Research on the Matching of Technical Demands and Scientific and Technological Achievements of Electric Power Enterprises

Yujing Gong[a,*], Guangkai Li[b], Sen Zeng[c]

China Southern Power Grid Scientific Research Institute, Guangzhou 510700, China

[a,*] gongyj@csg.cn, [b]ligk@csg.cn, [c]zengsen@csg.cn

*Corresponding Author

Keywords: Technical needs matching, Scientific and technological achievements matching, Domain characteristic words, Boolean models

Abstract: In order to make the technical needs and scientific and technological achievements of power companies match each other, this paper proposes a Boolean model based on the technical requirements of the technical domain index and the scientific and technological achievements, and applies this retrieval model to the technical requirements and scientific and technological achievements matching system. The experiment proves that the matching effect by this method is better.

1. Introduction

With the development of the times, in order to meet the needs of production and development, electric power enterprises have established closer relations with scientific research institutions and accumulated a lot of scientific and technological achievements. However, there are situations such as low conversion rates in the transformation of scientific and technological achievements. Therefore, establishing a sound scientific and technological achievements transformation business process and building a scientific and technological achievements transformation platform for electric power enterprises can solve this problem very well. The most important part of the platform is the matching of technological requirements with scientific and technological achievements.

At present, there are two common retrieval technologies in information retrieval, namely full-text retrieval technology and content-based text retrieval technology [1]. Because the full-text search technology is based on thesaurus or vocabulary search, regardless of text content, it is very likely to match irrelevant information and affect the accuracy of the matching. Therefore, content-based text retrieval has a dominant position in the field of information retrieval. Content-based text retrieval technologies mainly include Boolean models [2], vector space models [3], and probability models [3-5]. Although many domestic and foreign research scholars have done a lot of research on information retrieval, there are few articles on information retrieval and matching of technological needs and scientific and technological achievements of electric power enterprises. Due to the special nature of the electric power industry, special research needs to be done in combination with its industry characteristics.

Based on the above research, this paper uses the feature words in the technical field as matching keywords to construct a Boolean model that matches technical requirements with scientific and technological achievements, and finally applies this method to the matching system.

2. Identification of Technical Needs and Scientific and Technological Achievements

2.1 The Concept of Technical Needs and Technological Achievements

Technology demand as a field of demand refers to the desire or demand for technology (including the form of knowledge and material form) put forward by the system to achieve a specific goal of technological, economic, and social development over a period of time [6].

Scientific and technological achievements refer to achievements that have certain academic

  DOI: 10.25236/edbm.2020.074

significance and practical value through scientific and technological activities [7]. In China, scientific and technological achievements are mainly divided into three categories: applied technological achievements, scientific theoretical achievements, and soft science research achievements.

2.2 Significance of Technological Requirements and Scientific and Technological Achievements Identification of Electric Power Enterprises

In the era of rapid development of science and technology, competition between enterprises is essentially a contest of technological strength. As an important part of infrastructure construction, electric power companies need to have advanced technology. Therefore, the identification of technological requirements and scientific and technological achievements can help enterprises to more quickly and accurately match the scientific and technological achievements that meet their own technological needs, thereby increasing the rate of transformation of scientific and technological achievements and enhancing the comprehensive strength of electric power enterprises.

In the entire process of the transformation of scientific and technological achievements, only when the identification of technological requirements and scientific and technological achievements is established can we use this as a basis to better complete the matching of technological requirements and scientific and technological achievements, thereby promoting the development of scientific and technological achievements transformation. Therefore, the identification of technological requirements and scientific and technological achievements is not only a prerequisite for the transformation of scientific and technological achievements, but also an important cornerstone for effective docking of technology and the market.

