High-Quality Extraction Method of Education Resources Based on Block Chain Trusted Big Data

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Abstract. In order to improve the level of educational administration, it is necessary to extract educational resources with high quality. Based on the block chain trust, a high-quality education resource extraction method is proposed, and a model function of high-quality education resource extraction is designed by using the spatial distribution resource scheduling model. In order to judge the convergence of high-quality education resource extraction process, a statistical analysis model of high-quality education resource extraction is established. The method of quantitative feature analysis and fuzzy information clustering is used to extract and control the high-quality educational resources. The root game equilibrium optimization algorithm realizes the optimization of the high-quality of educational resources. The simulation results show that the optimization ability of using this method to extract the high quality of educational resources is better, and the scheduling process has strong convergence, it improves the ability of optimal scheduling and acquisition of educational resources.

Keywords: Block chain · Trusted big data · Administrative resources · High quality extraction · Data access

1 Introduction

Since the start of IT informatization construction in education departments, education data have shown explosive growth, accumulated for so many years, formed a large amount of data already, and naturally formed “education big data”. The core goal of data governance is to sort out and standardize education data, solve possible problems, and establish unified, real-time and accurate authoritative data resources for all departments and functional units to share. This paper studies the high-quality extraction model of education resources, brings the national advantageous education resources into the dispatching scope, and combines the information fusion and big data analysis technology to carry out the optimal design of the high-quality extraction scheme of education.
resources [2]. People pay attention to the optimal dispatching and feature extraction design of related education resources. In the high-quality extraction and scheme design of education resources, the dispatching model design is the key. The statistical analysis model of high-quality extraction of education resources is established. Combined with fuzzy information fusion and optimization method, the operational research analysis theory [1] is adopted to carry out the high-quality extraction and game planning design of education resources [3]. This paper proposes a high-quality extraction scheme of education resources based on block chain trusted big data. Firstly, a spatial distributed resource scheduling model is adopted to design a mathematical model for high-quality extraction of education resources. Secondly, an optimal optimization parameter design for high-quality extraction of education resources is carried out. Combining with the concentration of block chain trusted big data distribution information, the fitness level and equilibrium level of high-quality extraction of education resources are analyzed. The root game equilibrium optimization algorithm realizes the optimization of high-quality extraction of education resources. Finally, the simulation test analysis shows the superior performance of the method in improving the high-quality extraction ability of education resources [4].

2 Mathematical Model and Parameter Analysis for High Quality Extraction of Education Resources

2.1 High Quality Extraction Model of Education Resources

In order to realize the scheduling optimization of education resources, a mathematical model design for high-quality extraction of education resources is carried out in combination with an adaptive optimization method [5]. A quadratic programming model for high-quality extraction of education resources is established. The distribution center (i, j = 0) using high-quality extraction of education resources has K (K = 1, …, K) scheduling paths, N(i, j = 1, …, N) scheduling points, and the initial load capacity of each group of education resources is Q.

Define the following variables and parameters:

\[ x_{ij}^{k} = \begin{cases} 1 & k > j \\ 0 & \text{else} \end{cases} \]

\( g_i \): Required distribution quantity of education resources characteristic distribution point i.

\( u_i \): Distribution service order of education resources characteristic distribution point i.

Using the model correlation variable analysis method, the multi-objective function for high-quality extraction of education resources can be determined as follows:

\[ \min D = \sum_{i=0}^{N} \sum_{j=0}^{N} \sum_{k=1}^{K} d_{ij} x_{ij}^{k} \quad (1) \]

\[ \min C = \sum_{i=0}^{N} \sum_{j=0}^{N} \sum_{k=1}^{K} c_{ij} x_{ij}^{k} \quad (2) \]
As shown in the above formula, there are three optimization objectives for the high-quality extraction of education resources [6]. By adopting a linear programming scheme, the constraint conditions for obtaining the shortest high-quality extraction distance, the lowest cost and the largest safety factor of education resources are as follows:

\[
\max S = \sum_{i=0}^{N} \sum_{j=0}^{N} \sum_{k=1}^{K} s_{ij} x_{ij}^k
\]  

