Dynamic Monitoring of RS and GIS Resources and Ecological Environment Based on High Temperature Materials

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Abstract. The dynamic monitoring and analysis of regional ecological environment is an important part of land use research, which can provide support for regional ecological environment and macro regulation of government departments. With the support of remote sensing technology (RS) and geographic information system (GIS), a land use dynamic monitoring system is established to obtain land use change information quickly, accurately and economically. In order to reduce the influence of thermal radiation, noise and vibration of high temperature material machinery on the measurement results in high temperature measurement environment, the paper proposed the measurement method of ultraviolet light high humidity thermal deformation and gray average method. In this paper, the algorithm of digital image correlation method and the establishment of high temperature measurement system are studied. A set of high temperature material mechanical digital image correlation system suitable for high humidity environment measurement is independently established and applied to the high humidity test of materials. The results show that the above comprehensive method can effectively improve the influence of thermal flow disturbance on system imaging in high humidity environment. Comprehensive analysis of regional ecological environment data shows that environmental quality is closely related to regional ecological environment. Meteorological conditions are one of the important factors affecting the environment, and the project of returning farmland to forest plays a vital role in improving the environment.

Keywords: High temperature materials; RS and GIS; Dynamic monitoring of ecological environment.

1. Introduction
Ecological environment is the organic combination of ecological system and environmental system. It includes biological ecological factors and abiotic ecological factors, such as vegetation, rivers and lakes, land, climate and other physical and geographical conditions and man-made conditions. It is the environmental basis for human survival and development [1]. Environmental quality assessment is a scientific and quantitative description of regional environmental quality. It is to select representative, comparable and operable evaluation indicators and methods according to specific purposes. Correct evaluation of the current situation of ecological environment quality is the basis of regional ecological environment prediction or early warning research, and is an important basis for formulating and planning...
regional national economic development plans [2]. Remote sensing monitoring of land use in China began in the 1970s. The focus of land use remote sensing monitoring is on the change of cultivated land and the expansion of construction land. However, in recent years, research on global change and regional land use, land use change monitoring and mechanism has been significantly enhanced [3]. It can provide rich resource and environment information quickly and accurately. The geographic information system creates an ideal environment for remote sensing information processing, processing and application. The organic combination of the two provides real-time and dynamic spatio-temporal change information for environmental regulation [4]. Among them, remote sensing (RS), geographic information system (GIS) and their combination provide time-space change information for real-time and dynamic monitoring of ecological environment regulation, as well as information extraction, analysis and processing [5-6]. In order to obtain and manage the dynamic information of land use in a fast, accurate and economical way, scientifically manage the spatio-temporal data of land use, provide advanced management tools for the land management department, and provide decision-making support for regional sustainable development.

2. Methodology

The high-temperature digital image correlation method, as its name implies, applies its own digital image correlation method to the high-temperature environment measurement of actual industrial engineering. In recent years, after continuous innovation and optimization by relevant researchers, digital image correlation methods have made great progress in testing the mechanical properties of high temperature materials. The material mechanical measurement under high temperature conditions is very important for the safety, high service life and high temperature of the high temperature resistant materials in the aerospace, military industry, etc., and the deformation and strain field information of the material surface at high temperature is obtained. It is the key and foundation for the study of its mechanical properties [7]. Rigid body displacement experiments at room temperature can be used to verify the accuracy of the measurement system. Because in the experiment, it can be considered that the displacement produced by the displacement platform used in the experiment is standard and accurate. As a space exploration technology, remote sensing has played a significant advantage in land resources investigation. GIS is another advanced science and technology rising after remote sensing technology. It stores, manages, processes, analyzes and displays geographic information under the support of computer software and hardware to provide support for decision-making. Comprehensive application of RS and GIS technology to dynamic monitoring and analysis of land use status can quickly and accurately grasp the information and trends of land use status and dynamic changes, and provide efficient auxiliary means for macro-control of dynamic balance of total land use and ecological environment protection [8].

