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LETTER TO THE EDITOR

Design of Network Management System for Forest Resources Based on Genetic Algorithm

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At present, wireless sensor networks are widely used in forest resource management. For adaptive wireless sensor network design and resource management, a forest resource management system based on different regional planning is proposed. The genetic algorithm suitable for integer optimization is optimized. A resource management system with high reliability and aiming at security is designed, and its scope is illustrated by an example. After analysis, it is found that the research is based on reality, application-oriented, and close to the actual business needs, in line with the needs of forest resources information and network management at all levels.The research results can lay a solid foundation for the next step of system development. The development results of forest resources networked management system will be able to unify standards and norms, which will be adopted by forestry departments at all levels in the country, which has good versality and practical value and can be popularized and applied in the whole country.

Genetic algorithm; forest resources; network; management

1 Introduction

Forest resources are the material basis for the sustainable development of forestry. The quantity and quality are directly related to whether forestry can achieve sustainable development. How to expand the quantity of forest resources, improve its quality, strengthen the management of forest resources, and achieve the sustainability of forest resources has become a hot spot and consensus of global concern. On the basis of understanding and analyzing the current forest resource management system and different management objects and management methods at various levels and levels, combining the management theory, methods, techniques and information system construction characteristics of the information age, the forest resource management information system suitable for China's actual situation is analyzed, including system construction principles and software development strategies, system requirements analysis, goals and functions, data standards and software development standards, and data dictionary.

Kalaiarasi and Sriramya 2019) published an article in Ekoloji (Issue 107, 2019) entitled “Environmental Analysis of a Novel Hybrid Ant Breeding Algorithm for Forest Fire Detection using Wireless Sensor Networks”. This paper addresses the deadly threat of forest fires to environmental degradation and prevents forest damage. A forest fire detection ant colony algorithm based on wireless sensor network is proposed. The wireless sensor network consists of several sensor nodes. Information is collected in the surrounding environment and communicated with each other, and the measurement data is sent to the base station for further processing. The main problem with sending information to a base station is the time delay. To reduce time delay, routing uses an efficient optimization algorithm (Mi et al, 2015). The experimental results show that the algorithm has high computational accuracy, but there is no uniform standard and norm in this method, and there are certain

difficulties in the sharing and exchange calculation of forest resources.

A dynamic cluster-based destination tracking algorithm for wireless sensor networks is proposed by Wan et al. (2017), which solves the problem of complex information transmission and dynamic estimation in the tracking process of wireless sensor networks. The algorithm avoids the problem of low network lifetime caused by large-scale wake-up nodes by temporarily clustering the sensor nodes around the target. In the target state estimation, the algorithm adjusts the threshold of the node based on the dynamic detection of the target's acoustic signal strength. The weighted centroid localization algorithm is performed by the position of the detection node as the weight of the target, and the weight of the algorithm is low. The hardware of the node is not high. The experimental results show that the algorithm can solve the small-scale problem. When the problem is nonlinear and large-scale decision space, the calculation time will be greatly increased and the solution is difficult.In the redundancy configuration optimization problem described in this paper, it is necessary to select the optimal redundancy configuration strategy among 6 × 107 possibilities. It takes several weeks to solve with the traditional algorithm. On the other hand, the non-convex nature of this problem makes most traditional planning algorithms unusable. The intelligent optimization algorithm corresponding to the integer programming algorithm widely adopts the parallel search technology (Wu and Yi, 2015), which overcomes the low efficiency of the single-point search of the traditional planning algorithm. Genetic algorithm is a typical intelligent heuristic optimization algorithm, which is an adaptive global optimization algorithm that simulates the genetic and evolutionary processes of living things in the natural environment.

2 Idea description

Forest resource management is a series of coordinated activities for the expansion and reproduction of forest resources for the achievement of forestry objectives. Specifically, in order to achieve multiple benefits of forests, we should plan, organize, direct, coordinate and control the forest resources and related factors in a region through comprehensive application of various methods and technologies. In order to achieve a common goal, people have conscious, organized and ongoing coordination activities. The essence of management is to amplify the effectiveness of forest resource systems (Wu and Yi, 2015).

2.1 Network Optimization of Forest Resources Based on Genetic Algorithm

The probe in the mobile network works in one of four modes. The corresponding 2-bit code is: passive sensor (00), active sensor operating in the low signal range (01), active sensor operating in the high signal range (10), active CH sensor (11). The chromosomes are arranged according to the probe ID, so all probe codes are binary strings as an individual in the application of genetic algorithms. As a multi-objective optimization problem, the selection and description of the fitness function is crucial. The fitness function must include all parameters that have a significant impact on network performance and be expressed correctly.

2.2 Service model of networked system for forest resources

Due to the administrative division, the production management of forestry is regional, and it is usually territorial management. If a unified centralized data management model is adopted, it will not reflect the different actual needs of various departments. Therefore, sharing management system of the forest resource adopts a relatively centralized distributed model for data management. According to the principle of territorial management, it generates and manages local related data. All local departments need only be responsible for managing local data in accordance with the actual situation, and provide data sharing by connecting the Internet. For ordinary users, because there is a unified system entry, it is not necessary to pay attention to where the requested data actually comes from (Pappu and Gummadi, 2017).

2.3 Adaptive Extension of System Server

The sharing management system of forest resources adopts the mode of sub-regional management, and the

respective forestry management departments are responsible for the management functions of the local system (Possel et al., 2018). The construction progress of the local system cannot be fully synchronized. The construction of the forest resources sharing management system can only be carried out step by step throughout the country. The local servers completed can join the service network of the system and serve the users of the whole country. To provide services, the forest resource sharing management system provides the adaptive expansion characteristics of the server (Salman et al., 2017).