As shown in the above formula, there are three optimization objectives for the high-quality extraction of education resources [6]. By adopting a linear programming scheme, the constraint conditions for obtaining the shortest high-quality extraction distance, the lowest cost and the largest safety factor of education resources are as follows:

\[
\sum_{i=0}^{N} g_{i} y_{ik} \leq Q, \quad k = 1, 2, \ldots, K
\]  

\[
\sum_{k=1}^{K} y_{ik} = \begin{cases} 
1 & i = 1, 2, \ldots, N \\
K & i = 0
\end{cases}
\]  

Where, \( \sum_{i=0}^{N} x_{ij}^k = y_{jk} \); \( j = 0, 1, 2, \ldots, N; \quad k = 1, 2, \ldots, K \)

\[
\sum_{j=0}^{K} x_{ij}^k = y_{ik} \quad i = 0, 1, 2, \ldots, N; \quad k = 1, 2, \ldots, K
\]

\[
x_{ij}^k = 0 \quad \forall i = j; \quad k = 1, 2, \ldots, K
\]

\[
u_i - u_j + (N + 1) \sum_k x_{ij}^k \leq N
\]

\( i \neq j, i = 1, 2, \ldots, N; \quad j = 1, 2, \ldots, N \)

Where, \( x_{ij}^k \in \{0, 1\} \); \( y_{ik} \in \{0, 1\} \); \( u_i > 0 \)

Under the constraint conditions, the process of education resources distribution is optimized. Ant colony spatial planning algorithm is adopted to obtain the education resources scheduling scheme with K scheduling paths. Combined with the adaptive optimization method, high-quality extraction and spatial planning design of education resources are carried out [7].

### 2.2 Parameter Optimization for High Quality Extraction of Education Resources

The convergence judgment of the high-quality extraction process of education resources is carried out by combining a linear programming scheme, a statistical analysis model for high-quality extraction of education resources is established, emergency parameter optimization design of education resources is carried out [8–10], the number of ants in ant colonies for high-quality extraction of education resources is set to be m, the spatial planning path distribution constraint parameter from the characteristic distribution point I of education resources to the characteristic distribution point j of education resources is \( \eta_{ij} \), \( \tilde{d}_{ij} \) is taken, Indicates the shortest path from the feature distribution point I of
education resources to the feature distribution point \( J \) of education resources. Combined with the intensity analysis of pheromone concentration, automatic optimization of high-quality extraction of education resources is carried out. The spatial planning model for high-quality extraction of education resources is obtained as follows:

\[
P^k_{ij}(t) = \begin{cases} 
\frac{\tau_{ij}(t)^\alpha \eta_{ij}^\beta \epsilon_{ij}^{-\gamma} \sigma_{ij}^\sigma}{\sum_{j \in \text{allowed}_k(t)} \tau_{ij}(t)^\alpha \eta_{ij}^\beta \epsilon_{ij}^{-\gamma} \sigma_{ij}^\sigma} & \text{if } j \in \text{allowed}_k(t) \\
0 & \text{else}
\end{cases} (8)
\]

In the above formula, \( \text{allowed}_k(t) = (1, 2, \ldots, n) - \text{tabu}_k \) indicates the convenient point for high-quality extraction of education resources. Ant \( K \) is allowed to select the next point. Obtaining a search list \( \text{tabu}_k(k = 1, 2, \ldots, m) \) for high-quality extraction of education resources, and obtaining a diversity space analytic function for high-quality extraction of education resources by recording the path of ant \( k \) at time \( t \) and combining a fuzzy degree monitoring method as follows:

\[
j = \begin{cases} 
\arg \left\{ \max_{j = \text{allowed}_k(t)} \left[ \tau_{ij}(t)^\alpha \eta_{ij}^\beta \epsilon_{ij}^{-\gamma} \sigma_{ij}^\sigma \right] \right\} & q \leq q_0 \\
\text{else} & (9)
\end{cases}
\]