The biological abundance index is an indicator for assessing the degree of abundance of biodiversity in a region, and is calculated from the proportion of the equivalent area of forests, waters, grasslands and other ecosystems. Table 1 below shows the regional land use structure obtained by using RS and GIS technology.

| Cultivated land | Woodland | Grassland | Building land |
|-----------------|----------|-----------|---------------|
| 780.36          | 690.12   | 39.92     | 350.11        |
| 661.72          | 249.33   | 8.96      | 159.68        |
| 650.04          | 337.41   | 24.18     | 256.94        |

At present, the organic combination of remote sensing and geographic information system has become a hot spot in the development of high-tech. Remote sensing can provide abundant information of resources and environment quickly and accurately. The high temperature heating and holding system consists of a high temperature furnace with an optical glass observation port on the front and a temperature control platform connected with the high temperature furnace [9]. The system has the function of setting temperature control steps before experiment and automatically adjusting and
maintaining temperature. Any object whose surface temperature is higher than absolute zero will emit electromagnetic waves of different frequency bands, and the spectrum distribution of the electromagnetic waves is related to the temperature of the object itself. Remote sensing image processing refers to the geometric correction and image enhancement of the original data acquired by remote sensing. This time we used image processing software to process remote sensing images on the workstation. Because some small maps will inevitably occur during the classification process, these small maps need to be culled and re-classified, and the surrounding small maps are merged into the large categories by clustering, and the non-conforming small patches are removed by filtering [10]. Using database technology and multi-resolution coupling technology to establish a seamless mosaic network information system integrating environment, resources and social economy; this method effectively reduces the interference of vibration and noise on experimental results. The toothed fluctuations are effectively removed. And by comparing the average pre- and post-average data, the obtained data is consistent with the deformation characteristics of the material at high temperatures.

The PSR model is a dynamic model structure that includes three main indicators: stress, state, and response. The three indicators interact and constrain each other. Among them, the urban water ecosystem health PSR model covers the three dimensions of the pressure of the water ecosystem, the maintenance state of the water ecosystem and the dynamic response of human society. Pressure subsystem mainly refers to the negative impact of economic development and water resource consumption on aquatic ecosystem. This model analyses the interaction between human and environment from the perspective of system theory. Figure 1 shows the PSR model of urban aquatic ecosystem health assessment.

![PSR model](image)

**Figure 1. PSR model**

In order to ensure the measurement of the system in high temperature environment, it is necessary to adopt effective measures to reduce or even eliminate the impact of hot box radiation on imaging. In high temperature measurement, the speckle will fall off or oxidize more or less in long time high temperature environment. Therefore, filling inert gas in the environment of high temperature measurement or pumping the measurement environment into vacuum can improve the measurement accuracy. Taking the patches on the background vector map as the unit, each patch is checked one by one. When the land use type indicated by the image is inconsistent with the background land use type, it is regarded as the land use change area. Using the secondary development technology of GIS, integrating the ecological
environment information system and control system, and establishing a decision support system with spatial analysis function and sustainable development discrimination function, it can realize visualization and operation. The ecological comprehensive evaluation index is used to evaluate the quality of the ecological quality. According to the evaluation index values of the evaluation unit and the weight values of each individual indicator, the weighted summation method is used to calculate the comprehensive evaluation index value. Finally, manual visual interpretation is performed on the missing and misclassified pixels, and the undivided pixels are coordinately marked and the global positioning system is used for field sampling. The high-temperature thermal deformation measurement method achieves the original design goal and can be used for high-precision measurement of surface deformation of metal materials and structures in high temperature environments.

