

Analysis of the Current Development Status of the Engineering Cost Industry in the Era of Artificial Intelligence

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Abstract

Cost estimation is a very important department in construction engineering. Accurate cost estimation can improve the accuracy of the cost budget for construction engineering projects. Traditional cost estimation mainly based on manual estimation methods, which has low accuracy in the budgeting process of engineering projects and easily leads to significant errors in data estimation, resulting in economic losses for construction engineering projects. Application of artificial intelligence technology in construction cost estimation can adopt scientific calculation methods to estimate the cost of construction engineering projects, thereby improving the accuracy of cost estimation for construction engineering projects.

Keywords

Engineering cost industry, artificial intelligence, cost estimation.

1. Introduction

With the rapid development of modern science and technology, computer technology has been widely applied in the fields of people's work and life. As a major tool for human intelligent activities, the replacement of human manual production methods by computer technology has become an inevitable trend in the development of science and technology [1]. The development of computer technology and the application of computer equipment have promoted the development of human intelligent technology. Artificial intelligence is a behavior of human intelligence that, according to the laws of human intelligent life development, runs specific program codes through computers to complete human task activities. People use computer technology to build artificial intelligence systems to help people achieve certain specific behaviors[2-4]. Human intelligent technology is the simulation of human intelligent behavior through the research and development of computer technology. With the rapid development of artificial intelligence technology, artificial intelligence systems have also been widely applied in the cost estimation of construction engineering projects. By using artificial intelligence technology to manage the cost of construction engineering projects and supervise the construction engineering projects, using scientific methods to improve the accuracy of construction cost estimation[5].

2. Artificial Intelligence Technology

2.1. Characteristics of Artificial Intelligence Technology

The most fundamental characteristic of artificial intelligence technology is its perceptual ability, which serves as the foundation for the operation of artificial intelligence systems. Artificial intelligence technology computers as its primary devices, and computers possess memory functions; the development direction of artificial intelligence technology is to achieve the integration of thinking and memory functions. Artificial intelligence technology is characterized

by learning function, and learning ability is an essential capability to adapt to social development, emphasizing the dominant role of knowledge in modern economic development. The central processing system of artificial intelligence technology relatively similar to the human nervous system, and artificial intelligence technology has a response capability similar to that of humans, which has promoted the intelligence of computer technology.

2.2. Definition and Characteristic Analysis of Construction Engineering Cost

In the preparation process of a construction engineering project, the estimation of construction engineering is a necessary step. The construction engineering cost is the budgeting of the construction price of the construction engineering project. The construction price of an engineering project includes the budget for the total of the construction engineering project and the budget for the cost of resources consumed by the construction engineering project. Construction engineering cost projects involve large capital expenditures. A construction engineering project is a very-scale undertaking. In this systems engineering, it includes material procurement, job assignments for construction workers, and the top-level design of the entire construction engineering project, etc.

We to budget up to hundreds of millions of funds for the material costs of all these engineering tasks. The main constraining factor of a construction engineering project is the huge material and capital cost. Construction engineering projects have different project characteristics in different fields. Due to the different target benefits of construction engineering projects, the differences in construction engineering costs are very large. A lot of time needs to be invested during the construction process of a construction engineering project. The implicit factor of construction engineering cost is the construction time cost of the engineering project. If the construction time of construction engineering is longer, then the time consumed by the construction engineering project will be more, which will lead to the construction engineering project being more affected by dynamic factors. Construction engineering are characterized by complexity.

3. Analysis of the Current Research Status of Construction Engineering Cost

3.1. Factors Affecting the Cost Estimation of Construction Projects and Analysis of Characteristic Variables

There are many factors affecting construction engineering costs. Top-level design factors of construction engineering projects and the skill levels of construction personnel are human factors that influence construction engineering costs. Changes in engineering projects, national policy regulations, and natural factors are all objective factors that affect construction engineering costs. There are a vast number of factors influencing engineering costs, and any single factor cannot be omitted during the budgeting process. If any influencing factor is not accounted for during the cost estimation process, the cost of the entire construction project will be affected, and the accuracy of the estimation will decrease. During the building construction process, an increase in the number of floors and the building area will affect the expenses of the engineering project.

Additionally, changes in the materials purchased during construction and changes in construction personnel expenses will all affect the accuracy of the construction engineering cost estimation. Therefore, all dynamic influencing factors must taken into consideration during the construction engineering cost estimation process. Incorporating labor productivity and other factors into the cost estimation of engineering projects can effectively reflect the technical and management levels of the project. In an AI-based construction engineering cost estimation system, we must input the human factors, objective factors, and dynamically

changing factors that affect the engineering project cost as parameters into system to ensure the accuracy of the final cost estimation for the construction engineering project.