2.3 Technological Needs of Power Companies and the Acquisition of Scientific and Technological Achievements

The technical text dictionary of electric power enterprises in this paper is composed of technical field and technical field feature word sets. Domain feature words are the most appropriate words to describe the technical field, and are specialized terms that represent the concepts of the technical field [19]. At the same time, the set of all characteristic words in a technical field is called a technical field characteristic word set, and the domain characteristic word set can represent the characteristics of the entire technical field. This article proposes to use the characteristic words in the technical field as the identification and as a basis for matching. When filling in the technical requirements and scientific and technological achievements information, the following technical field characteristic words need to be filled in for subsequent matching. By consulting the relevant literature [8] and referring to the relevant content of the Polaris Electric Business Commerce section, combined with the characteristics of the power field, some feature word sets of the power industry technology field are given (see Table 1).

Table 1 Three Scheme Comparing

Technical field	Feature word set in technical field
Power generation technology	Thermal power generation, wind power generation, photovoltaic power generation, nuclear power generation, distributed energy power generation, boilers, steam turbines, gas turbines, generators, anemometers, blades, towers, towers, arresters, photovoltaic inverters, solar counter current boxes, photovoltaics Controller, photovoltaic support, ventilation equipment, steam generator, pressure vessel, garbage power generation, gas power generation, biomass energy, combined heat and power, geological energy, ocean energy
Power transmission	DC transmission, AC transmission, substations, generators, converter valves, transformers, bypass switches, transfer switches, filters, arresters, reactive power compensation equipment, control and protection devices, telecontrol communication equipment, insulators, transformers, disconnectors , Circuit breakers, capacitors, bushings, wave arrestors, reactors, relay protection devices
Distribution technology	High-voltage distribution cabinets, generators, transformers, power lines, circuit breakers, low-voltage switch cabinets, switchboards, switch boxes, control boxes
Big grid	Island detection equipment, grid-connected controller, protection measurement and control

	equipment, micro power controller energy storage device, power quality compensation equipment
Operation and Maintenance	Inspection operations, experimental equipment, maintenance equipment, live work, insulator testing, ground resistivity, soil resistivity, pole tower maintenance equipment, put-on, tight-line equipment, metal processing equipment, fixtures, insulation tools, tackles, operation lever connection tools

3. Matching Model of Technological Requirements and Scientific and Technological Achievements

3.1 Fundamental

The basic principle of content-based text retrieval technology is to match the intersection of the set of texts to be queried with the set of documents being searched according to the content of the document, and return the query results according to the matching situation. The models of content-based text retrieval technology mainly include Boolean model, space vector model and probability model. Because this paper mainly proposes ideas and methods for matching the technical needs and scientific and technological achievements of electric power enterprises, in this particular context, this article uses a Boolean model as the matching model of technical requirements and scientific and technological achievements of electric power enterprises.

Boolean model is a simple, efficient and frequently used matching model. It defines a binary variable as a feature item in the document to represent the document. These variables are generally composed of terms [9]. When querying, multiple index terms are connected by the connection terms and (), or (), not ().

3.2 Boolean Model of Technological Requirements Matching Technological Achievements

When using technological requirements to match scientific and technological achievements, suppose that there are n scientific and technological achievements in the scientific and technological achievement database X, then the set of feature words in the i technological field is X_{i}, where $1 < i < n$, then X_{i} can be expressed as:

$$X_i = \left(x_{i1}, x_{i2}, \ldots, x_{im}\right)$$

In the formula, x_{im} is a technical domain characteristic word of the technological achievement, and m is the number of domain characteristic words. In addition, if the set of domain feature words for the technical requirements proposed by the power company is Y_j, then Y_j can be expressed as:

$$Y_j = \left(y_{j1}, y_{j2}, \cdots, y_{jn}\right)$$

Among them, y_{jn} is a characteristic word in the technical field of the technical requirement, so the technical requirement retrieval formula is as follows:

$$Z_k = \left(y_{j1} \wedge X_1\right) \vee \left(y_{j1} \wedge X_2\right) \vee \cdots \vee \left(y_{j1} \wedge X_n\right) \vee \left(y_{j2} \wedge X_1\right) \vee \cdots \vee \left(y_{in} \wedge X_n\right)$$

