The Whole Process Management Monitoring and Control of Construction Waste

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Abstract. The rapid development of urbanization has increased the number of urban construction projects, resulting in a large number of construction waste, and improper disposal of construction waste is likely to lead to safety problems and environmental risks. In order to reduce or even eliminate the recurrence of such incidents, this paper, based on the analysis of the current situation at home and abroad, puts forward how to improve the whole process management mode of construction waste from three aspects: large data acquisition and processing, spatial and temporal characteristics analysis and evolution mining of main body behavior rules and model establishment. The improvement of the whole process management mode of construction waste proposed in this paper will further improve the deficiencies in the current management of construction waste, so as to better realize the standardized management of construction waste and make the construction waste fully utilized and reused safely and efficiently.

1. Introduction

Since a landslide triggered by the dumping of construction waste in Shenzhen in 2015, efforts have been stepped up across the country to reduce the possibility of such incidents happening again. At present, the existing research on building waste management mainly focuses on the recycling of building waste materials, the management of building waste policies and the use of modern technology to monitor vehicles, and so on. Based on the whole-process management model of construction waste, this paper proposes real-time monitoring and intelligent control of the whole process of construction waste.

2. Existing circumstances

Japan has introduced a summons system to regulate the transport of construction waste to prevent illegal disposal [1]. Technically, Japan has implemented environmental labelling, set quality standards, and encouraged the circulation and use of recycled products. The Danish government has implemented a tax policy on the emission of construction waste, which has effectively curtailed the phenomenon of disorderly discharge and increased the utilization rate of construction waste recycling [2]. In South Korea, the management organization of construction waste recycling is clearly stipulated in laws and regulations, and a clear management organization system has been established from the top down. Meanwhile, relevant enterprises and personnel are graded and reported, and a certification system for recycled materials is established. The German government invested a lot of money in the research and development of recycling technology of construction waste, and built large-scale recycled aggregate...
processing plants in each region, and stipulated that these recycled products should be used in government-funded projects [2].

In China, most laws and regulations are mainly for the prevention of pollution, and do not take into account the whole process of monitoring and control of construction waste disposal, which is of strong principle and poor operability [3]. In China's construction waste management and supervision system, different provinces and cities set up different management agencies, and the scope of powers and responsibilities between departments is not clearly defined, and there will be multiple leaders or inaction in the supervision process [4]. Construction waste treatment is in a transitional stage. Due to the lack of research and development funds, insufficient government incentive policies, and the one-sided pursuit of economic benefits by responsible enterprises of construction waste, China's construction waste treatment technology is not mature enough [5]. Due to the lack of quality standards and certification, the recognition of recycled products in the society is not high, etc., all of these lead to the construction waste whole process chain management implementation and development is limited. Therefore, it is necessary to implement real-time monitoring and intelligent control of the whole process of construction waste based on the analysis of the existing situation in various parts of China, so as to promote the benign development of the construction waste industry.

3. Real-time monitoring and intelligent control of the whole process of construction waste

To sum up, it is urgent to further improve the whole-process management mode of construction waste. This paper will further elaborate the necessity of implementing real-time monitoring and intelligent control of the whole process of construction waste from the aspects of big data acquisition, processing and processing of construction waste, spatial-temporal characteristics analysis, evolution mining of main body behavior rules and model establishment. The research objective of this paper is to guide the real-time monitoring and intelligent control of the whole process of the generation, operation, treatment, recycling and utilization of recycled products of urban construction waste.

1) study and design the operation mode of real-time monitoring and intelligent control of the whole process of building waste.

2) research on real-time monitoring and intelligent control technologies in the process of construction waste generation, operation, treatment and resource utilization.

3) develop an information platform for real-time monitoring and intelligent control of the whole process of building waste.

4) carry out comprehensive application demonstration in two cities (districts) above the prefectural level, and form a universal technical specification and general information platform for real-time monitoring and intelligent control of urban construction waste in the whole process.

3.1. Data acquisition and processing

Through the development of layered and multi-category interface specifications, it is used to connect with the e-government system of housing and construction departments and urban management departments, and use Hadoop big data acquisition, transmission, conversion and storage technology to obtain multi-source big data of construction waste generation, operation, processing, recycling and recycling products utilization. 3S criterion, scatter diagram method, Lagrange interpolation method and other data cleaning methods are used to preprocess the discovery, deletion and interpolation of abnormal data to ensure the integrity and reliability of data. The clustering analysis of multi-source big data in the whole process is carried out by using K means, aggregation hierarchy algorithm and other theoretical methods.

