


HanLP-Based Technology Function Matrix Construction on Chinese Process Patents

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ABSTRACT

The technology/function matrix is an essential method of patent analysis. This paper presents a semi-automated methodology to create technology/function matrix for Chinese process patents in any given domain. The approach adopts computer-aided algorithms in the process of extracting technology words, extracting function words, and generating technology/function matrix. The purpose of this paper is to increase the efficiency of building technology/function matrix and reduce the cost of manpower and time. The Chinese process patents in the domain of robot path planning art taken as an example to verify the methodology.

KEYWORDS

Bubble Graph, Chinese Process Patents, Data Mining, HanLP, Patent Analysis, Robot Path Planning, Technology/Function Matrix, Visualization

1. INTRODUCTION

The purpose of patent analysis is to provide reference to the decision-making in the development of technology, products and services (Kim G, 2017; Kim D et al., 2018). The process of patent analysis is to analyze, process and combine a large amount of unstructured information on patent documents, and use statistical methods to get valuable technical information (e.g identification of technological opportunities, technology trends, etc.) (Yoon J, 2017; Sampaio, P. G. V. et al., 2018; Moehrle, M. G. et al., 2019). The technologies of data mining (discriminant analysis, rule induction, visualization technology, etc.) are introduced into patent analysis to liberate people from the monotonous and boring work of reading patent documents, enhance the efficiency and accuracy of analysis (Lee, J. H. et al., 2018; Kim, J. M. et al., 2019; Son, C, 2018). Patent analysis also belongs to Knowledge Discovery in Databases. In the process of patent analysis, a variety of types of knowledge and expertise are needed (Zemmouri, E. M. et al., 2012). The results of patent analysis can show the hidden relations and laws in patent documents by means of graphical means in multimedia technology, which makes it easier for researchers to understand and make decisions based on them.

The technology/function matrix is a commonly eminent method of patent analysis. The technology/function matrix is usually posted in the form of bubble graph. In the bubble graph, the x

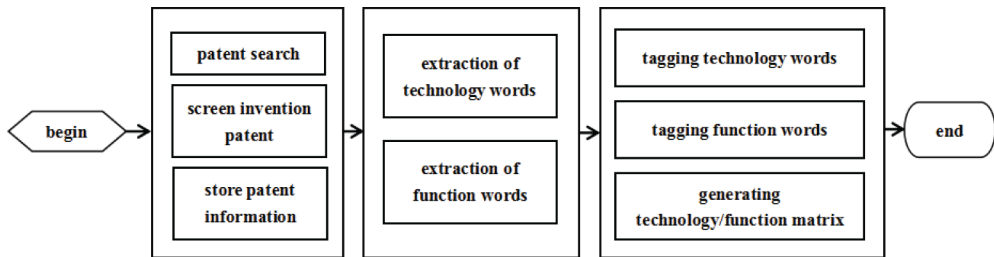
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axis represents a function, the y axis represents technology, the bubble size represents the quantity of patents. The cross point having no bubble may be a technology gap in a given domain. The technical/function matrix can help managers, researchers and engineers take a decision on the technological development in a given domain.

The construction process flow of technology/function matrix is depicted in Figure 1.

Figure 1. Construction process of technology/function Matrix



The general process of creating a technical/function matrix consist of three steps:

- The first step consists of three processes: searching for invention patents in a given domain by keyword, screening invention patents, storing information about invention patents;
- The second step include two processes: extracting technology words of the process patents and literature review in the given domain, extracting function words of the process patents;
- The third step is composed of three processes: tagging technology words of invention patents, tagging function words of invention patents, generating the technology/function matrix.

In the general process of creating a technical/function matrix, it goes to get a lot of time to extract technology words and function words. The abstract of invention patents needs to be analyzed manually in order to tag the technology words and function words used in the process patent.

2. RELATED WORK

Hu Juxiang proposed a method of extracting technology/function phrases from patents by synthetically considering the structure, clue words, syntax and grammar analysis of the patent document. The method can increase the accuracy of extracting technical/functional phrases (Hu, J. X. et al., 2016). Due to the lack of technical keywords in the patent, Han Hongqi proposed patent technology words extraction process model based on the C value method, which modified the formation rules of the term and the formula for calculating the degree of terminology. The process model realizes the extraction of technology words (Han, H. Q. et al., 2011). Chen Ying proposed an extraction method of technology words and function words based on three characteristic factors of patents: patent structure, grammar and clue words (Ying, C. et al., 2011; Ying, C. et al., 2012). Taking “carbon nanotube technology” as an example, Tseng Y H proved that the machine extracted the feature words with clear classification can achieve the similar effect with artificial index, which provides a theoretical basis for the application of text mining in patent maps making (Tseng, Y. H. et al., 2007). Built on ontology technology and text mining technology, Lu Jiawei proposed a semi-automatic construction method of technology/function matrix and took MOCVD technology as an example to verify (LU, J. W. et al., 2018). Built on the hidden Markov model, Zhang Bopei proposed a function words recognition method from patents. This method first selects candidate functional words with lexical and syntactic analysis, and

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