Interpretation of Planting Area of Sorghum Based on RapidEye Image

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Abstract: Because of the characteristics such as high resolution, RapidEye image are widely applied to the fields of remote monitoring and information extraction, etc. In this paper, the RapidEye image of August in 2012 is used to remotely monitor the planting area of vintage sorghum in the study area. Firstly we preprocess the basic data, GPS sample data and image, and establish the classification marks. Then human-computer interactive interpretation scheme is used to the generation of farmland mask. Finally we select three automatic classification schemes and extract the sorghum information by means of the spectral curves of crops. Accuracy assessment is carried out with the field sample data, and the interpretation result is satisfied. All these can provide the monitoring data and help for the decision-making of macro-layout of sorghum planting in Maotai Base.

1. Introduction

The high-resolution remote sensing imagery for agricultural work has become an inevitable trend in the development of remote sensing technology and agricultural engineering, and it will provide some support for optimal agricultural production decision-making [1]. In the use of high-resolution remote sensing images for crop area estimation and monitoring, as early as 2001, Pradhan developed a representative computer system based on regional frame sampling to estimate crop area [2]. Simonneaux and Marshall applied multi-temporal high resolution images and high resolution image interpolation techniques to crop classification and crop area monitoring [3, 4]. Wu Bingfang proposed and implemented the CPTP (crop planting and type proportion) crop area estimation method, and calculated the remote sensing data and the ground survey data separately [5].

RapidEye has a high resolution and a resolution of 5m after resampling. It is the world's first commercial satellite to provide red-side bands and is widely used in vegetation monitoring, resource monitoring, agriculture, insurance, and government [6-8]. It also has obvious advantages in land use information and remote sensing monitoring of large-scale crop planting areas [9-11].

This paper takes Renhuai City and Xishui County of Guizhou Maotai Brewery High-altitude Base as the research area to extract the planting area of wine sorghum. In the early stage of the research, the research team conducted field investigation and sampling of the study area for 2 consecutive years. The RapidEye image with data pretreatment was selected as the data source in August 2012. The cultivated mask was first adopted. Secondly, on the basis of the arable land mask, the scheme of automatic extraction of sorghum information is adopted. Accuracy evaluation of the interpretation results, the selection of the highest accuracy interpretation results as the final result, and is very close to the official statistics. Therefore, based on the RapidEye image, the extraction area of Maotai brewery sorghum was selected to provide reliable monitoring data and decision-making basis for the macro layout of Guizhou Maotai brewing sorghum planting.

2. Data Source and Data Processing

2.1 Data Preparation Stage.

The RapidEye original image includes five spectral bands of blue, green, red, red and near-infrared, which can monitor vegetation changes and provide rich and effective information for land classification and vegetation growth status monitoring. The study area basic data includes the August 2012 RapidEye image, 1:50,000 DEM data, administrative data, field sample data and some

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statistical data.

2.2 Data Processing.

RapidEye image processing uses the IKONOS correction model. In the common band combination, the color of the 321-band building is close to the actual ground, but the details of the agricultural land are not rich and prominent; the 432 band (ie, the combination scheme of red, red and green bands) has rich agricultural details, but the color of the building The color difference is quite different from the actual object color; the image of the green band combination scheme is closer to the color of the actual object, and the texture details are prominent. Therefore, the range of crops such as sorghum is extracted, especially the vegetation information such as sorghum and corn is distinguished, and the combination of false color band and simulated true color band is used.

Analyze data, unify vector data space projection; analyze image spectral features and establish terrestrial interpretation flags. Two interpretation methods for human-computer interaction interpretation and automatic classification are determined, and the combined image of the false color band and the true color band combination image are determined as the source of the interpretation image data.

3. Sorghum Information Extraction

3.1 Cultivated Land Mask Extraction.

First, it is necessary to interpret the cultivated land data through human-computer interaction, and use the cultivated land as a mask to cut out the image data for automatic classification. With Arcgis software as the platform and Google Earth as the auxiliary, the county is divided into townships and towns, and combined with the field sampling data of 2011 and 2012, the farmland data of Renhuai City and Xishui County are obtained through human-computer interaction.

Complete the relevant spatial data processing and analysis, generate township polygon data, and obtain the farmland data of each township. After data processing and statistical analysis, the decoded farmland data of each township was obtained, and the statistical table of cultivated land area was collected.

Investigate the missing and trapped arable land and obtain the more accurate arable land data. The initial interpretation of the area of cultivated land in Renhuai City was 557951.80 mu, and the total area of cultivated land in Xishui County was 311159.38 mu.

3.2 Crop Spectral Curve Analysis.

According to the sample data collected in the field, the data processing generates point data. After screening and purification, 272 valid sample data are selected from 405 sample data, and also used as the accuracy verification data of the automatic classification result.

Sample data such as sorghum and corn are superimposed on false color, true image color image and DEM data, and sample command is processed in Arcgis to obtain gray scale and elevation information tables of each sampling point. Through statistical analysis, the gray scale information and spectral curve of each cultivated land are obtained. Using the gray value of each object, the spectral curves of various crops in cultivated land are produced and used as the basis for automatic classification of various ground objects.

3.3 Sorghum Information Extraction.

Using the arable land mask, the mask image data is generated, and the remote sensing image automatic classification scheme is determined through the spectral curve of the ground object, and the supervised classification and unsupervised classification are selected.

In the supervised classification, the ground objects are divided into two categories, sorghum and other categories. In the unsupervised classification method, it is divided into several categories, and then the classification re-encoding and the type are merged into two categories. Finally, the results of sorghum planting area under the three classification schemes of Renhuai City and Xishui County were obtained (Table 1).

