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High Risk Management Model For The Power Enterprise Based on Rough Set Theory

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Abstract

The traditional risk management model can't process historical data efficiently, this paper proposed a high-risk customer management model based on rough set theory to solve this problem. In this paper we briefly analyze the characteristics and application of rough set, and then give a method to reduce the irrelevant indicators before generating rules. This method is based on the advantages of rough set in processing large scale data. The model combines risk management theory in engineering and rough set theory in a very good way to process the historical data. Finally this paper gives an experiment to illustrate how to establish and apply the proposed model.

Keywords: Rough set theory; Electricity engineering; High-risk customers; Risk management

1. Introduction

With the constant expansion of china's power grid scale, the role of the enterprise risk management becomes more and more important, so how to control the risk in this area is one of the significant subjects. There are many high-risk customers distributed in china such as company in the coal, coke, chemicals, steel and some other industries. High-risk customer means that it will cause significant personal injury, social impact, or serious environmental pollution accident when it interrupts the power supply. It's unavoidable that the power enterprises have closed link with various high-risk customers. It will generate significant impact on the operation of power enterprise if the government policy, enterprise operation risks and enterprise management risks change. In order to reduce losses to the maximum extent, power enterprise requires a model that can analyze high-risk customers historical data and then based on those data predict the risk level of the future.

Risk management model includes five sequential aspects, they are risk identification, risk measurement, risk warning, risk Prevention and risk assessment. Risk identification should be objective itself, now all the high-risk customer risk level is concluded by experts based on their work experience, this method ignores the role of historical data. That model does not have enough consideration on the uncertain and imprecision of risk. So it will unavoidable lead to some faulty judgments. Additionally, in the current assessment, the weights of all the attributes for the high-risk customer are considered as identical[3]. While

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in the actual scenario, there will be some properties which have less impact on the final risk level. If we remove these redundant attributes, then there will produce a simplify attribute set which will have a positive impact on risk judgment. This paper selects the rough set theory to make up the lack of the risk management theory, because it can remove irrelevant attributes when there aren't any additional information.

2. The rough set theory

Rough set theory is a mathematical tool to deal with the problems which has the feature of uncertain and imprecise. The main contents of rough set include knowledge reduct of information system, approximation space and so on. The advantage of rough set is that it can express either vagueness concept or clear concept.

2.1. Rough set features

The rough set features are as follows:

- We can use it without any additional information.
- Rough set theory is a powerful data analysis tools, it can handle and express incomplete data. It also can obtain minimum expression of information, identify the dependencies between data and get minimum regularity from experience data when the key meaning of information is kept [1].
- Rough set theory can easily combine with other data analysis methods such as fuzzy theory, neural networks and other methods.

2.2. Classic concepts of rough set

Definition 1[4]. $S=(U,A,\{Va\},a)$ is an information system, U: a nonempty, finite set called the universe; A: a nonempty, finite set of attributes; Va is called the domain of $a\in A$; a : an information function $U\to Va$ In a decision table, $Q=\{C\cup D\}$ satisfy $C\cup D=A$, $C\cap D=\Phi$, where C is a set of condition attributes and D is a set of decision attributes.

Definition 2[1]. In decision table, $S=(U,C\cup\{d\})$, $B\subseteq A$, C a set of condition attributes then the indiscernibility is $ind(B,\{d\})=\{(x,y)\in U\times U:d(x)=d(y),orP_a\in B,a(x)=a(y)\}$.

Definition 3[6]. In an Information System $S=(U,A)$, if $B\subseteq A$, $X\subseteq U$, then

$X_{\underline{B}}=\{x\in U\,|\,[x]_{ind(B)}\subseteq X\}$, $X_{\overline{B}}=\{x\in U\,|\,[x]_{ind(B)}\cap X\neq\Phi\}$ is called A-lower approximation of X and A-upper approximation of X $S_{POSB(X)}=X_{\underline{B}}$ $S_{NEGB(X)}=U-X_{\underline{B}}$, $S_{BNB(X)}=X_{\overline{B}}-X_{\underline{B}}$, they respectively represent A-Boundary of X.

2.3. Reduction

Knowledge reduction plays a very important role in intelligence information and data processing, and it is also vital in rough set theory. In general, the information in knowledge base is not always in the same position, even some of the information is unnecessary or we can say they are Redundancy. The purpose of reduct is to delete unnecessary information when keep the classification ability unchanged.

Definition 4. The elements of discernibility matrix of C is defined as follows: