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Retraction

Retracted: Application of Computer Vision and Sensor Technology in Multivariate Assessment of Ecological Environment Carrying Capacity

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] Z. Wang and W. Wang, "Application of Computer Vision and Sensor Technology in Multivariate Assessment of Ecological Environment Carrying Capacity," *International Transactions on Electrical Energy Systems*, vol. 2022, Article ID 5087610, 8 pages, 2022.

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Research Article

Application of Computer Vision and Sensor Technology in Multivariate Assessment of Ecological Environment Carrying Capacity

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In order to solve the problems of low accuracy and long monitoring time of the existing ecological environment monitoring system, this study puts forward the application method of computer vision and sensor technology in the multivariate evaluation of ecological environment carrying capacity. In this method, the monitor, server, and spatial identifier are designed in the hardware area of the ecological environment monitoring system to maximize the monitoring performance according to the data memory. By analyzing the monitoring principles of RS technology and GIS positioning technology, the devices in the hardware area are reasonably called, and the workflow of the ecological environment monitoring system is summarized, so as to complete the optimization of the ecological environment monitoring system based on RS and GIS technology. The experimental results show that the monitoring accuracy of the ecological environment monitoring system proposed in this study is higher than that of the traditional monitoring system, with an average of 95.4%; the detection time is about 70 s, which is the lowest compared with other systems when the detection quantity is from 0 to 40 and the detection time is from 0 to 80. The designed monitoring system effectively improves the monitoring effect of the ecological environment and promotes the sustainable development of the ecological environment.

1. Introduction

Environmental issues are global issues in the 21st century. Environmental planning is a reasonable arrangement of space and time for human activities and the environment to make the environment, economy, and society develop in a coordinated manner [1]. Ecological environment planning is an important way to achieve the coordinated development of society, economy, and environment. The idea of the modern ecocity directly originated from Edward Howard's garden city [2]. The theory of the garden city shows people the ecological charm of the balance between city and nature. Since the 1960s, the United States, Japan, Britain, Germany, and France have taken a series of actions in environmental planning management, established environmental planning committees, and designated and implemented national, state, and urban environmental planning [3]. The timely development of eco-environmental planning has timely alleviated the contradiction between the economy and environment. However, the research and solution of environmental problems must involve complex and open information systems. Computer information technology combines modern theories and methods in the development of environmental protection with computers. It has strong spatial and attribute analysis capabilities and can provide convenient and accurate data management and analysis means for the research of ecological environmental protection planning. Therefore, the combination of computer information technology and environmental science has great development potential [4].

Solving the problem of ecological environment monitoring is a major event related to urban environmental protection and people's health [5]. We must do a good job in ecological environment monitoring, strengthen applied research on ecological environment monitoring, protect the urban ecological environment, and promote sustainable urban development. Modern ecological environmental monitoring has diversity and complexity. With the help of Internet of Things technology, the scientific and technological content of ecological environmental monitoring can be improved, and the efficiency of ecological environment monitoring can be improved. At the same time, it can relatively reduce the detection pressure of environmental monitoring personnel [6].

At present, with the development of the national economy, the public has higher and higher requirements for the living environment. The living environment level is mainly composed of the ecological environment and man-made environment. Among them, the man-made environment is controllable, but the ecological environment is uncontrollable. Therefore, to improve the living environment level, the protection of the ecological environment is particularly critical [7]. The function of the ecological environment monitoring system is to monitor the ecological environment status of each region, provide key analysis data for the protection of the ecological environment, and promote the sustainable development of the ecological environment. The traditional ecological environment monitoring system has a poor ability to identify potential ecological environment change factors and is not forward-looking, which makes some ecological environments unable to be treated and protected in time, resulting in irreparable losses [8]. Therefore, based on the traditional monitoring system, this study integrates RS technology and GIS positioning technology and takes the development needs of the field of ecological environment management as the core to build a new ecological environment monitoring system.

