Research on Intelligent Design Management System of Building Structures Based on Fuzzy Rule Neural Network

Fu Qiaoling

Chongqing Water Resources and Electric Engineering College, Yong Chuan, Chong Qing, 402160, China

Keywords: Fuzzy Rule Neural Network; Building Structure; Intelligent Design Management System

Abstract: Architectural technology is becoming more and more mature than before, but there are still many problems in the design of architectural structure. Therefore, the author regards intelligent design of building structure as the focus of research, and lists some common problems concisely. Because there is some fuzziness in the understanding of structural reliability, the fuzzy rule neural network is used for reliability evaluation. At the same time, several targeted solutions have been proposed to help. The results confirm that the intelligent structure monitoring system based on fuzzy rule neural network design system can greatly improve the application performance of the system, and at the same time, it can ensure that the system meets the intelligent monitoring requirements of actual engineering structure.

1. Introduction

The design of the building structure cannot be carried out by itself, and it must be carried out in accordance with the relevant principles, because the quality of the building directly affects the overall safety of the building [1]. The construction industry must pay close attention to this development trend, continuously improve the technical requirements for structural design of construction engineering, pay attention to the quality and safety of construction engineering and the aesthetic appearance of the building to cater to the social development of China and the needs of the public [2]. If the law and degree of such reliability damage can be scientifically evaluated, it can provide a reliable basis for the safe use of the building structure, so as to take effective measures to prevent or delay the damage of the structure [3]. This is of great significance for ensuring the safety of building users and prolonging the service life of structures [4]. At the same time, based on the development of current neural network technology, the design of intelligent monitoring system for engineering structures is strengthened [5]. In order to be able to effectively monitor engineering structural factors in future engineering buildings, the system can be used to improve the intelligent monitoring performance of engineering structures and play an important role [6]. Many control theories and algorithms have been developed, such as optimal control, pole assignment, independent mode control, instantaneous optimal control, impulse control, etc. [7]. So now we use the Fuzzy Rule Neural Network to design architectural design and construction drawings, which is the main trend of the future development of architectural design [8].

2. Methodology

China's social and economic development and the progress of construction engineering technology provide a very favorable environment for the development of China's construction industry. With the continuous improvement of people's living standards, there are higher requirements for the quality and comfort of buildings. Architectural design and structural design restrict each other and restrict each other. They complement each other, try to avoid problems in the design process, and then find relative strategies, so as to improve the quality of architectural design in China as a whole [9]. This method no longer relies on the role of individuals, but uses detection data to assist judgment, which reduces the subjectivity of identification. In today's society, about neural networks, it is not possible to permeable pattern recognition and image processing, as well as

Copyright © (2019) Francis Academic Press, UK DOI: 10.25236/iwmecs.2019.036

nonlinear data optimization, and can also use neural network technology in speech processing [10]. Building structures are large and complex nonlinear systems, and it is difficult to establish accurate mathematical models, and conventional control algorithms sometimes have difficulty achieving the desired control effects. In order to unify the operation of the appraisal and the appraisal scale of the appraiser, China has promulgated a series of procedures and standards for building structure appraisal. Therefore, when designing the structure, the designer should put the overall structural design of the construction project in the first place, and improve the quality and appearance of the building as much as possible, so as to gain a place in the market competition.

Building structure design is not a fantasy, it needs to combine the actual situation of the building, such as the importance of building construction, the geographical environment of the location, the earthquake resistance of the building, and so on. Only by considering these factors can we scientifically choose the structural form of the building. Thereby the structural force members and the load bearing system are further arranged. The designer must pay attention to the importance of the design drawings to the structural design of the building. It is necessary to clearly mark every detail on the drawings, as well as the seismic resistance level of the construction project, the type of construction materials used in the construction, and the beams and columns of the construction project. Parts are marked. In recent years, according to the structural reliability design theory, the probability method of measuring structural reliability using structural failure probability is also being explored. Because of the huge amount of Engineering in the design of building structure, some designers neglect the specific situation of the building, ignore the relevant requirements, and design only by subjective experience. However, in the process of actual design drawings, the constructors do not attach importance to the architectural drawings, and do not consider the problems comprehensively. As a result, the design drawings are only simple drawings, and do not carefully label the details that need to be paid attention to, which affects the interpretation of the constructors. This has a certain impact on the construction progress, but also has a negative impact on the quality and safety of the project.

