LETTER TO THE EDITOR

Location of Forest Environment Erosion Area Based on Remote Sensing Image

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Aiming at the problem of low positioning accuracy of traditional forest environmental erosion area location method, a method based on remote sensing image for forest environmental erosion area location was proposed. Remote sensing images of forest erosion areas were extracted in an ideal time period; The segmentation of remote sensing images is guided by region growth algorithm and truncation method based on the idea of local optimal mutual adaptation; The dbN wavelet basis is used to decompose the remote sensing image in three layers, and then the decomposed sub-bands are coded separately to form a new image; Remote sensing image location of forest environmental erosion area is realized by genetic algorithm. The experimental results show that the proposed method has high positioning accuracy, which verifies the applicability of the proposed method in locating forest erosion areas.

Remote sensing image; forest environment; erosion area; positioning

1 Introduction

Forest environmental erosion is a natural phenomenon on the earth's surface. Except permafrost area, soil erosion occurs in different degrees all over the world. After the emergence of human society, forest environmental erosion has become a dynamic process under the joint action of nature and human activities, which constitutes a special environmental background and has become the focus of the world's resources and environmental problems. Remote sensing technology is helpful for soil erosion assessment and can provide spatial data for forest soil erosion assessment.

At present, remote sensing image positioning is mainly accomplished by satellite orbit information and time code information. In the case that the orbit information and time code information cannot be obtained, the positioning of remote sensing image must rely on the manual interpretation and interpretation of experienced interpreters, which has a large workload, low efficiency and low accuracy. High-precision positioning is the basis of geometric processing and geospatial information acquisition of remote sensing images, and it is the basic guarantee of measuring and producing various scale topographic maps by using high-resolution satellite remote sensing images. Therefore, using remote sensing technology to locate erosion areas has become a research hotspot in related fields.

Yuwei Zhang, Luhe Wan, Zhendong Lipublished an article in the Ekoloji (Issue 106, 2018), entitled “Forest

Vegetation Type Extraction and Dynamic Monitoring - A Case Study of Heilongjiang Province, China" (Zhang et al. 2018).This paper aimed to establish an effective remote sensing method for monitoring forest vegetation succession patterns or dynamic changes. Taked heilongjiang province as the experimental area and taked TM image as the basic data, the maximum likelihood classification method and supported vector machine classification method were used to extract forest vegetation type information respectively, and the classification accuracy of the two methods was compared. At the same time, by extracting change information and superposition analysis, the dynamic change of large area forest type is monitored, and the Suggestions of forest sustainable development are put forward.

Yang et al (2018) proposed a method of forest fire prediction and location based on neural network.This paper introduced the neural network into the wireless sensor network, takes the data of fire occurrence as the input training sample, and taked into account the influence factors of light, temperature, humidity, wind force, terrain and flammability, etc., to building a predictable model, the probability of fire occurrence was predicted by the convergent network; A vast forest area of sensor placement in the unattended, for each sensor to replace batteries were both complicated and not reality, so in considering how to energy saving and maintenance under the condition of the stability of the wireless sensor network, improve the network life cycle, the proposed dynamic partitioning inhomogeneous clusters routing scheme (DPNNC), but exists the problem of low precision of the method. Jiang et al (2018) proposed a new method of fire area location based on CMYK color features. In the forest fire monitoring system, in order to located the specific location of the suspicious fire ignition point in the video monitoring image of the forest in real time and efficiently, the combination of the color feature of the flame under the CMYK color model and the genetic algorithm for the optimal fitness function was studied. By reasonably configured the factors of M, Y, K and other low-order moment features of color in the detection window neighborhood in the Euclidean distance classification fitness function, the initial positioning of suspicious fire pointed in forest monitoring images can be controlled within 0.05s. Then the accurate alarm signal was given through the calculation and verification of the color information of the fire sample image and the initially located suspicious fire ignition point, but this method also has the problem of low positioning accuracy.

In order to solve the problem of low positioning accuracy in traditional methods, a method of locating forest environmental erosion area based on remote sensing image was proposed.