3.2. Research on the Application of Artificial Intelligence Technology in Construction Engineering Cost Estimation

In construction engineering cost estimation, artificial intelligence technology possesses strong capabilities. It can analyze and calculate massive amounts of data, and it also has significant advantages in of self-organizing and self-learning functions. By effectively integrating artificial neural networks and genetic algorithms within artificial intelligence systems, the genetic algorithm in artificial intelligence technology, compared to traditional, offers unique functions that meet the requirements of construction engineering cost estimation algorithms and improves the accuracy of engineering project cost estimation.

4. Artificial Intelligence Computing Models

4.1. Establishment of a Construction Cost Estimation Model based on Artificial Intelligence Technology

BP artificial neural network is a commonly used backpropagation network. The BP artificial neural model includes an input layer, an output layer, and hidden layers. Inside each layer of the model, there are many nodes, and these nodes represent neurons. Within each layer the BP artificial neural network model, nodes are not interconnected with each other, while nodes between adjacent layers are interconnected. Information enters the system through the input layer, propagates unidirectionally layer within the system, and leaves the system from the output layer after passing through the various layers inside the model.

4.2. Research on the Effective Fusion of Genetic Algorithms and Artificial Neural Networks

Effectively fusing the advantages of algorithms and neural networks, genetic algorithms possess global search capabilities, which is their greatest advantage. Through the effective optimization of neural networks by genetic algorithms, the most important aspect is the design. Neural networks can provide effective assistance to genetic algorithms, and the establishment of genetic algorithms can be based on neural networks. Genetic algorithms optimize the connection weights of neural networks; they can the corresponding functions in the neural network weights, adjust relevant data, and enable the neural network to have better connection weights. All data of the engineering project estimation system are contained in the network weights.

The automatic design method is a fusion of genetic algorithms and neural networks; it is highly efficient and can optimize the neural network through genetic algorithms, thereby reducing the negative factors of neural network. The algorithm for neural performance provided by the neural network is also a fusion of genetic algorithms and neural networks. The algorithmic tools in the neural network algorithm adopt neural network weights which can achieve changes in the convergence of the genetic algorithm. The effective optimization of neural network connection weights by genetic algorithms can ensure a good fusion between genetic algorithms and neural networks.

The training neural network connection weights is optimized through functions, adjusting data analysis to find the most optimized connection weights. However, in general weight training, due to the influence of various factors, problems arise in parameter selection, the weight training time is delayed, causing low convergence efficiency, and the entire neural network experiences oscillation. The accuracy of the engineering project estimation value will be affected, extreme values will appear in local positions of the entire network. We calculate the

optimization of neural network connection weights through genetic algorithms, ensuring that the weights correspond to the connection weights, minimizing error of the sample function, improving the accuracy of the weights, and ensuring the smooth progress of the entire weight training.

5. Results

The establishment of simulation model.

With the rapid development of information technology, application of artificial intelligence technology in the field of construction engineering is an inevitable trend in the development of construction engineering. In artificial intelligence technology, computer technology serves as an important technical guarantee. application of artificial intelligence technology in construction engineering cost estimation research is of great significance. Artificial intelligence technology can ensure the accuracy of data estimation and improve the economic benefits of construction engineering projects.

6. Conclusion

Artificial intelligence is a process of replacing human labor and completing related applications based on computer science and computing, relying on the programming and design of programs. Artificial intelligence generally features capabilities such as perception, memory, adaptation, and reaction. Engineering cost estimation is a very important link in construction engineering, generally characterized by numerous influencing, a large total cost, strong variability, strong dynamism, and high complexity. In the process of manual cost estimation, it is necessary to have a clear understanding of the rules for calculating quantities price levels, quotas, and rates involved in the entire cost estimation process, and to comprehensively consider various factors affecting the engineering cost without any errors. Therefore, it consumes a lot of energy and time and manual calculation inevitably leads to some errors or mistakes, or even allows some enterprises to adopt improper means to achieve the purpose of malicious bidding. After the introduction of artificial intelligence into engineering estimation, by reducing the interference of human factors and relying on computer programming and design to program materials and equipment, accurate and efficient calculations can be performed. This ensures the accuracy of calculations while also guaranteeing the accuracy of the cost estimation documents, thereby reasonably realizing the interests of both the owner and the contractor.

Acknowledgments

The authors gratefully acknowledge the financial support from Liaoning Communication University.

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