At present, the existing research on construction waste data mainly focuses on simple construction waste reuse, recycling, incineration and landfill. From the perspective of the whole country, the current construction waste treatment method still adopts the traditional treatment method: for a large number of construction waste, the vast majority of it is transported to the countryside or countryside without any treatment by the construction unit, and it is disposed by piling or landfill in the open air. In some developed coastal areas, construction waste can be classified and recycled, such as Shanghai, Shenzhen
and other cities. Other solid waste can be sent to the construction waste treatment center for classified treatment; For recyclable materials, waste recycling enterprises are introduced to participate in the development of recycled building products, such as recycled asphalt pavement and concrete aggregate. Even though some developed coastal areas have conducted classification and resource treatment of construction waste, due to the lack of accurate collection and processing of data on the classification of construction waste, serious unreasonable garbage classification still exists, leading to insufficient secondary utilization of recyclable materials and secondary generation of construction waste.

The construction waste disposal platform can better obtain multi-source big data of construction waste, and connect with relevant departments, so that construction waste is initially processed under the guidance of the government, and pollution is controlled through government orders and administrative means. At the same time, a variety of data cleaning methods to ensure the integrity and reliability of data, make data clustering analysis. According to the "administrative measures on the classification and consumption of construction waste (interim)" jointly issued by the municipal urban management commission and other departments, the mandatory classification and disposal of construction waste will be implemented. In municipal construction projects, such as municipal government, traffic, garden and water utilities, the replacement ratio of recycled construction waste products selected in designated construction sites shall not be less than 10%. The data analysis presented in this paper is helpful to better realize the mandatory classification of construction waste, so as to meet the requirements of current laws and regulations and fully realize the recycling of construction waste. Here is the architecture that shows overall architecture of data storage management subsystem, such as figure 1. This will help us build the platform better.

Figure 1. Overall architecture of data storage management subsystem

3.2. Spatial-temporal feature analysis and evolution mining of subject behavior rules
Using the principal component analysis method, the FP-growth algorithm in machine learning, the association rule algorithm of classified data and other association analysis theories, the paper analyzes the spatial and temporal distribution characteristics of construction waste generation, the characteristics of construction waste vehicle transportation track, and the distribution characteristics of consumption field environment. By using histogram, chi-square statistical method and other mathematical statistical theories, this paper explores the characteristics of the behavior of the participants in each link of construction waste management and control, and gives the expression of the probability density function of the law. In view of the characteristics of feature data, such as high spatial and temporal dimensions,
large amount of data and wide data sources, the nonlinear modeling theory of gradient lifting decision tree in machine learning was used to establish a nonlinear law model of the behavior of participants in all aspects of construction waste management and control.

Existing monitoring of construction waste is mainly concentrated in just on green residue in the car all installed beidou satellite positioning system, in a state of vehicle real-time monitoring, line data gained by the failure to use for good planning, the main function is focused on the monitoring of vehicles, transport vehicles driving circuit also needs to be optimized. For main body behavior research focus is mainly focused on the introduction of relevant theories of game, respectively in the three stages of the whole process of construction waste management, each phase has chosen at the center of the main body construction unit, transport enterprises, recycling enterprise, set up the game theory model and related behavior analysis, the conclusion and put forward policy Suggestions. Lack of real analysis of the evolution of the theme behavior law, only from the theoretical level of economic analysis, the policy recommendations may not be practical.

The spatio-temporal characteristics analysis proposed in this paper can be used to analyze the generation of construction waste, the track of construction waste vehicles and the environmental distribution of consumption field in detail from the aspects of system demand analysis, system design, system implementation and test. The analysis obtained can be used to eliminate a large amount of construction waste generated by house demolition, realize the reduction, recycling and recycling of construction waste in construction projects under construction, and realize the closed treatment of urban construction waste, effectively avoiding noise, dust and other environmental problems. At the same time, through modeling, the behavior rules of main bodies involved in the whole-process management of construction waste are explored, including construction units, construction units, transportation enterprises, construction waste consumption places, recycling enterprises and governments. According to its characteristics, the main body of the behavior rules establish the main body behavior involved in the whole process of construction waste management of each link of the relevant law model, the whole process for construction waste management provides more objective scientific forecast, to improve the construction waste is simple management and produce all kinds of problems and waste secondary regeneration, the implementation of the construction waste recycling.

