

The Study on the Second Land Investigation Based on RS Technology

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Abstract: Land is the fundamental resource of economic and social development. Land investigation is the absolutely necessarily basic and commonweal job to national economic construction, meanwhile, is the system project of wide-involved-fields, strict-policy and high-technology. Do well in the second national land investigation is very significant to carry out and implement scientific development view, to construct socialist harmonious society, to facilitate the economic and social sustainable development and to strengthen land and resources management. During the second land investigation, RS, GPS, GIS and other high-technologies were fully used, especially RS for its characteristics of periodicity, dynamic, abundant-information, high-obtained-efficiency and recording & transmission by digital mode. On the basic of these characteristics above, the paper analyzed the feasibility of the use of RS technology in the second land investigation and discussed deeply in the processing and interpretation of RS images. The fact shows that the RS technology is very important to finish with high quality of the second national land investigation.

Keywords: the second; Land Investigation; Remote Sensing (RS); Image; characteristic analysis

1 INTRODUCTION

The second land investigation, which began in 2007 and will end in 2010, was defined as a investigation of the type, area, distribution and ownership of land, according to the technology standard of 《The Second National Land Investigation Technology Regulations》, with the working base map of Digital Orthophoto Maps from up-to-date RS images, with reference relative materials, such as the maps and data of land survey, by using the national unified land classification standard and by field survey. The aims of the second land investigation are to master the true land basic data, to realize the information and network management of investigation results, to set up & improve the institution of land investigation, statistics and registration, to realize the social service of land resource information and to meet the need of economic social development, land macro-control and land resource management. During the second land investigation, RS, GPS, GIS and other high-technologies were fully used to construct a comprehensive land information database which is integrated with many data formats, meanwhile, to real-

ize the real-time dynamic renewal to the land investigation data. The paper mainly discussed the application of RS technology in the second land investigation.

2 REMOTE SENSING TECHNOLOGY AND FEASIBILITY ANALYSIS

2.1 Remote Sensing Technology

The word "RS" comes from "Remote Sensing". RS technology usually is defined as a scientific technology of obtaining the characteristics information of study object, and extracting, processing, expression and applying the characteristics information by some sensor device and without the direct contact with the study object. RS information has the characteristic byperiodicity, dynamic, abundant-information, high-obtained-efficiency and recording & transmission by digital mode.

2.2 The Feasibility Analysis of RS Technology in the Second Investigation

In the traditional land investigation assignment, after acceptance the task of land investigation, the steps were, firstly, the preparation for the investigation and material processing, secondly, fields investigation with the drawings and recording the land use status, and then further

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fair drawing, filling in forms and presenting the results in indoors. In this treatment processing, a lot of human and material resources were consumed, the efficiency was low, the period was long, the capital investment was multiple and artificial interference factors were great, so this method was difficult to meet various application demands. The most important character of RS technology is strong objectivity and low period. Not only the surface real-time data could be obtained in the shortest time, but also stable surface cover data flow of various resolutions would be obtained in long time, which provides a new way to update the land use basic map with different scales and makes sustainable updating of land use possible. According to the character of RS technology and the requirement of land investigation, to embody the actual situations of land use and urgency of land investigation, using RS images is feasibility to the land investigation.

3 APPLICATION OF RS TECHNOLOGY IN THE SECOND LAND INVESTIGATION

The base map of the second land investigation is digital orthophoto map. With the continuous development of the aviation & aerospace and RS technology, the field investigation during the first land detailed survey is not absolute in the second land investigation and a lot of work were transferred to the inner, so the interpretation in indoors is very important in the second investigation. The interpretation in indoors is the method that determines the topographic elements from different images features and their size and correct positions, according to the imaging law and interpretation characteristics of ground objects. So the quality of digital orthophoto map affects the quality of the second land investigation results. To make the suitable digital orthophoto map and to ensure the quality of images, RS technology mentioned next will be used.

3.1 Geometric Correction of RS Images

The principle of the geometric correction is to avoid the spatial geometric processing and directly use the ground control points to simulate mathematically to the geometric distortion. In fact, geometric correction is the processing that to make sure of the location of ground objects in the RS images in accordance with a certain geodetic level and projection coordinate system, to re-

align the RS images data, to generate a new image that accords with some map projection or graphic expression and to achieve the goal of geometric correction.

3.2 Registration of RS Images

Image registration refers to unification of coordinate and pixel spatial resolution between images by geometric transformation overlapping the homonymy image of multiple images.

3.3 Fusion Processing of RS Images

Image fusion is the process of taking multi-source RS images to uniformed coordinate and using some algorithm in multi-frame images to synthesize a new image. The aim of the image fusion is to integrate the multiband information of single sensor or the information of different type sensors, to eliminate the possible redundancy and contradiction between multi-sensors, which can strengthen the information transparency of images, improve the precision, reliability and using rate of translation and describe the information of objects clearly, completely and accurately. The images after fusion are wholly homogeneous in high bright, moderate in color contrast, abundant in texture and color information, significant in ground objects differentiation, without ghost image or blurry and achieving to nature color in hue.