\( q_0 \in (0, 1) \) is the spatial distribution constant for high-quality extraction of education resources, and \( q \) is a random number between 0 and 1. When \( q > q_0 \), the optimization threshold \( j \) for high-quality extraction of education resources satisfies the convergence condition [11], and the global information update formula for high-quality extraction of education resources is as follows:

\[
\tau_{ij} = (1 - \rho) \tau_{ij} + \rho \Delta \tau_{ij}^{\text{best}}, \quad \rho \in (0, 1) (10)
\]

\[
\Delta \tau_{ij}^{\text{best}} = 1/O^{\text{best}} (11)
\]

In the formula, \( O^{\text{best}} \) is the global optimal target value for current ants to perform high-quality extraction of education resources, \( \rho \) is the pheromone concentration. After obtaining the optimal solution for high-quality extraction of education resources by combining ant colony optimization method, in the spatial distribution vector set [12], the distribution center optimization parameters for high-quality extraction of education resources are obtained as follows:

\[
\tau_{ij} = (1 - \xi) \tau_{ij} + \xi \tau_0, \quad \xi \in (0, 1) (12)
\]

In the formula, \( \tau_0 \) is constant, \( \tau_0 = 1/\left( nO_{\min}^3 \right), O_{\min}^3 \) are global update disturbance thresholds. Based on the above analysis, a parameter optimization model for high-quality extraction of education resources is established to improve the optimal scheduling and access capability of education resources [13].

3 Optimal Design for High Quality Extraction of Education Resources

3.1 Optimization of High Quality Extraction of Education Resources

The auto-correlation quantitative feature analysis and fuzzy information clustering method are adopted to carry out high-quality extraction and adaptive optimization control
of education resources, a block chain trusted big data detection algorithm is established to realize optimization design of high-quality extraction of education resources [14], game control of high-quality extraction of education resources is carried out according to the distribution relevance of block chain trusted big data, and the game model of high-quality extraction of education resources is as follows:

\[
p_{ij}^k(t) = \begin{cases} 
\frac{[\tau_{ij}(t)]^\alpha [\eta_{ij}(t)]^\beta}{\sum_{s \in \text{allowed}_k} [\tau_{is}(t)]^\alpha [\eta_{is}(t)]^\beta}, & \text{if } j \in \text{allowed}_k \\
0, & \text{else}
\end{cases}
\]  

(13)

\[
\tau_{ij}(t+n) = (1 - \rho)\tau_{ij}(t) + \Delta \tau_{ij}(t)
\]  

(14)

\[
\Delta \tau_{ij}(t) = \Delta \tau_{ij}^k(t)
\]  

(15)

\[
\Delta \tau_{ij}^k(t) = \begin{cases} 
\frac{Q}{d_k}, & K > L \\
0, & \text{else}
\end{cases}
\]  

(16)

In the formula, \(\tau_{ij}(t)\) and \(p_{ij}^k(t)\) respectively represent the pheromone intensity on the connection line between node I and node j of high-quality extraction of education resources at time t, and the conditional distribution probability of high-quality extraction of education resources represents the relative importance of ant k trajectory; \(\eta_{ij}(t)\) represents the conditional probability of ant K selecting a high-quality extraction path of education resources; \(\eta_{ij}(t) = \frac{1}{d_{ij}}\) represents the expected degree of ant K transferring from high-quality extraction node I of education resources to scheduling node J. Usually, \(tadu_k\) represents the spatial distance of emergency network of education resources, and fuzzy degree search method is adopted to obtain the conditional permission function of high-quality extraction of education resources as K, \(d\) represents the optimization ability of ant K, \(tadu_k\) represents the pheromone concentration recorded by ant K for optimization, set represents the ant colony variability of high-quality extraction of education resources, and adopts ant colony optimization method to obtain the information amount on path \(ij\) in the process of high-quality extraction of education resources. Q indicates the pheromone intensity of education resources emergency, and \(k\) is constant. According to the above analysis, an ant colony optimization model for high-quality extraction of education resources is established, and spatial planning and design are carried out according to the ant colony optimization results [15].