2. Literature Review

In recent years, the rapid development of computer information technology has added new blood to the traditional ecological planning theories and methods. It makes the ecological planning system expressed in the form of numbers and tables and provides convenience for information acquisition, data analysis, and scheme formulation of ecological planning [9]. Haruna and others proposed the application of remote sensing, GIS technology, and software engineering in ecological planning. Later, with the deepening of computer information technology in urban planning, architectural design, and other spatial environment design fields, GIS and virtual reality (VR) technology began to be applied in urban construction [10]. Liu and others systematically integrated the most advanced GIS and VR platforms in the world based on the urban planning and design method of GIS and VR technology, highlighted the applicability, served the production projects, greatly improved the quality and efficiency of urban planning and design, introduced virtual scenes into urban planning, visually and intuitively, generated data in urban planning, and provided conditions for the future implementation of urban planning and computer urban planning information management [11]. Yakubova and others used VR, GIS, WWW, and other information technologies to digitally collect and store, dynamically monitor and process, comprehensively manage, and transmit and distribute various information such as geographical environment, infrastructure, natural resources, ecological environment, population distribution, social and economic status in the study area. Build a three-dimensional urban model and urban basic information platform and establish a professional application rule base, model base, and corresponding application system suitable for different functional departments. On this basis, develop a computer application system for governments at all levels to comprehensively manage cities and make macro decisions and use digital technology for ecological planning, changing the concept of planning [12]. Mai and others proposed the Yellow River Basin water based on the spatial data collection, editing, management, analysis, and mapping system, which directly provides the government departments with the query of the background data of the ecological environment and reflects the change trend and law of the ecological environment [13]. Alharthi and others used RS and GIS technology, took the TM satellite remote sensing image of the study area as the main data source, combined with the social and economic data and field investigation records of the study area in recent years, conducted scenario simulation on the ecological environment of the study area, and used envi4.5 as a supporting tool to guide the development planning and ecological construction of the study area by exploring the dominant resources and contradictions in land use [14]. Khashaba and others aimed to realize dynamic monitoring and information management of the ecological environment in the research of the ecological environment information management system based on WebGIS. Based on the investigation of basic ecological environment data and the establishment of a massive spatial database, WebGIS technology is seamlessly integrated with traditional mls/oa, and the integrated "3S" technology is used to realize the management of massive ecological environment resource data in the planning area [15]. Through the extraction and mining of "3S" thematic information, it preliminarily provides auxiliary decision support for ecological environment planning and management.

3. Methods

3.1. Hardware Design of the Ecological Environment Monitoring System Based on RS and GIS. The hardware of the ecological environment monitoring system based on RS and GIS is mainly composed of a monitor, server, spatial identifier, and memory. Figure 1 shows the hardware composition of the system.

3.1.1. Monitor. The monitor is the core hardware equipment in the hardware area of the ecological environment monitoring system based on RS and GIS technology [16]. Its main function is to call RS monitoring technology and GIS technology to monitor the ecological environment according to relevant conditions through the data information fed back by the spatial identifier and memory. The sbh-98h series monitor