Tab.1 The extraction results of sorghum planting area from three classification schemes

Classification scheme	Supervised classification	Unsupervised classification of false color images	True color image unsupervised classification
Renhuai City	358505.73	291007.13	282409.1
Xishui County	245756.79	195085.02	197128.04

4. Classification Results Accuracy Evaluation

The accuracy of remote sensing image classification accuracy is usually compared with the original image or ground sampling data and the accuracy is expressed as a percentage of the correct classification. The two results of supervised classification and unsupervised classification are usually evaluated using parameters such as Producers Accuracy, Users Accuracy, Overall Classification Accuracy, and conditional Kappa coefficients. Studies have shown that the classification quality is very good when the Kappa coefficient and the classification accuracy value are 0.6-0.8 [12].

According to the collected sorghum sample data, the supervised classification and unsupervised classification of sorghum classification results of Renhuai City and Xishui County were evaluated. The classification accuracy of false color images in Renhuai's unsupervised classification scheme is better than that of true color images, and the classification quality is a good level. The classification results of the supervised classification and unsupervised classification of false color images in Xishui County are not ideal, and the classification quality is in the category of poor. The classification results of true color images in the unsupervised classification scheme are ideal. The overall Kappa coefficient is 0.7207, and the Kappa coefficient of the Gaochun classification is 0.7054. The classification quality is very good.

5. Conclusions and Discussion

The automatically sorted raster data is processed by data to obtain vector data and statistical data results. After clustering statistical analysis and removal analysis, classification re-encoding is performed, and the raster data is vectorized. Finally, use the smoothpolyline and feature to polygon commands in Arcgis to smooth the vector data to get the required vector data.

According to the area data of the vector data, the area of sorghum planting in Renhuai City was 29,6084.3 mu, and the planting area of sorghum in Xishui County was 19,3331.2 mu. The data were divided into township area statistics, and the sorghum spatial layout and sorghum planting area statistics of 19 townships in Renhuai City and 16 townships in Xishui County were obtained (Fig. 1).

Due to its high resolution, RapidEye images can meet 1:25000 interpretation and mapping accuracy. Because it can identify the ground objects of 10m×10m, accurately extract the boundary of cultivated land and determine the area of cultivated land, it has obvious advantages for remote sensing monitoring of large-scale crop planting area.

Automatic classification of the image of the plateau mountainous area makes it difficult to obtain data that meets the accuracy requirements. Therefore, human-computer interaction interpretation is used to extract the cultivated land data, and then the image is automatically classified. The two methods are combined to improve the accuracy of sorghum crop area interpretation. .

Experiments verify that among the three classification schemes of supervised classification, unsupervised classification of false color images, and unsupervised classification of true color images, a scheme with high interpretation accuracy is selected as the source of automatic classification data of sorghum, and the classification results are more reliable and achievable. letter. It is proved that the remote sensing interpretation method based on RapidEye image has high precision and feasible scheme, which provides reliable monitoring data and decision-making basis for the macro layout of wine sorghum planting.

References

[1] Yang Hongwei, Tong Xiaohua. Application status of medium and high resolution remote sensing images in agriculture[J]. Transactions of the Chinese Society of Agricultural Engineering, 2012, 28(24): 138-149.

[2] Sushil Pradhan. Crop area estimation using GIS, remotesensing and area frame sampling [J]. International Journal of Applied Earth Observation and Geoinformation, 2001, 3(1): 86-92.

[3] Simonneaux V, Duchemin B, Helson D, et al. The use of high-resolution image time series for crop classification and evapotranspiration estimate over an irrigated area in central Morocco [J]. International Journal of Remote Sensing, 2008, 29(1): 95-116.

[4] Marshall M T, Husak G J, Michaelsen J, et al. Testing a high-resolution satellite interpretation technique for crop area monitoring in developing countries [J]. International Journal of Remote Sensing, 2011, 32(23): 7997-8012.

[5] Wu Bingfang, Li Qiangzi. Crop planting and type proportion method for crop acreage estimation of complex agricultural landscapes [J]. International Journal of Applied Earth Observation and Geoinformation, 2012, 16: 101-112.

[6] Asam S, Fabritius H, Klein D, et al. Derivation of leaf area index for grassland within alpine upland using multi-temporal RapidEye data [J]. International Journal of Remote Sensing, 2013, 34(23): 8628-8652.

[7] Ramoelo A, Skidmore A K, Cho M A, et al. Regional estimation of savanna grass nitrogen using the red-edge band of the spaceborne RapidEye sensor[J]. International Journal of Applied Earth Observation and Geoinformation, 2012, 19: 151-162.

[8] Tigges J, Lakes T, Hostert P. Urban vegetation classification: Benefits of multitemporal RapidEye satellite data [J].Remote Sensing of Environment, 2013, 136: 66-75.

[9] Dupuy S, Barbe E, Balestrat M. An Object-Based Image Analysis Method for Monitoring Land Conversion by Artificial Sprawl Use of RapidEye and IRS Data [J].Remote Sensing, 2012, 4(2): 404-423.

[10] Adam E, Mutanga O, Odindi J, et al. Land-use/cover classification in a heterogeneous coastal landscape using RapidEye imagery: evaluating the performance of random forest and support vector machines classifiers [J]. International Journal of Remote Sensing, 2014, 35(10): 3440-3458.

[11] Conrad C, Dech S, Dubovyk O, et al. Derivation of temporal windows for accurate crop discrimination in heterogeneous croplands of Uzbekistan using multitemporal RapidEye images [J]. Computers and Electronics in Agriculture, 2014, 103: 63-74.

[12] Landis J R, Koch G G. The measure of observer agreement for categorical data [J]. Biometrics, 1977, 33(1):159-174.