2 Idea description

2.1 Remote sensing image acquisition

The forest environmental erosion monitoring project adopts the method of artificial field survey, which is time-consuming and laborious. In addition, the research on forest environmental erosion has many impact factors, a complicated process and a large amount of data. Therefore, the manual survey cannot guarantee the data accuracy. Remote sensing data can be used to quickly obtain a wide range of land use patterns and vegetation coverage (Guo et al. 2017, Zielinska et al. 2017; Seutloali and Beckedahl 2015). However, the information reflected by remote sensing data in different periods is different. Based on the research results of several researchers, it is determined that the remote sensing images acquired between April and may each year are most conducive to the study of forest environmental erosion. At the same time, there is still a period of time before the flood season in June and July. At this time, the forest environment is still the same as that of last year due to erosion, so as to reflect the forest environment erosion of the previous year in the most authentic way. In this stage, the mapping effect is better, and the image is clearer, which is conducive to image interpretation, and can also avoid errors caused by unclear image. The remote sensing image in this period is the most ideal, so remote

sensing image of forest erosion area is extracted in this stage.

2.2 Remote sensing image segmentation of forest environmental erosion region based on region growth algorithm

The selection of seed points and the selection of criteria for incorporating difference in the regional growth algorithm are directly related to the image segmentation effect. The image gradient information is used to select the seed points, and the spectral and shape characteristics are combined to enhance the ability of regional growth. Before the regional growth in each scale space, the selection of seed points should be carried out. Regional growth through unsuitable seed sites is often inconsistent with the objective results (Anees et al. 2018). The image boundary is usually a relatively stable part. Experiments show that selecting the seed points with the image boundary can get better experimental results. Sobel operator is used to calculate the gradient of each band, and then the gradient value of the ensemble is calculated. If the obtained value is greater than a set domain value, it is considered as the boundary. The interior point of each closed boundary can be considered as a homogeneous region, and one of them is randomly selected as the seed point.

In this paper, the truncation method based on the idea of local optimal mutual adaptation is used to guide the merging of segmented units. The following method is used for regional growth: Suppose you randomly select a seed point S0, search the image object S1 whose features are the least different from its neighbor domain, and do the same search for S1, get the image object S2 with the smallest difference from its features. If S0=S2, it is believed that the homogeneity criterion is well satisfied between S0 and S2. Otherwise, set S0=S1, Sl=S2. Repeat the above search until S0=S2. In this way, a segmentation region can be obtained to complete the segmentation of remote sensing images of forest environmental erosion regions.

2.3 Enhancement of remote sensing image of forest environment erosion area based on wavelet transform

Texture reflects the spatial variation characteristics of the DN value of image element, and it is a graph with regular arrangement distributed in the whole image or a certain area of the image. In the remote sensing images, the texture reflects the topography and geomorphologic features, and is an important information for identifying ground objects and determining geological structures. The texture feature is introduced into the analysis process of remote sensing image, and the reasonable interpretation is made based on the actual ground features, so that the combination of spectral feature and texture feature is conducive to enhancing the distinguishability of geological bodies and geological phenomena.

Texture features are mainly reflected in the spatial distribution of high-frequency information on the image. Therefore, based on the high-frequency information after wavelet transform, texture features with different resolutions and multiple directions can be obtained (Bing et al. 2018). Part of the workspace images are processed by wavelet transform methodn, dbN wavelet basis is used to decompose the image in three layers, and then the decomposed sub-bands are coded separately. Each high frequency subband image is weighted by the same amplitude, and reconstructed together with the invariant low frequency subband to form a new image. In this new image, compared with the original image, it contains more abundant high-frequency terrain texture information, which is enhanced and displayed according to the intensity distribution of the texture information.

The geological information in remote sensing images, such as the edge of features, geological structure and alteration, is often highly directional, so it is necessary to make use of it in image processing to obtain the most correct results. Wavelet transform can resolve the contradiction between the resolution of time domain and frequency domain. It is more advantageous than traditional methods to extract the edge and alteration information of ground objects by wavelet singularity detection.

