Construction Mode of Efficient Logistics System under the Big Data Environment

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Abstract. We analyze the construction mode of efficient logistics system under the big data environment in this paper. For logistics enterprise logistics information system has been established, that every day will have a lot of transportation, storage, packaging, handling, loading and the unloading, circulation processing, distribution, customer service and other business data, the dynamic business data has obvious time and make up the logistics enterprise's dynamic data source. The current logistics demand forecasting methods of data mining are artificial neural network and its improved algorithm, such as the application of neural network model fitting of the nonlinear relationship between regional economy and regional logistics, but this method can be interpreted and the limitation to the learning sample size. Under this basic condition, this paper proposes the new methodology on the efficient logistic system with integration of the data mining, information system and mathematical optimization methodologies.

Keywords: Logistics System, Efficient, Big Data, Environment, Construction Mode.

1 Introduction

The goal of data mining from large amounts of data, discover hidden behind the rules or the relationship between data, sufficient and reasonable use of basic data mining technology for market forecast and analysis, so as to lay a solid foundation for the correct decisions. The advantage of the data mining technology used in the logistics management mainly has three aspects: (1) mining to make logistics management more meet the needs of customers; 2 data mining to make logistics management more scientific, fast; (3) the data mining technology in logistics management has a strong supporting role [1-3].

Information flow throughout the whole process of logistics activity, while it is an important part of logistics, the logistics of any one link, contains a huge flow of the information. Associated is logistics information and logistics activities, ranging from the micro logistics job information to the logistics system of macroscopic decision-making information, circulation of information in all logistics activities. With the wide application of computer technology and that the network technology, logistics information system construction has made great progress, the modern logistics can realize real-time interaction, and growing dynamics of logistics information, logistics has become a kind of dynamic data. For logistics enterprise logistics information
system has been established, that every day will have a lot of transportation, storage, packaging, handling, loading and the unloading, circulation processing, distribution, customer service and other business data, the dynamic business data has obvious time and make up the logistics enterprise's dynamic data source. With this basis, we could summarize the applications into the following aspects.

- Dynamic logistics data mining and analysis module is the core module of the model, its main function is according to different application requirements, choice of different depth of the data mining technology for dynamic logistics data mining analysis and knowledge rules [4-5].
- Service module can through the human-computer interaction interface to interact with users, financial management, account receivable analysis, cost analysis, supplier, transport routes, transport, performance analysis, vehicle loading analysis, correlation analysis, sales analysis, inventory cost, inventory physique, bulk goods analysis, supplier credit parity, delay of delivery, procurement price analysis, general site selection, analysis, route optimization analysis, vehicle scheduling, market demand, customer value analysis, customer churn analysis, logistics strategy partner selection, etc.
- Dynamic data source mainly includes the basic logistics enterprise logistics information system to produce the transportation data, store data, packaging, handling, loading and the unloading of data, processing data, distribution, procurement, customer service, data and other data, as well as the logistics information system to other systems or platforms that is closely related to the enterprise business data, such as policy information, market information, the competitors information, etc.

2 The Logistics System

Logistics, as the name implies is the flow of the content and it includes transportation, distribution, loading and unloading, storage, packaging, circulation processing, and the various activities such as information transmission. Therefore, logistics is actually from the supplier to receive the entity flow process. However, the current logistic modes hold the following challenges. (1) The constructed model, confined to a more internal, relatively independent system, and the investment large, difficult to share, management inefficiency, slower, high energy consumption, does not support under the network environment of distributed mining, the mining efficiency is not high. (2) the constructed model, only for static data, it is difficult to deal with heterogeneous data sources, dynamic data source and the scattered data, there is a data processing bottleneck; (3) the constructed model, but also difficult to deal with massive amounts of data, dynamic growth cannot meet the demand for computing power, huge amounts of data mining are difficult to found in huge amounts of data can be understood and useful knowledge; (4) the constructed model, only suitable for professional and that the technical personnel, proficient in algorithm, this increases the cost of enterprise development, also hindered the wide application of data mining technology [6-7].