### 3.2 Implementation Process of High Quality Extraction of Education Resources

A block chain trusted big data detection algorithm is established to realize the optimization design of high-quality extraction of education resources, game control of high-quality extraction of education resources is carried out according to the distribution relevance of block chain trusted big data, and fitness function is set. Since the problem of high-quality extraction of education resources is transformed into a Traveling Salesman Problems (TSP), according to TSP problem, the optimized planning model is as follows:

\[
\min D_{total} = \sum_{i \in N} \sum_{j \in N} x_{ij}d_{i,j}
\]  

(17)
\begin{equation}
\begin{aligned}
&\sum_{j \in N} x_{i,j} = 1, \forall j \in N \\
&\sum_{i \in N} x_{i,j} = 1, \forall i \in N \\
&\sum_{i \in M} \sum_{j \in N - M} x_{i,j} \geq 1, M \subset N
\end{aligned}
\end{equation}

In the formula, \(d_{i,j}\) is the distance between the two network nodes \(i, j\) for high-quality extraction of resources is expressed, the game control for high-quality extraction of education resources is carried out according to the association of trusted large data distribution in the block chain, and the fitness level and equilibrium level for high-quality extraction of education resources are analyzed in combination with the concentration of trusted large data distribution information in the block chain. The algorithm implementation steps are as follows:

Step (1) Planning and coding the high-quality extraction of education resources. The linear programming coding path of the commonly used planning path is represented by the optimal optimization path.

Step (2) Initialize the population of block chain trusted big data detection algorithm. The initial route of ants from the distribution center of feature distribution is set up, and global update is carried out according to pheromones.

Step (3) Calculate the objective function and the optimal solution of this cycle, and combine ant colony optimization to avoid the algorithm falling into local optimization.

Step (4) Using CRO to find out the best solution for high-quality extraction of education resources.

## 4 Simulation Experiment Analysis

In order to verify the application performance of the method in realizing high-quality extraction of education resources, simulation experiments are carried out and Matlab is used for simulation analysis. It is assumed that ant colony performs optimal scheduling path search range: \(-500 \leq x_d \leq 500\). The optimal value for global search of education resources is \(\min(f_6) = f_6(0, 0, \ldots, 0) = 0.83\), and other relevant parameters are set as follows:

\(q_0 = 0.6, \alpha = 1, \beta = 2, \lambda = 1, \gamma = 1, \sigma = 1, \rho = 0.2, \xi = 0.1, m = 50, N_{C_{\text{max}}} = 100, Q = 5\). The three optimized paths for high-quality extraction of available education resources are as follows: \(1 \rightarrow 4 \rightarrow 8 \rightarrow 4 \rightarrow 0, 0 \rightarrow 12 \rightarrow 3 \rightarrow 5 \rightarrow 0, 0 \rightarrow 4 \rightarrow 6 \rightarrow 0\). Maximum load distribution of education resources: 200, 500, 58. See Table 1 for safety evaluation values between education resources emergency center and dispatching point.
Table 1. Safety evaluation values between education resource emergency center and dispatching point

| $s_{ij}$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|---|
| 0       | – | 6 | 7 | 4 | 5 | 6 | 7 | 5 | 5 |
| 1       | 4 | – | 6 | 5 | 6 | 6 | 4 | 8 |   |
| 2       | 6 | 8 | – | 4 | 7 | 5 | 4 | 4 | 4 |
| 3       | 8 | 4 | 5 | – | 6 | 4 | 3 | 3 | 6 |
| 4       | 4 | 3 | 3 | 7 | – | 7 | 4 | 4 | 7 |
| 5       | 7 | 4 | 4 | 3 | 5 | – | 5 | 5 | 3 |
| 6       | 9 | 7 | 5 | 4 | 4 | 5 | – | 6 | 4 |
| 7       | 5 | 4 | 7 | 7 | 6 | 4 | 7 | – | 6 |
| 8       | 4 | 3 | 5 | 4 | 3 | 5 | 6 | 5 | – |