2.4 Remote sensing image location of forest environmental erosion area based on genetic algorithm

(1) Coding: Remote sensing image distortion should be considered in the process of forest erosion area matching and positioning. Therefore, the coding scheme in this paper considers three independent variables, corresponding to z axis position, y axis position and rotation distortion Angle respectively, three chromosomes need to be considered in the genetic algorithm, and the length of each chromosome corresponds to the value range of independent variables.

(2) Fitness function: In the process of remote sensing image matching, appropriate individual evaluation function should be adopted as the fitness function. The so-called individual evaluation function is the similarity measure of two images. In this paper, the normalized correlation coefficient is selected as the fitness function.

(3) Selection mechanism: Choose the superior individual from the group, the operation that eliminates inferior individual calls choice. Selection operators are sometimes called regenerative operators. The commonly used selection operators include: Optimal individual preservation method, expected value method, etc. In this paper, the selection mechanism combining fitness ratio and optimal individual preservation is adopted.

(4) Adaptive adjustment of crossover probability and mutation probability: The adaptive adjustment of crossover probability and mutation probability, on the one hand, is to ensure individual diversity and prevent premature convergence; on the other hand, it is also to prevent the algorithm from excessive divergence and entering the random search state. gd plus is used as a measure of individual diversity in each generation group, gdm is defined as:

$$gdm = \overline{f} / f_{\max} \tag{1}$$

$\overline{f}$ is the average of individual fitness in a certain generation; $f_{\max}$ is the maximum value of individual fitness in this generation. The larger the gdm value is, the more concentrated and less diverse the individuals are. Conversely, the smaller the gdm, the more individual diversity.

In fact, in order to improve the execution efficiency of genetic algorithm, a parameter N is set in the implementation process to control the genetic algebra of genetic algorithm. When the maximum adaptive value of successive N generations does not change, or the maximum adaptive value of successive N generations does not appear larger, the genetic operation ends and the algorithm ends. Under the precondition of using genetic algorithm to match the remote sensing image of erosion area, the remote sensing image location of forest environment erosion area is realized.

3 Results

In order to verify the effectiveness of the proposed method for locating forest erosion areas based on remote sensing images, an experimental test is required. The test software is Matlab and the operating platform is Windows XP. The test results of positioning accuracy are shown in Table 1.

Table 1 The test results of positioning accuracy

Number of experiment/Times	Positioning accuracy/%
2	98.7%
4	97.9%
6	98.2%
8	97.5%
10	97.8%

The experimental results show that the proposed method has a localization accuracy of more than 97% and

can accurately locate the forest erosion area.

4 Discussion

Inspired by the research results of Yuwei Zhang et al., a method for locating forest environmental erosion areas based on remote sensing images was proposed. Experimental results show that the proposed method has high accuracy. The main reason is that this method uses the wavelet transform method to process part of the workspace images, dbN wavelet basis is used to carry out three-layer wavelet decomposition of remote sensing images, and then each sub-band after decomposition is coded separately to form a new image. Using genetic algorithm to realize remote sensing image location of forest environmental erosion area can effectively improve the positioning accuracy.

Due to the shortage of research funds, the layout and distribution density of observation sites are often not able to meet the needs of research on forest environmental erosion areas, and some research sites are located in no man's land, so the measured data are often not able to meet the needs of research. In other words, the spatial resolution, temporal resolution and spectral resolution of remote sensing data need to be improved..

5 Conclusions

Will now the current situation of the figure of forest environmental erosion area and other thematic maps such as geomorphological map, land type map overlay processing, can carry out regional multi-factor analysis of forest environmental erosion, can quickly find a forest environment the leading factor in the erosion areas, the formation mechanism of erosion area, find out now the forest environment for the development and protection of regional land resources to provide basic information and basis. Therefore, a remote sensing image-based localization method for the present forest environmental erosion area is proposed, and the experimental results show that the accuracy of this method is high. The relationship between different land use types and the amount of forest environmental erosion areas can be determined by locating the current forest environmental erosion areas, so as to find out which human activities are dominant in the current forest environmental erosion areas and work out a more reasonable forest development plan.

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