3.4 Characteristic Analysis of RS Images

There are different characteristics in different ground objects in RS images. These image characteristics are the basis of interpretation and identification. After determining the ground objects of information extraction, image characteristic analysis of these ground objects could be started. So called image characteristic analysis, it is the image qualitative analysis of quasi-extracted visual ground objects in the aspects of hue, shape, shadow, texture and image structure. Through the qualitative analysis of these ground objects and images, the image characteristics of different ground objects could be summarized and concluded. In accordance with the image characteristic, the technician would interpret in indoors.

Farmland: there are obvious geometric shape, larger area, and connecting with the road and residential points. The hue is different along with the difference of the soil, humidity, crop species and growth season. Generally, the

humidity is high and the hue is dark, while the humidity is low and the hue is light; the hue of the growing crops is dark, while the hue of mature crops is light; the hue of irrigating farmland is dark, while the hue is light when the farmland is not being irrigated. The shapes of farmland in the gully are irregular; most of them is narrow and long. The terrace is like ladder. Paddy fields usually have small-segment and kilter block and the level of its ground is flat. There is bund around the paddy fields. The hue of the paddy fields in the images is generally relatively homogeneous, charcoal grey and darker than dry land. The shapes of the paddy field in the plain area are mostly grid and are irregular in the mountain area. Meanwhile, the value of the spectrum feature is different to different farmland classification showed in Fig. 1.

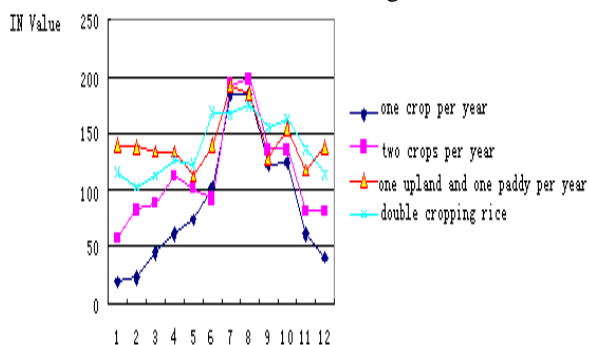


Fig. 1 spectrum feature value of different farmland classification

Water: the hue is different because of the difference of the ray reflection angle and the depth of the water in the land, however, most of the hue is cyanic color, blue and dark blue. There are several existing forms of the water in the land, such as river, lake and pond. The shape of the rivers is always banding and with a lot of bands, while the shape of the lakes is an irregular face shape.

Road: there are two forms of the road in the city, one is cement road, and the other is asphalt road. The hue of the cement road is grey-white and the hue of the asphalt is grey-dark. The geometric shape of the urban road is usually banding. The country roads are narrower than the roads in the city with nature bands and the hue is white.

Building: the building in the city is relative centralized. There is a long and narrow shadow in high-rise building. Residential plot is formed by rows of single buildings. The buildings in the rural are mostly single buildings with small area. The single buildings are inter-

digitate each other, and the shapes are scattered and irregular.

Desert and non-used land: the hue of the desert and non-used land, such as bare land, is always bright and white, which is easy to interpret.

Likewise, the value of the spectrum feature is different to different classification showed in Fig. 2.

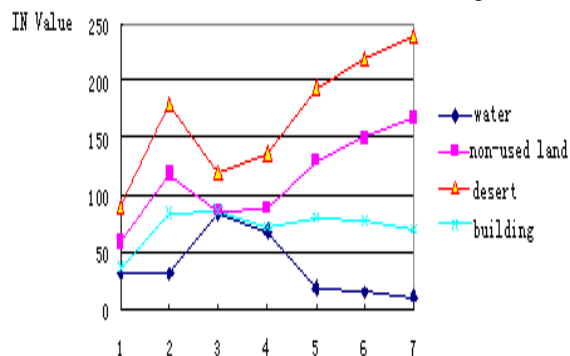


Fig. 2 spectrum feature value of different classification

4 CONCLUSIONS

Land is the fundamental resource of economic and social development. Land investigation is the absolutely necessarily basic and commonweal job to national economic construction, meanwhile, is the system project of wide-involved-fields, strict-policy and high-technology. Do well in the second national land investigation is very significant to carry out and implement scientific development view, to construct socialist harmonious society, to facilitate the economic and social sustainable development and to strengthen land and resources management. During the second land investigation, RS, GPS, GIS and other high-technologies were fully used, especially RS for its characteristics of periodicity, dynamic, abundant-information, high-obtained-efficiency and recording & transmission by digital mode. When they were investigating in the fields with the RS digital orthophoto map as the work base map, the technicians could transplotted to the work base maps according to the images information, and then they would confirm the achievements of indoors in On-the-spot. The method of using RS technology is higher efficient, lower labor intensity, shorter period. With the development of RS technology and the maturation of the applications of the high-resolution, high-spectral remote sensing and radar images in the land resource investigation, the traditional land use investigation method does not adapt to the rapid development of social

economy and the scientific, effective and reasonable application of the land. The RS technology solves the problem effectively.

In a word, the RS technology has the advantages of macroscopic, dynamic, convenient, repeatable, low-cost and is significant in the second national land investigation.

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