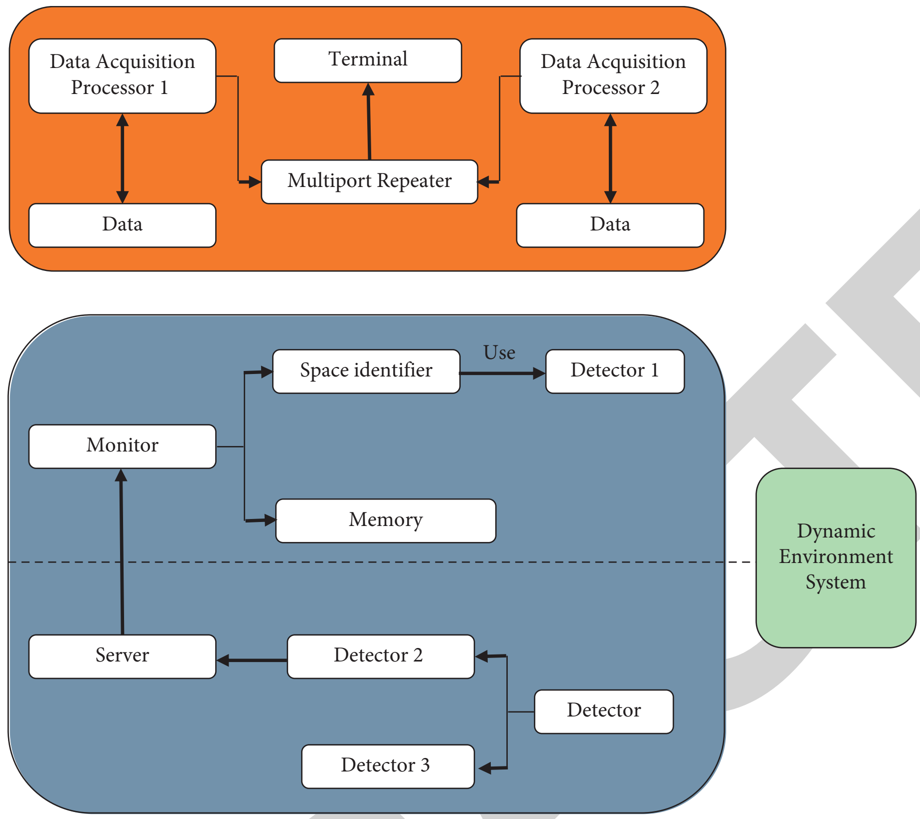

Figure 1: Hardware of the ecological environment monitoring system based on RS and GIS.

selected in this article has a resolution of 1296p, a lens aperture of f1.4, a monitoring visual angle of 360 degrees, and an SD card tag with the ability to track the movement of the ecological environment. The sbh-98h monitor adopts 8-channel multichannel mode and is equipped with 940 nm infrared fill light. It can also master the nighttime changes in the ecological environment. For the data collected by the monitor, the H.264 coding method is used for data conversion. In addition, the monitor has a memory comparison function. The monitoring system will submit a safety monitoring standard to the monitor. Once the environmental status of the monitor comparison area does not meet the standard, an alarm will be sent immediately.

3.1.2. Server. The function of the hardware area server is to maintain the normal operation of each hardware device in the hardware area and ensure the stable operation of the monitoring system [17]. The core of the server used in this article is the CC2530 chip, which is mainly composed of a CPU, DMA channel, controller core, and other basic devices [18]. CC2530 chip is applicable to the 2.4 GHz IEEE802.11 communication standard and provides a powerful background operation support for the ecological environment monitoring system. CC2530 chip integrates RF front-end, data converter, clock, and other modules and can also conduct environmental monitoring in areas with weak signals. In addition, the CC2530 chip has 21 programmable i/o interface units, and there is no queue cache during operation, which improves the working efficiency of the monitoring system. The 8 km ram of the CC2530 chip has its own memory function. When conducting secondary environmental monitoring on the same area, it will call the first monitoring data and environmental change rules to simplify the monitoring process of the monitoring system.

3.1.3. Spatial Identifier. The function of the spatial recognizer is to identify the data of the ecological environment of a certain area and provide the basis for the monitoring of the ecological environment [19]. This study adopts a Kohkuo-98 spatial recognizer, which weighs 130 g. The effective distance of this spatial recognizer is 1000 km, the recognition accuracy is 40 mm, the angular resolution is 25 msec/scan, the driving current is 150 mA, and the driving current when the recognizer is turned on is 300 mA. The vibration mode of the spatial recognizer is 1.5 mm, 10–55 Hz, 2-hour double amplitude vibration mode for each axis, and its protection grade is IP65, which meets the IEC standard of the recognizer. Three groups of input and output ports are designed at the edge of the device. P1 port has 8 pins, P2 port has 5 pins, and P3 port has 10 pins, a total of 23 pins. These pins can not only identify the data of the ecological environment but also complete the configuration of the pin data transmission function of the spatial identifier.

