A Brief Discussion on the Applications of Artificial Intelligence in the Field of Valuation

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Abstract. with the rapid development of AI, its application in various fields is more and more extensive. This paper expounds the definitions and principles of artificial neural network, expert system and case-based reasoning, as well as its application in the field of engineering evaluation, analyses and summarizes the advantages and disadvantages, and points out possible future directions of the development in the field of the three artificial intelligences.

1. Introduction
In the evaluation method, because of the shortcomings of the traditional methods, such as large error, slow speed, long period and so on, fuzzy mathematics[1], neural network, genetic algorithm[2] and other estimation methods have come into being. Due to the complexity, concealment, multilevel and fuzziness of engineering projects, there is no mature and effective estimation method yet. In this paper, three artificial intelligence methods, artificial neural network, expert system, case-based reasoning are expounded and analyzed in the field of engineering evaluation, and the future direction of development is pointed out.

2. The Branch of Artificial Intelligence

2.1. Artificial Mental Network Method
The artificial neural network originated in the 40s of the last century. The basic principle is that people can achieve intelligence by simulating the structural characteristics of cortical neurons. It consists of a large number of neurons, and each neuron represents a specific output function. Every two node connections represent a weighted value, and the output of network is different from output function and weighted value. The nonlinear model of the neuron is as shown in Figure 1. The nonlinear model of the neuron:
2.2. Expert System
The expert system (ES) uses the computer models of experts reasoning to copy with complicated issues that experts require explanation in reality. It can be regarded as the combination of "knowledge base" and "Inference Mechanism", according to the information provided by the user, it will use the relevant knowledge of storage, select reasonable reasoning mechanism and simulate the expert to solve the problem.

2.3. Case-Based Reasoning
Case based reasoning (CBR) is a new method of issues solving in the field of artificial intelligence, which originated from Yale University. It is solved by reference or modification of source case solution. The advantage is that past cases can be used to evaluate solutions of new problems and prevent possible errors. It combines quantitative analysis with qualitative analysis, and has constantly updated dynamic knowledge base and adaptive learning mode.

3. Land Valuation Model Based on Bp Neural Network

3.1. Introduction of BP Neural Network
Back Propagation takes neurons as the basic structure, and includes of three aspects: input level, implication layer and output layer. The middle layer can also be expanded to many levels, and the connections between layers are connected by neurons. Each neuron is input with multiple connections and has only one output, and each connection path corresponds to a weight coefficient, and the learning and training of the neural network is realized through the adjustment of network weights and thresholds.

3.2. Evaluation Process of BP Neural Network
The BP algorithm is also called the error back propagation. The basic idea of the algorithm is to input signals in the input layer, and calculate it through hidden layer and output it through output layer. If there is a deviation when comparing the output value with the tag value, the mistake will propagate backwardness from the output level to the input layer. In the whole procedure, we use gradient descent algorithm to adjust the weights of neurons.

The specific calculation process of the BP neural network model is as follows:

Step 1: Initialize network. The weights of each connection are respectively given to a number in interval (-1,1), and the set error is $\varepsilon$, the given accuracy is A and the maximum learning frequency is T.

Step 2: Select the T-th input sample and the corresponding expected output.
$$d_{l}(t) = (d_{1}(t), d_{2}(t), \ldots, d_{0}(t))$$
$$E(t) = (E_{1}(t), E_{2}(t), \ldots, E_{0}(t))$$
Step 3: The input and output values of the hidden layer are calculated respectively.

Step 4: By comparing the expected output value and the actual output value of the network, we compute the partial derivatives of the error function to the neurons in the output lever.

Step 5: The partial derivative $\partial E(t)$ of hidden layer neurons is calculated by using the connection weights of hidden layer to output layer, the $\hat{\partial}(t)$ of output layer and the output value of hidden layer.

Step 6: The connection weight $W_{on}(t)$ is corrected by $\hat{\partial}(t)$ and the transmission of hidden layers.

Step 7: Use $\hat{\partial}(t)$ and input layer to correct the connection weight.

