FCM Application Research of Tax Decision Support System

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Abstract. in order to improve the management of tax decisions, tax decision support system has been added to the current tax decisions. Its purpose is mainly to analyze the basic data generated in tax decisions, so as to summarize the operation rules and provide more auxiliary information. This paper will study the application of FMC algorithm in the tax decision support system, summarize the connotation of tax decision and FMC algorithm, summarize its significance, and combine the mathematical model and classification of fuzzy clustering analysis, so as to obtain the specific application of FMC algorithm in the tax decision support system.

Keywords: tax decision; Support system; FCM algorithm.

1. Connotation of Tax Decision-making

The connotation of tax decision-making is that in the process of tax work, tax objectives can be achieved while working procedures are simplified. The specific content of the scheme established in this process can be called tax decision-making [1]. At the same time, tax decisions can be regarded as a kind of economic decisions. When making tax decisions, tax policies and tax objectives should be confirmed in the first place, so as to clarify the choice of tax system, tax source and tax category. Its additional content also includes tax decision and tax administration system formulation, and finally also includes the relevant staff allocation. In the process of internal classification of tax decisions, it can be embodied as macro and micro tax decisions. In the process of classification by nature, it can be divided into strategic decisions and tactical decisions. However, they are all set up for the purpose of guiding the normal tax work and implementing the significance of tax administration [2].

2. Connotation of FCM Algorithm

FCM algorithm is the abbreviation of fuzzy c-means clustering algorithm. There are many kinds of fuzzy clustering algorithms, among which FCM algorithm 17 has been applied successfully. The specific principle is to confirm the membership degree of the sample point center and classify the sample data in this way. FCM algorithm is also the core technology of unsupervised machine learning. It has a strong degree of reduction to data analysis in the real world and has been applied in a large number of fields.

3. Advantages and Disadvantages of FCM Algorithm

3.1 Advantages of FCM Algorithm

Compared with other algorithms, FCM algorithm will conduct statistics on the membership values of different samples during the statistical process. This enables it to conduct statistics on the reliability of classification results in the process of calculation, which can help improve the accuracy of calculation in terms of membership and greatly improve the reliability of results. In the case of average membership, it is more convenient to apply other auxiliary means [3].

3.2 Disadvantages of FCM Algorithm

The advantages of FCM algorithm are summarized above, but it also has some disadvantages in the actual use. For example, when the data sample is unbalanced, for example, when the sample size is large and the sample size is small, the FCM algorithm can only consider the adjacent samples, which will lead to the occurrence of the principle target sample in the adjacent samples, which may

have some impact on the results. At the same time, FCM algorithm has the disadvantage of large amount of calculation, and the calculation process is relatively complex [4].

4. Significance of FCM Algorithm in Tax Decision Support System

With the rapid development of current information technology, the significance of the application of FCM algorithm in the tax decision-making support system has been gradually reflected, and the role of tax informatization in accelerating the efficiency of tax work and formulating tax plans has also been gradually reflected. Tax authorities have accumulated a large amount of tax data, but the lack of proper application of data leads to the formation of information island effect. Therefore, data mining becomes the key to improve the tax decision support system. However, the traditional hard partition has the obstacles of intermediation, so the soft partition of tax data by using FCM algorithm to express the intermediation can more objectively and concretely reflect the real tax situation.

5. Mathematical Model and Classification of Fuzzy Clustering Analysis

5.1 Mathematical Model of Fuzzy Clustering Analysis

FCM algorithm, as a kind of fuzzy clustering analysis, also needs mathematics as its support. With the continuous improvement of its theoretical basis, a specific mathematical model has been summarized as follows:

$X = \{x_1, x_2, \cdots, x_n\}$ In membership, the following conditions are met:

$E = \left\{ \mu_{ik} \mid \mu_{ik} \in [0,1]; \sum_{i=1}^{c} \mu_{ik} = 1, \forall k; 0 < \sum_{k=1}^{n} \mu_{ik} < n, \forall i \right\}$ Can be divided into multiple virtual subsets.

5.2 Classification of Fuzzy Clustering Analysis

In the process of classification of fuzzy clustering analysis, it can be divided into four types, namely pedigree classification, equivalence classification, graph theory classification and objective function classification. Among them, objective function classification is suitable for the case with high real-time degree, and has the characteristics of simple design and easy to use in the computer.

6. Principle of FCM Algorithm

6.1 Objective Function

The objective function of FCM algorithm can be expressed as:

$$\begin{cases} Jm(U,P) = \sum_{k=1}^{n} \sum_{i=1}^{c} (\mu_{ik})^m (d_{ik})^2, m \in [1, \infty) \\ U \in M_{fc} \end{cases}$$

In this function expression, m is the smoothing parameter. Dik family is regarded as similarity, which is used to measure the distance between vectors.

6.2 Implementation Steps

The implementation steps of FCM can be summarized as follows:

$$\mu_{ik}^{(b)} \left\{ \sum_{j=1}^{c} \left[\left(\frac{d_{ik}^{(b)}}{d_{jk}^{(b)}} \right)^{\frac{2}{m-1}} \right] \right\}^{-1}$$

Under this condition, the original model matrix can be everywhere:

$$P_i^{(b+1)} = \frac{\sum_{k=1}^{n} \left(\mu_{ik}^{(b+1)} \right)^m \cdot xk}{\sum_{k=1}^{n} \left(\mu_{ik}^{(b+1)} \right)^m}, \quad i=1,2,\cdots,c$$

7. Specific Application of FCM Algorithm in Tax Decision Support System

When making tax decisions and using tax decision support system, the commonly used functions can be divided into five types, and the five commonly used functions can be elaborated from five levels. Its specific level can be divided into data warehouse layer, data analysis layer, statistical analysis layer, information display layer and system decision layer. The role of the multidimensional data analysis layer and the statistical analysis layer is to process data, and at the same time, it can be regarded as the key module needed to obtain information and realize the three-dimensional analysis of data in the data warehouse layer with the data mining technology [5]. In this way, reliable data can be provided for decision makers to think about. The following part clearly shows its specific usage in the form of pictures, as shown in Table 1.

Table 1. three-dimensional hypothesis diagram of data warehouse

Time	1	2	...	11	12
Tax authorities	2	3	...	4	1
Economic type	1	2	...	1	2
Industry type	2	1	...	2	1

In this hypothesis diagram, the time is divided into year, month and day, the tax authorities are divided into province, city, district and town, the economic types are divided into state-owned enterprises and private enterprises, and the industry types are industry and commerce and manufacturing respectively. The above factors are all related factors that tax decision makers need to understand, and they are all relatively fuzzy variables. Therefore, in this process, FCM algorithm can be applied to confirm all original distribution and original center, and then the tax payment level information can be obtained through 8 iterations [6].

8. Conclusion

In the current research, the main purpose of the establishment of the tax decision support system is to conduct statistics on a large number of information and mine the information transmitted in the information. In this way, it has a favorable influence on the decision-making and achieves the purpose of deepening the application of data. With the application of FCM, the most accurate and useful

information can be obtained in the shortest time. It is hoped that the discussion in this paper can contribute to the application of FCM algorithm in tax decision support system in the future and help tax work to form a complete working system.

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