3.1.4. Memory. This article uses the 8051 core memory, which has four 8 + 256 g storage spaces and multiple slots. When the memory detects that the storage space is not redundant enough, it immediately inserts a temporary storage card. At the same time, the memory immediately clears up the buffer data and invalid data stored in the space and then transfers the data in the slot to the memory. The task of the memory is to store the ecological environment data for the monitoring system and call the previous environment data during monitoring, so as to simplify the monitoring process. Each storage space of the memory has a read-write function. Is memory module is set for storage, and the ecological environment data deleted in a certain period can be retrieved. The read/write storage speed of the 8051 core memory can reach 2045 mb/s, which is also scalable. It can be additionally equipped with two d × 517 hard disks to expand the original 4 GB DDR4 to 32 GB, so as to improve the storage speed and call the speed of the memory.

3.2. Software Design of the Ecological Environment Monitoring System Based on RS and GIS. Remote sensing technology is based on electromagnetic wave theory. It uses a variety of card readers and sensors to identify electromagnetic waves within a certain distance and processes the collected data, so as to affect the ecological environment, apply it to different fields, and solve different problems. Remote sensing technology is used to collect data on a certain space area, simulate its environmental status, and assist ecological environment monitoring [20]. The basic principle of applying remote sensing image main analysis technology to ecological environment monitoring is to use the remote sensing effect to classify the ecological environment and then monitor according to the data of various ecological environment indicators. Figure 2 shows the RS technical idea.

When monitoring the ecological environment, the principal component analysis technology of remote sensing images is used to determine the ecological environment level according to the remote sensing ecological environment indicators. The principal component analysis of remote sensing images was used to monitor the ecological environment of air quality and soil dryness. Its eco-environmental indicators include ground humidity, air humidity, ground temperature, and green plant coverage. Using remote sensing technology for monitoring, first, collect the above ecological environment indicators, normalize the collected data, and calculate the correlation matrix of each indicator. The monitoring system automatically simulates the regional ecological environment and analyzes the ecological environment level of the region in combination with the geographic location information detected by GIS technology. The specific normalization calculation formula is as follows:

$$\mathrm{RSE} = 1 - \{PCl[a, b, c, d, e)]\}, \tag{1}$$

$$D = \frac{\left(\mathrm{RSE} - \mathrm{RSE}_{\mathrm{OMIN}}\right)}{\left(\mathrm{RSE}_{0\mathrm{MAX}} - \mathrm{RSE}_{0\mathrm{MIN}}\right)}, \tag{2}$$

where a is the soil moisture; b represents air quality; c represents the air humidity component; d is the surface temperature; e refers to green plant coverage. The fluctuation range of the normalized value is between 0 and 1. The closer the value is to 1, the better the ecological environment is. On the contrary, the worse the ecological environment is.

GIS is also called geographic information technology. The task of this technology is to integrate information science and geographic science. It is a comprehensive geographic information technology based on cybernetics, information theory, artificial intelligence, spatial analysis, and other disciplines. It is used to collect data related to geographic information. With the development of the network field, the biggest advantage of geographic information technology in the field of ecological environment monitoring is visualization and real-time, which makes the results of ecological environment monitoring highly accurate. The principle of geographic information monitoring is to call the geographic information of the area to be monitored in the geographic information system through the network to provide the analysis data basis for the identification of the ecological environment level and then combine the regional ecological environment simulation imaging formed by GIS technology to carry out a visual geospatial analysis. Figure 3 shows the implementation path of GIS technology.

In the ecological environment monitoring system, the main work of GIS technology is to collect, analyze, and monitor the geographical information of the monitoring environment and the surrounding area. Once there is a fluctuation in the geographical area within the monitoring area that can affect the monitoring area, GIS technology will identify it for the first time and make countermeasures to maintain the development of the ecological environment.