Step 8: Figure out the total error $\varepsilon = \frac{1}{2n} \sum_{i=1}^{n} \sum_{o=1}^{o2} (d_i(t) - y_o(t))^2$.

Step 9: If the error is satisfied, the calculation is finished. Otherwise, select another sample and expected output, and return to the third step to learn.

Land evaluation is carried out through BP model, and the collected known data are input into the program as parameters, and a lot of operations are performed to achieve the best connection weight. Then the main factors of the land to be estimated are input into the program, and the price of the land is simulated through the realized connection right.

4. Engineering Valuation Model based on RBF Neural Network

The basic principle is to map the actual function by using the function operation ability of the network. The investment estimate information of target project is taken as the input value of the model. Using the engineering features, cost situation and material analysis as the model samples, the different input values correspond to different output values, so as to achieve the space mapping from the space of the input engineering characteristics to the output cost index.

The MATLAB toolbox relatively completes the generalization of the results of neural network, which integrates various algorithms for users. For example, we use function newrbr() to train the radial function neural network model, and use net=newrbr (P, T, goal, sp, mn, df) to build the network. Among them, goal represents target error, sp means distribution coefficient, mn represents the upper limit of neuron number, and df represents the frequency displayed in training process [3].

5. Engineering Valuation Model Based on Case-Based Reasoning (CBR)

5.1. The Basic Principle of CBR

The four basic steps of case-based reasoning are retrieval, reuse, modification and preservation, also known as 4R. When a target case appears, it searches for similar cases in the case base according to its characteristic information, that is, retrieval. If a similar source case is found, the solution can provide a reference for new cases. If no similar case is found, the solvent of the case is corrected and the solution is worked out, then the new case is saved as part of the source case [4].

5.2. CBR Based Interpretation

The basic way for CBR to solve problems is to apply typical solutions to experience and provide users with solutions. However, simply providing users with methods does not make users fully believe in the reasoning results of the system. Therefore, many scholars have put forward a more transparent way to explain the reasoning results. Sormo analyzes the origin of reasoning results in intelligent system, and classifies the results according to the objectives supported by reasoning results [5]. Nugent and Cunningham use the concept of anti-unification when they use symbols to describe, and propose an interpretation method for black box prediction [6]. The members of the research team derive the local feature weight from the internal algorithm behavior pattern and act on the case extraction process. At the same time, the local feature weight can also be used to compare the difference between the target case and the source case, thus effectively proving the effect of the extraction case in the prediction results, and the user has a clearer understanding of the model [7]. In the classification problem, Plaza and others propose to use symbolic descriptions to explain the computational process of case-based
reasoning, and to provide users with a symbolic description to explain the results, making the similar relationship between the source case and the target case more clear [8].

6. Conclusions
(1) BP neural network makes the appraiser reduce the influence of subjective factors on engineering evaluation, and has a certain speed and accuracy. As the BP network is dynamic, it is possible to form a more complete system model by constantly updating data, which means that the coverage is wider and the accuracy is higher.

(2) By using the engineering estimation model of case-based reasoning, all the cost indicators can be stored, organized and managed through Access, so as to establish engineering case base. The weighted Euclidean distance method is adapted to compute the similarity degree among cases, and multiple searches are done, so as to get the best case and get the best solution.

(3) The artificial neural network and case-based reasoning can not obtain the nonlinear relationship among the network parameters, and the expert system based on RBP neural network breaks through this limitation.

7. Expectations
(1) In 2016, financial institutions began large-scalely use "Internet plus" to transform the traditional loan process. In the next few years, artificial intelligence will be introduced in the evaluation institutions. At least in the field of individual loans, the evaluation mechanism of evaluation institutions will be deeply reformed, and the rules of the fittest in the valuation industry will be realized under the support of artificial intelligence.

(2) Bayesian algorithm based on causal cognitive framework has made new progress in practice. Bayesian algorithm is not blind data irrigation, the Bias algorithm does not blindly fill the data but based on small data to make decisions, which is one of the future trends of artificial intelligence. AI will play an important role in intangible assets evaluation, real estate appraisal and business valuation.

8. References
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