensing technology in this industry to a certain extent.

3.1. Countermeasures

First, optimize the technical route according to the specific application, so as to continuously improve the monitoring efficiency. In monitoring land reclamation, the selected remote sensing monitoring technology route should be feasible. Continuously carry out relevant technical research, continuously optimize the technical route, improve the technical feasibility, adopt a variety of practical methods to achieve high accuracy requirements and economy, significantly improve the image data processing efficiency, continuously improve the big data processing capacity, and improve the technical support capacity in remote sensing monitoring land reclamation.

Second, continuously enrich and diversify technical means. China's monitoring of land reclamation has a huge amount of data, and the monitoring task is difficult to achieve by using a single technical means. Therefore, it is difficult to take a variety of measures to judge the monitoring effect of the project, evaluate and correct the overall situation according to the judgment results, and analyze and study with the field investigation and inspection, so as to objectively verify the accuracy of the monitoring results.

4. Conclusion

The development of mineral resources not only promotes economic development, but also seriously destroys land resources and ecological environment. This study deeply analyzes the remote sensing technology of land reclamation in mining area, and discusses the application, common problems and Countermeasures of remote sensing technology in land reclamation, which has a certain reference significance for improving the application level of remote sensing technology in land reclamation in mining area.

Acknowledgements

The Project Supported by Natural Science Basic Research Plan in Shaanxi Province of China(2021JQ-958).

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