3.3. Model establishment
By using the operation optimization theory and taking the whole process management and control of construction waste as the whole object, an intelligent cooperative management and control model with multiple business levels in different links is established. For integer and continuous variables contained in the model the nonconvex mixed-integer nonlinear programming features, integrated using the theory of traditional logistics optimization algorithm (such as branch and bound algorithm, column generation algorithm and the Lagrangian relaxation algorithm, etc.) and intelligent algorithm (such as genetic algorithm, ant colony algorithm and simulated annealing algorithm, etc.) of the respective advantages and solving the efficiency and accuracy of give attention to two or more things, design based on the theory of logistics optimization and integration of intelligent algorithm efficient algorithm. Based on the spatial and temporal characteristics analysis and behavior rules of the whole process of construction waste, the intelligent early-warning model of abnormal behavior and safety risk of the whole process of construction waste is established by using the big data of real-time monitoring and the theory of artificial intelligence decision tree and random forest.

The safe transportation of muck truck is a hot issue that is widely concerned by the society at present. How to rationally plan the transportation path of muck truck and reduce the transportation risk brought by muck truck to the passing road section under the premise of guaranteeing the economic interests of the transporter is of great significance. Existing theoretical research about residue in car transport route choice is relatively scarce, is more about dangerous goods and hazardous waste transportation route choice research, the research of the transportation risk only considers the effect of regional accident probability or through personnel objective risk such as density, while the route choice has certain instructive for residue in the car, but it does not fully apply. The research of muck truck transportation
mainly focuses on the monitoring of muck truck's location, the research of management countermeasures, the research of logistics optimization and so on. In order to further strengthen the management of muck truck, how to evaluate and optimize the transportation route declared by transportation enterprises has become an urgent problem to be solved by relevant management departments.

The establishment of a management and control model that takes the whole process of construction waste as the object can achieve better intelligent coordinated management and control of the three main stages of the source production, transportation classification and recycling of construction waste. Although from the perspective of supervision, the risk of muck transportation can be contained to a certain extent, but it cannot fundamentally solve the safety risks caused by unreasonable choice of muck truck transportation route. The intelligent cooperative management and control model comprehensively utilizes the advantages of the traditional operation planning optimization theory algorithm and the intelligent algorithm to provide more effective and scientific scheme for the distribution design of muck vehicle transportation lines and consumption fields, which will greatly improve the transport efficiency of transport vehicles and reduce the construction cost of consumption fields. At the same time, based on its large data analysis results, the establishment of intelligent early warning model, using qualified vehicle emissions and clear place, to carry on the reasonable planning of the given field and, than terrain difference, quickly found suspected dumps, appeared the regulation range of suspected point, early warning forecast, in order to prevent the Shenzhen construction waste caused landslides human disorderly pile up events happening again.

4. Conclusion
This paper first puts forward the reasons for the attention paid to the management of construction waste stacking, analyzes the current situation of construction waste management at home and abroad in recent years, and summarizes the experience of building waste treatment abroad that is worth learning and drawing lessons from, as well as the deficiencies in the supervision and treatment of construction waste in China. On this basis, how to better solve the problems in the process of building waste management in China, this paper puts forward the implementation of real-time monitoring and intelligent control of the whole process of construction waste, in order to improve the current existing building waste in the whole process due to poor management caused by the insufficient recycling of building waste. It mainly includes the following three parts:

1) real-time monitoring and intelligent control of construction waste
2) spatial and temporal characteristics analysis and evolution excavation of main body's behavior law under the new mode of whole-process electronic single-form control of construction waste
3) establishment of the whole-process intelligent decision cluster model of construction waste

The data are acquired from the monitoring of construction waste, and the spatio-temporal characteristics and behavior rules of the subject are analyzed, and a scientific model is established for prediction and alarm. Through the implementation of the above aspects, do a good job in the management of construction waste, in order to reduce the occurrence of man-made safety accidents. At the same time, the optimization of transport vehicle lines and reasonable design of consumption sites can also greatly reduce the cost of transport enterprises and recycling enterprises, so that more enterprises can enter into it and realize the virtuous cycle of building waste resources utilization.

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