The Boolean model believes that feature words can only appear in two situations in scientific and technological achievements Y_m: presence and absence. Therefore, the weight variable of the feature words is set to a binary value (0,1). If the technical feature domain feature word is the same as the technical feature domain feature set X_{i}, the technical domain feature words are assigned 1; otherwise, 0 is assigned; the corresponding scientific and technological achievements with a value of 1 are finally output. The specific model is shown in Figure 1.

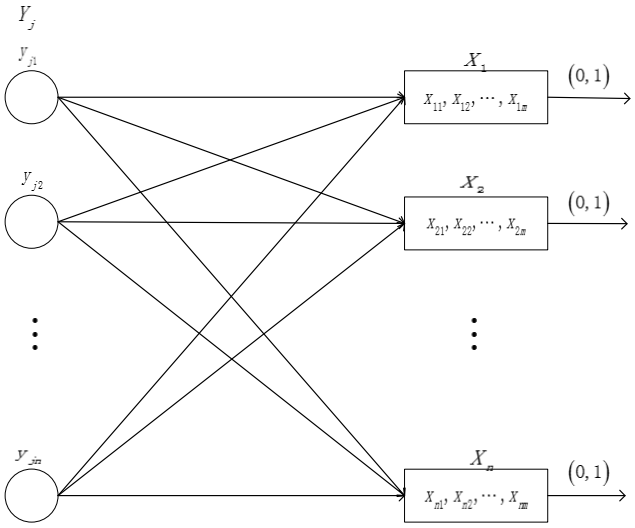

Fig.1 Boolean Model of Technological Requirements Matching Technological Achievements

4. Conclusion

In this paper, the feature words in the technical field are taken as the key to the matching of technological requirements and scientific and technological achievements. By constructing a Boolean model of matching technological requirements and scientific and technological achievements, the mutual matching of technological requirements and scientific and technological achievements is finally achieved. Experiments prove that the method has good matching effect and fast matching speed when applied to the matching system. However, with the continuous development of the power industry, the technical field feature words in the system should also be constantly updated and transformed, which is also the direction for our next research and improvement.

Acknowledgment

Science and technology project of China Southern Power Grid Co., Ltd. (zbkjxm20180038).

References

[1] Tao Zou, Jicheng Wang, Wenqing Yang,et al.Text Information Retrieval Technology . Computer Science. (1999) No. 9, p.72-75.

[2] Salton G , Fox E A , Wu H . Extended Boolean information retrieval. Communications of the ACM, Nov. (1983)No. 26, p.1022-1036.

[3] Jianfeng Pang, Dongbo Bu, Shuo.Research Bai.Research and Implementation of Automatic Text Classification System Based on Vector Space Model.Application Research of Computers. (2001)No. 26, p. 23-26.

[4] Nick Reid J , Katz A N . Vector Space Applications in Metaphor Comprehension. Metaphor and Symbol. (2018),p.1-15.

[5] Costello F , Watts P , Fisher C . Surprising rationality in probability judgment: Assessing two competing models. Cognition. (2018),p.280-297.

[6] Zhai C , Lafferty J . A study of smoothing methods for language models applied to information retrieval. ACM Transactions on Information Systems. (2004) No. 22, p.179-214.

[7] Harrag F . Text mining approach for knowledge extraction in Sahîh Al-Bukhari. Computers in Human Behavior. (2014) No. 30, p. 558-566.

[8] Juan Yu, Yanzhong Dang. Research on Extraction Method of Domain Feature Words. Journal of Information. (2009)No. 9, p. 368-373

[9] Hongquan Liu, Liangfeng Zhang. Analysis of Boolean Logic Retrieval Model.Modern Information. (2004)No. 9, p. 4-6.