3. Result Analysis and Discussion

At present, the temperature deformation in the material deformation measurement is mostly in the form of a high temperature furnace. Experiments have shown that in the high temperature environment, a large temperature difference is formed inside and outside the observation window of the high temperature furnace. For the problem of high-temperature imaging affected by blackbody radiation in high temperature environment, the paper compares the illumination of different light sources and uses the corresponding filter to filter out stray light, observes the imaging of different color speckles, and finds an optimal imaging scheme at high temperature. Due to the existence of the same-spectrum foreign matter and the phenomenon of homosexuality in remote sensing, we need to carry out field verification of the land use change area interpreted indoors. At the same time, the field survey is carried out to compare the differences between remote sensing data and actual data. Error correction and compilation of remote sensing interpretation data are carried out to ensure the reliability of data and various maps. Eco-environmental status index refers to the overall quality of the ecological environment in the evaluated area. According to the importance of biological abundance index, vegetation cover index, water network density index, land degradation index and environmental quality index, different weights are assigned to calculate. Determine the corresponding relationship between the spatial coordinates of the calibration plate and the image coordinates, and calculate the internal and external parameters of the camera. The relative position of the calibration plate and the camera is constantly changing. At this time, the internal parameters of the camera remain unchanged, while the external parameters change with the change of the calibration plate.

The use of remote sensing and GIS means to carry out dynamic monitoring of environmental quality has achieved good results, but there are still a series of problems that need to be improved in future work. Create a database for all data. This is the basis for research on ecological environment regulation and is also a key technical work. The basic steps include: graphical interpretation of digitization, building topological relationships, and building a database. Establishing a spatio-temporal data model of land-use spatio-temporal database is the abstraction and expression of temporal geography and the basis of the land-use dynamic monitoring system. Different spatio-temporal data models will determine the method of spatio-temporal data processing and the organization and management of spatio-temporal databases. The interactive digitization and database acquisition subsystem mainly carries out thematic information extraction and digitalization. It adopts human-computer interactive input and various data formats (raster data, vector data, attribute data) acquisition methods. Consider combining two kinds of samples into one kind of sample. After multiple sample selection and sample separability calculation, the values of the two parameters are above 1.8, which shows that the separability is good. Snapshot model records land use status at different time of investigation. The model is simple, but the data redundancy is large and the spatial-temporal analysis ability is low. Spatio-temporal composite model records the history and current situation of land use in a map layer. The data redundancy is small, and the spatial-temporal analysis ability is relatively strong.

In the field of industrial engineering, the strength of materials or structures has always been an essential step in verifying whether the materials meet the requirements of working conditions. Therefore, the elastic modulus, as an important index to characterize the stiffness of materials, is one of the
parameters that must be obtained. There will be errors in the measurement results of any measurement system, and digital image correlation measurement system is no exception. The interference of the external environment and the system errors of the test system itself will affect the accuracy of the test results to a certain extent. The space-time query of land use includes traditional queries on the one hand, such as querying topic attributes from space or querying spatial distribution by topic attributes. Time and space query is a special or comprehensive query on the time, space and thematic attributes of land use, such as land use time and space change query. After data acquisition and preprocessing (including data compression, data conversion, set correction, and windowing of the study area, etc.), data files are generated; Secondly, image data loading, image transformation, image analysis, query, filtering and boundary enhancement are carried out. Ecosystem is a multi-level and multi-factor complex system. Different factors have different impacts on the environment, so it is necessary to determine the weights of the evaluation factors. Because of the harsh high temperature environment and the oxidation of speckles and specimens, it is particularly important to find a new method of speckle making.

4. Summary
When measuring high temperature or even ultra-high temperature, some thermal barrier is needed for the camera, light source and other experimental equipment, so that the experimental equipment can be protected. Secondly, the noise effect caused by the temperature rise can be reduced. In the remote sensing land use dynamic monitoring system, the transition between agricultural land and non-agricultural land is relatively easy to identify, but the transition between agricultural land or non-agricultural land types, such as between dry land and irrigated land. There are certain difficulties in transforming recognition. When measuring in a commercial temperature environment, the temperature variation of the system components such as the lens holder also introduces measurement errors. Therefore, a method of blocking the influence is also a well-informed direction for subsequent accuracy. The influence of meteorological conditions on vegetation growth lags behind to a certain extent. Therefore, in future research work, we should properly advance the time of meteorological factors, and when is the most appropriate time to advance is the problem to be solved in the future. It is suggested that environmental protection departments should establish a long-term mechanism for evaluating the ecological environment, and take the trend of dynamic changes in the ecological environment of each district and county as the basis for formulating the policy of ecological function regionalization and land use management, so as to promote the coordinated development of society, economy and ecological livability.

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