Based on the performance analysis of the equipment in the hardware area of the ecological environment monitoring system and the analysis and discussion of the monitoring principle of RS technology and GIS technology, this study summarizes the workflow of the ecological environment monitoring system based on RS technology and GIS technology. Figure 4 shows the specific work steps.

3.3. Experimental Study. In order to verify the ecological environment monitoring system based on RS and GIS, a comparative experiment is designed. The selected comparative systems are the ecological environment monitoring system based on high score images and the ecological environment monitoring system based on the fuzzy analytic hierarchy process. Setting the ecological index mainly includes ecol index (ID), with the data type of Int. Corresponding to the ecological quality grade, the data type is Int; area occupied by grade, the data type is double; the percentage of grade area in the total area, the data type is double. According to the above experimental parameters, a comparative experiment was carried out. Table 1 provides the accuracy of monitoring results.

4. Results and Discussion

According to Table 1, the accuracy of the monitoring results of the ecological environment monitoring system proposed in this study is higher than that of the traditional monitoring

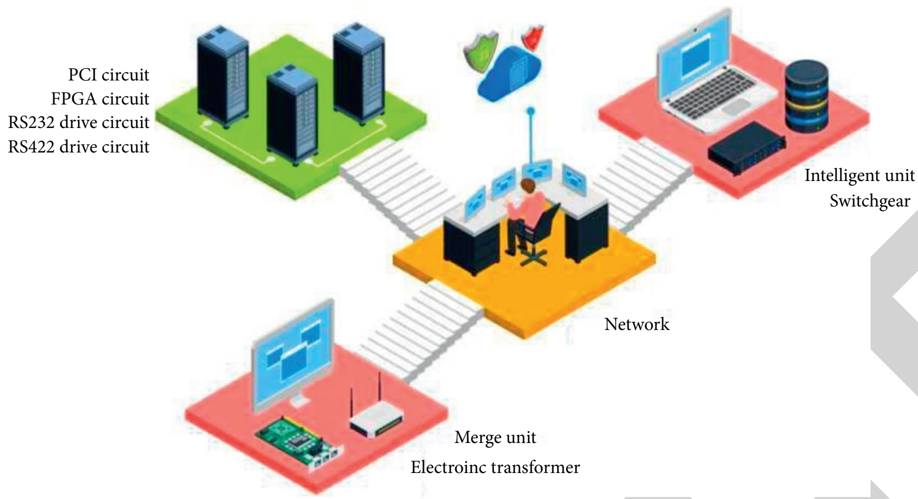

Figure 2: RS technical idea.