The current logistics demand forecasting methods of data mining are artificial neural network and its improved algorithm, such as the application of neural network
model fitting of the nonlinear relationship between regional economy and regional logistics, but this method can be interpreted and the limitation to the learning sample size. By contrast, the self-organizing data mining prediction accuracy is higher, in the regional logistics demand forecasting, the self-organizing data mining in simulation and prediction of complex system has a unique advantage.

![Fig. 1. The Logistics System Architecture](image)

3 Topology Optimization Methodology

The basic principle of ESO method is to establish a standard, in the process of optimization, conform to the standard of structural unit (low efficiency bearing units) are constantly, and the standard in the process of the optimization is also gradual evolution constantly, until all units are not qualify for this update, the iteration stop.

\[
\begin{align*}
\min & \quad f(X) \\
\text{s. t.} & \quad \begin{bmatrix} x_1 & x_2 & \cdots & x_n \end{bmatrix}^T \\
& \quad \kappa I = Q \\
& \quad \frac{1}{N} \sum_{i=1}^{N} V_i x_i \leq \phi_l \\
& \quad x_{\min} \leq x_i \leq 1, 0 \leq i \leq N_x
\end{align*}
\]

(1)

The math implementation of ESO itself is not difficult, but through mathematics method to establish the finite element model and applied to the different optimization problem is a laborious job. If we can use the existing finite element modeling tools and do analysis solver, but only through mathematical processing software algorithm can reduce the effort required in terms of programming and that the finite element
structure designers. In the formula 2, we demonstrate the solution and in the figure two, we show the visualized topology optimization methodology.

$$\mathbf{K}_T = -\left(\frac{\partial f_T}{\partial \mathbf{T}}\right)^T$$

$$\frac{\partial f_T}{\partial \mathbf{T}} = \frac{1}{n} \int_{\Omega} \frac{1}{|\Omega|} \sum_{i=1}^{N} \frac{\partial f_{\Omega_i}}{\partial \mathbf{T}}$$

$$\frac{\partial f_{\Omega_i}}{\partial \mathbf{T}} = \int_{\mathbf{\Omega}_i} n(\mathbf{N}_{T_i})^{-1} N_i \frac{\partial f_T}{\partial \mathbf{T}} d\mathbf{\Omega}_i$$

(2)

![Topology Optimization Methodology Demonstration](image)

4 Big Data and Data Mining Combination Approaches

In the field of data mining, in addition to study time and space is effective to improve the mining algorithm, also must take the corresponding technical methods to reduce the scale of data processing. For the better combination with the logistics system, we should consider the following aspects [8-11].
• Between attributes and attribute in decision tree were independent of each other, so for the each attribute information gain ratio calculation that can be performed in different sub processor, finally the result feedback to the parent processor, make a comprehensive analysis.

• According to the selected point of division the division of property list, the need to update the class list for each training sample. As a result, that each processor in the local memory has a consistent with the class list on the whole data set of backup and this needs to coordinate the communication between the processor to complete the class list update.

• Agrawal et al. proposed AIS, Apriori, AprioriTid and AprioriHybrid and Park the DHP were studied. The optimum processing put forward; Savadere put forward such as Partition algorithm is based on Apriori algorithm for mining association.

• Through continuous processing a set of the training samples and the network processing results obtained compared with known categories each sample error, to complete the study task. For that each training sample, constantly changing the weight to make the network output with minimum mean square error between the actual category and weight changes in reverse way.

5 Conclusion and Future Work

We analyze the construction mode of efficient logistics system under the big data environment in this paper. The current logistics demand forecasting methods of data mining are artificial neural network and its improved algorithm, such as the application of neural network model fitting of the nonlinear relationship between regional economy and regional logistics, but this method can be interpreted and the limitation to the learning sample size ., by contrast, the self-organizing data mining prediction accuracy is higher. We combine the topology optimization approach and the machine learning algorithms to propose the new perspective of the issues that will be meaningful for the further research.

References