According to the above parameter settings, a statistical analysis model for high-quality extraction of education resources is established, and the high-quality extraction of education resources and adaptive optimization control are carried out by using autocorrelation quantitative feature analysis and fuzzy information clustering methods, thus obtaining the final optimization path distribution as shown in Fig. 1.

![Fig. 1. Optimal path for high quality extraction of education resources](image)

According to the optimization path of Fig. 1, the convergence judgment of education resource scheduling is carried out, and the obtained result is shown in Fig. 2.

It can be seen from Fig. 2 that the algorithm in this paper achieves the optimal convergence at about 200, which is far faster than other algorithms, and the wireless convergence is close to 200, which shows that the method has good convergence for educational resource scheduling, ensures the fast and accurate analysis data, and can prevent the emergence of local optimal solutions.
The higher the number of iterations, the less the corresponding time. The criteria of response time are as follows:

1. Within 3 s, the page responds to the user and displays something, which can be considered as “very good”;
2. Within 3–5 s, the page responds to the user and displays something, which can be considered as “good”;
3. Within 5–10 s, the page responds to the user and displays something, which can be regarded as “reluctantly accepted”;
4. More than 10 s makes people a little impatient, and users are likely not to continue to wait. See Table 2 for comparison results.

Table 2. Comparison of algorithm results

| Algorithm      | Parametric performance | Experiment 1 | Experiment 2 | Experiment 3 |
|----------------|------------------------|--------------|--------------|--------------|
| PSO            | Number of iterations   | 32           | 18           | 16           |
|                | Response time (Unite: | 1.12         | 13.54        | 5.56         |
|                | seconds)               |              |              |              |
| Colony         | Number of iterations   | 14           | 18           | 28           |
|                | Response time (Unite: | 1.36         | 13.54        | 15.53        |
|                | seconds)               |              |              |              |
| Proposed method| Number of iterations   | 3            | 9            | 11           |
|                | Response time (Unite: | 1.03         | 1.26         | 8.12         |
|                | seconds)               |              |              |              |

Table 2 analysis shows that compared with other methods, the maximum response time of this method is 1.36 s, which is far lower than other methods, indicating that the optimization time of extracting high-quality education resources by this method
is relatively short, indicating that the response time is well guaranteed, the extraction efficiency of government resources is improved, and the emergency ability of platform search is ensured.

5 Conclusions

Combining information fusion and big data analysis technology, the optimization design of high-quality extraction scheme of education resources is carried out. This paper proposes a high-quality extraction scheme of education resources based on block chain trusted big data. Linear programming scheme is adopted to obtain the constraints of the shortest extraction distance, the lowest cost and the largest safety factor of high-quality extraction of education resources. Autocorrelation quantitative feature analysis and fuzzy information clustering method are adopted to carry out high-quality extraction and adaptive optimization control of education resources. According to the relevance of block chain trusted big data distribution, the game control of high-quality extraction of education resources is carried out. Combining with the concentration of block chain trusted big data distribution information, the fitness level and equilibrium level of high-quality extraction of education resources are analyzed. The root game equilibrium optimization algorithm realizes the optimization of high-quality extraction of education resources. The analysis shows that the optimization ability of high-quality extraction of education resources by the method in this paper is better, the convergence of the scheduling process is stronger, the optimization scheduling and access ability of education resources are improved, and the consumption time is shorter.

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