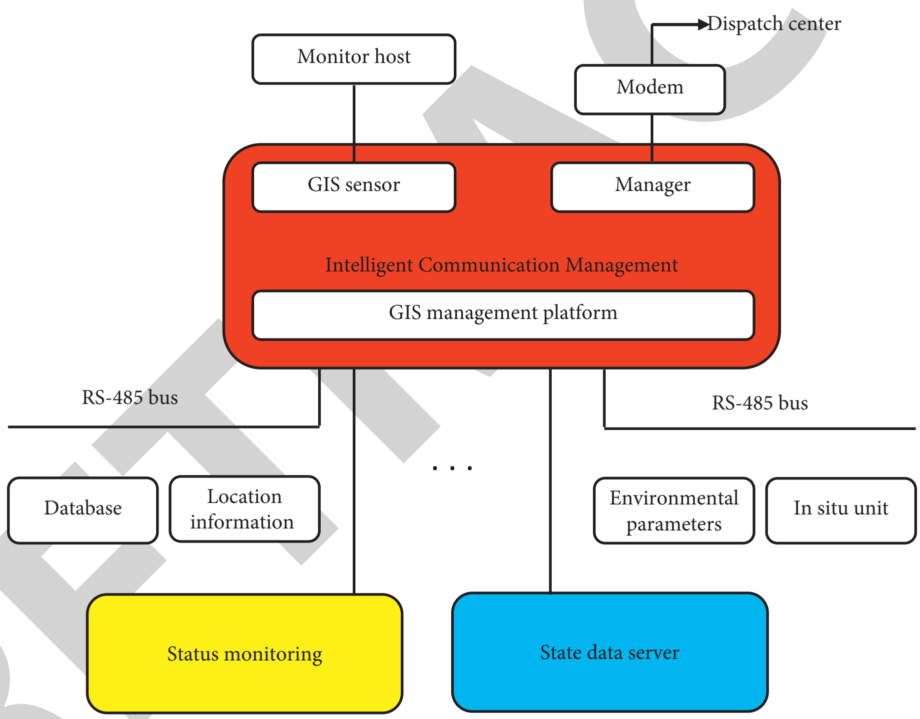

Figure 3: Implementation path of GIS technology.

system, with an average of 95.4%. The remote sensing technology based on GIS, combined with its own advantages, uses GIS technology to manage, analyze, and map spatial data while extracting urban ecological index information, so as to realize the quantitative evaluation of the urban ecological environment. It can be used in monitoring, PM2.5 spatial interpolation classification, thematic mapping, and other integrated system environments.

Figure 5 shows the test results of monitoring time. According to Figure 5, the monitoring system proposed in the article has a shorter monitoring time and better monitoring effect. With the increase in monitoring data, the monitoring time of the article system and the traditional system is getting longer and longer. However, the monitoring time of the monitoring method proposed in the article is always lower than that of the traditional system. Through the analysis and implementation of the existing technology, it can more objectively reflect the advantages and guarantee mechanism of the existing technology and provide ideas for the improvement of the overall function and application function of the environmental monitoring system in the future. The detection quantity of this system increases from 0 to 40, and the detection time increases from 0 to 80. Compared with other systems, the detection time is the lowest, about 70 s. This study focuses on the design and analysis of an air