3. Result Analysis and Discussion

In the design of intelligent monitoring system for engineering structure, based on BP neural network technology, structural damage diagnosis can be carried out in engineering construction, and better engineering structure analysis and monitoring results can be obtained. Therefore, fuzzy mathematics can be introduced into structural reliability evaluation, and the structural reliability can be evaluated by using fuzzy evaluation. At the same time, when modeling the structure, only the supervisor judged that the size of the roof beam was not specifically analyzed, resulting in the calculated amount of reinforcement not meeting the relevant regulations. Under this circumstance, China should formulate its relevant standards as soon as possible, and introduce some national standards and norms related to fuzzy rules neural networks. This inadvertent site selection behavior seriously affects the service life of the building. Therefore, designers must pay full attention to the importance of the foundation and achieve scientific and standardized site selection.

The reliability evaluation of the structure has been used for a long time by the traditional experience method. With the development of the detection technology, based on the traditional experience method, a practical identification method using modern detection technology to obtain various structural information has been developed. At the same time, in this system design, BP neural algorithm based on neural network can be adopted, and algorithm strategy similar to gradient optimization can be applied. In order to improve the analysis efficiency and adaptability of the system, the monitoring algorithm of the design system can be optimized. Partly, the system neural network model is optimized to improve the prediction efficiency. However, fuzzy logic does not require an accurate mathematical model of the controlled system, and is particularly suitable for describing complex nonlinear systems.

4. Conclusions

With the continuous development of our society and the advancement of technology, the competition in the construction market has become increasingly fierce. In order to survive in this increasingly competitive environment, designers of architectural engineering structures must strive to learn from cutting-edge design concepts at home and abroad to continuously improve their design. It can also avoid the randomness problem in the monitoring of engineering structure, effectively ensure the stability of the engineering structure, and exert its application value. It is worthwhile to promote the technology in practice. In this way, the trained network can be used to obtain the membership degree of different reliability levels, and these membership degrees are obtained under the same judgment scale, so that the subsequent fuzzy comprehensive evaluation has relative objectivity. In order to make the structure design more reliable and economical, we need to cooperate in many aspects, such as engineering and education, strengthen the wide application of computers, strive to develop new high-strength, light, environmental protection building materials, and promote the concept of conceptual design. At the same time, we should have a high sense of responsibility, take into account all kinds of problems that may arise in the design in advance, and put forward corresponding solutions, so as to improve the design level of the building structure, thereby increasing its competitive advantage.

References

[1] Pranevicius H, Kraujalis T, Budnikas G, et al. Fuzzy rule base generation using discretization of membership functions and neural network. Communications in Computer & Information Science, 2014, 465:160-171.

[2] Garc á, Juan Carlos Figueroa, Ochoarey C M. Rule generation of fuzzy logic systems using a self-organized fuzzy neural network.. Neurocomputing, 2013, 151:955-962.

[3] Sonule P M, Shetty B S. An enhanced fuzzy min–max neural network with ant colony optimization based-rule-extractor for decision making. Neurocomputing, 2017, 239:204-213.

[4] Mohammed M F, Lim C P. A new hyperbox selection rule and a pruning strategy for the enhanced fuzzy min-max neural network. Neural Networks, 2017, 86:69-79.

[5] Kulluk S, Lale Özbakır, Adil Baykasoğlu. Fuzzy DIFACONN-miner: A novel approach for fuzzy rule extraction from neural networks. Expert Systems with Applications, 2013, 40(3):938-946.

[6] GA-based learning for rule identification in fuzzy neural networks. Applied Soft Computing, 2015, 35:605-617.

[7] Ebadzadeh M M, Salimi-Badr A. IC-FNN: A Novel Fuzzy Neural Network With Interpretable, Intuitive, and Correlated-Contours Fuzzy Rules for Function Approximation. IEEE Transactions on Fuzzy Systems, 2018, 26(3):1288-1302.

[8] Lin Y Y, Chang J Y, Lin C T. Identification and Prediction of Dynamic Systems Using an Interactively Recurrent Self-Evolving Fuzzy Neural Network. IEEE Transactions on Neural Networks & Learning Systems, 2013, 24(2):310-321.

[9] Ganjefar S, Tofighi M. Single-hidden-layer fuzzy recurrent wavelet neural network: Applications to function approximation and system identification. Information Sciences, 2015, 294:269-285.

[10] Adrian R S, Patricia M, Uriel M H, et al. General Type-2 Radial Basis Function Neural Network: A Data-Driven Fuzzy Model. IEEE Transactions on Fuzzy Systems, 2018:1-1.