2.4 Distributed Data Management and Interconnection

The diversity of service objects of sharing management system for the forest resource and the shared data are processed and provided by different users, which increases the difficulty of data sharing and interaction. The traditional EDI (Electronic Data Interchange) mechanism relies on a powerful computer system between different businesses to implement compressed information transmission, and each piece of information must be encoded before being transmitted and used to the user.When the web application system is running on the web, the client will return the form to the initial server after each HTML form is filled. All data processing is concentrated at one end. The sharing management system for forest resource uses XML language format to realize data sharing nationwide. One of the main applications of XML is to change the basic mode of data exchange. XML can process data on the client side and transmit it to relevant users if necessary without changing the data format.The sharing management system for forest resource is based on the administrative division of forestry production management. In principle, all regions are responsible for the maintenance of forestry information within their jurisdiction, and information sharing is provided through interconnected servers.

3 Results

3.1 System Function Design

According to the “end user”, the forest resource management software can be designed to be applicable to one or more levels. Usually, different groups of management departments need different management information systems. Because different levels of management functions are different, the types of information required are different. Software is completely suitable for one level, and it is inevitable and inconvenient for another aspect. Software for accomplishing a specific task, such as national survey statistical software, is preferably designed to be multi-level and general. The basic data is input by the lowest level unit, the data is calculated step by step according to a specific statistical method, and the national data is summarized, which preserves the original data, reduces the data input and error rate, and ensures the uniformity of the summary method and the accuracy of the data.

According to different information sources, different purposes, and different needs of users, different application software need to be compiled, and the functions of the software should also be emphasized. For example, the main functions of forest resource management information system are query, analysis and decision-making; the main functions of statistical summary system are to establish models and statistics summary; the main functions of geographic information system are to search information through map positioning, or to locate maps through some information. For queries, there should be general queries and special queries. The so-called general query is to first generate query conditions and statements by users, and then query. The advantage of this query is that it does not need to know the user's needs first, but can also query. The disadvantage is that the input conditions are cumbersome, and if the user does not master the method, it may not be able to find out. The special query is the opposite. It is to store the user's query requirements and immediately call them out when needed. Obviously, this method cannot be used without prior consideration. The software construction of the system is divided into four levels of functional requirements. The functions at all levels are similar, but different levels of business produce different functional requirements. In addition, the required data

categories and granularities are different, and the four levels of functions are different.

3.2 Integrated Data Management

The attributes data, image data analysis results and step-by-step statistical reporting data of national forest resources continuous inventory (first-class survey) are unified managed to form a national macro forest resources database. Its main functions are as follows:

(1) One-class data management manages one-class national survey card data, graphics and image data. It mainly includes sample card data input, sample distribution map generation, sample site inspection, data modification, data aggregation, report generation and printing.

(2) After image data management scans the original image into the computer, it carries out vectorization, image correction, image superposition, image enhancement, image mosaic, image cutting and other processing, and can display forest land classification map and make index map.

(3) Receiving data management receives forest resources and operation design and engineering information data reported by provinces, prefectures and counties, and can generate forest classification maps and forest resources statistics charts based on provinces.

3.3 Private Line Network of Management System for Forest Resource

The use of dedicated lines to interconnect remote LANs, set up wide area networks or industry-specific networks is by far the most mature and most commonly used method. This method is not only mature in technology, but also has a wide geographical coverage and high security. The management network system of forest resource information can be established by using the DND line to the provincial forestry department to be opened by the State Forestry Administration. Its advantages are as follows: DDN can provide point-to-point dedicated line, frame relay and X.25 services with the speed up to ZMbpS by utilizing optical fiber reuse technology; it can realize multiple uses of a line, such as video conference, data transmission, etc., to save investment costs; DND dedicated line has fast data transmission speed, less interference from outside, relatively stable, and can meet the requirements of large-scale data transmission; Internet worker's physical isolation ensures the security and high-speed and stable transmission of national confidential data and mission-critical data; it is the best way to transit to a higher-speed transmission network in the future.

4 Discussion

Network management of forest resources involves a wide range of things, coupled with time is relatively hasty, knowledge level is limited, so this study cannot be considered very comprehensive, there are many shortcomings and shortcomings, such as the overall grasp is not very good, specific details are not very accurate and appropriate, which requires further in-depth study. In the process of investigation and analysis, it is found that the county-level system configuration is simple, while the personnel quality (computer level and information awareness, etc.) cannot keep up with the requirements of information management, and the county-level forest resource network data is the source and basis of other levels of data. It is very important to manage it, which forms a big contradiction. Therefore, county-level forest resource management should be strengthened to improve the software and hardware configuration, personnel quality and overall management level. In the research of management information system for forest resources, another important problem that must be paid attention to is to ensure the accuracy of the basic data. Otherwise, the system construction is good, and it can only be an empty shelf with harm. Therefore, the system emphasizes that the basic data is uniformly used as a data source with a 2.5 m resolution Spots satellite.

5 Conclusion

In this paper, a network management system of forest resources based on genetic algorithm is proposed, and the

improved network service model is used to optimize the reliability of forest management system data query. The results show that the genetic algorithm can effectively solve the query data allocation strategy of forest resources network under the basic reliability and economic constraints, and the method has good accuracy and convergence speed.

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