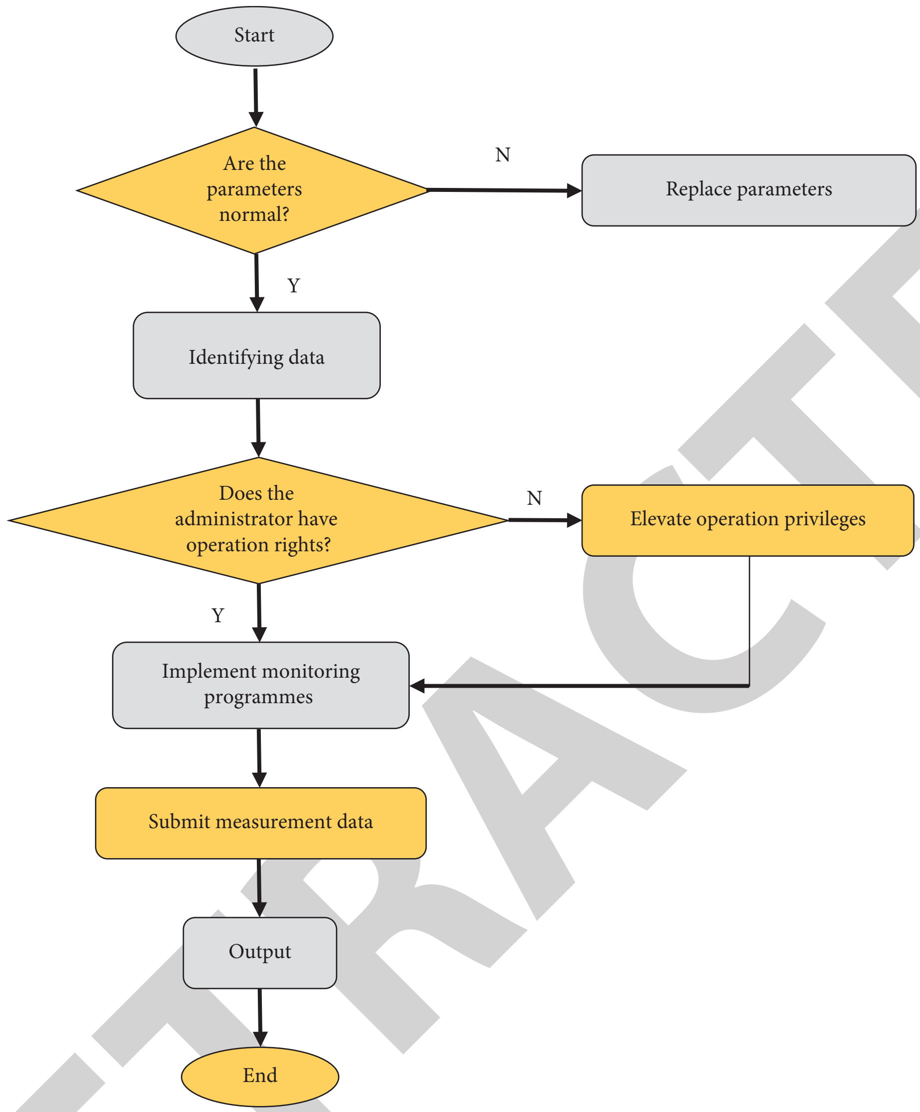

Figure 4: Software workflow of an ecological environment monitoring system based on RS and GIS.

Table 1: Accuracy of monitoring results.

Number of experiments	Accuracy %		
	Ecological environment monitoring system based on high-resolution image	Ecological environment monitoring system based on the fuzzy analytic hierarchy process	Ecological environment monitoring system based on RS and CIS
1	82.55	84.55	92.48
2	87.64	86.93	95.44
3	80.33	87.64	98.22
4	82.15	89.37	92.48
5	83.39	90.60	94.77
6	84.33	87.00	94.33
7	87.14	86.31	97.25
8	82.17	85.69	95.13
9	80.05	84.21	98.31
10	82.69	88.23	95.44

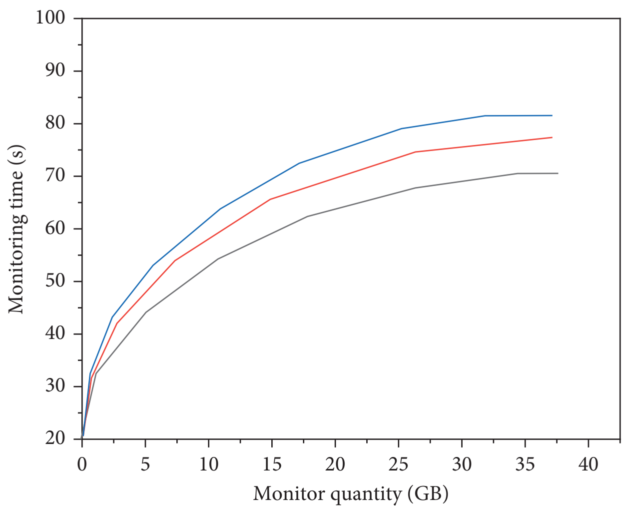

Figure 5: Monitoring time test results.

environment monitoring system. Through the structure and analysis characteristics of this system, the accuracy of monitoring results is enhanced.

5. Conclusion

This study puts forward the application of computer vision and sensor technology in the multivariate evaluation of ecological environment carrying capacity. In order to improve the environmental monitoring accuracy of the ecological environment monitoring system, including hardware and software, this study puts forward the system development scheme. Combined with RS, GIS technology, AE, and IDL language, the correct and feasible idea of design and development is realized. The urban ecological environment monitoring and evaluation functions involved in the system can be realized on the same interface, which has the characteristics of comprehensive functions and simple operation. The RI method is used to evaluate the ecological environment, which overcomes the problems of a single evaluation index and incomplete conclusions in the past. In addition, the system can quickly monitor and evaluate the regional ecological status, which is operable, objective, and progressiveness. The experimental results show that the ecological environment monitoring system based on RS and GIS proposed in this study has a shorter monitoring time, higher monitoring accuracy, and stronger monitoring ability.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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