

Identifying Key Technology Convergence Based on Complex Network and Sentiment Analysis

Technology convergence defined as a breakthrough which combines at least two or more existing technologies into hybrid technologies is currently a dominant trend in many areas (Curran et al., 2010). Technology convergence is one of the important sources of innovation and it creates synergies between technologies and further reshaping industry structures and competition rules (Hacklin, 2007). The identification of key technology convergence can not only enable researchers in related fields to quickly grasp the development of technology, but also help enterprises to develop technology strategies, improve independent innovation capabilities, and at the same time enrich and develop technology convergence analysis theory and method. It is of great significance to identifying key technology convergence.

Previous studies have mostly identified the technology convergence through the citation relationship between patents (Kose et al.,2018), but a large part of the references in the patents are based on the enumeration of prior technology, and may not represent the use and combination of previous patents. Therefore, this paper identifies the convergence of technical fields through the co-occurrence IPC of patents. In addition, there have been many studies to analyze the technical convergence in different fields (Song et al.,2017), but it has not been further refined to understand the specific convergence of technical topics. Therefore, this paper further identifies key technology convergence from the technical topic level, so that researchers in the relevant technical fields can have a more detailed understanding of the technology convergence.

This paper combines network analysis and semantic analysis, and takes the patent information of related fields as the data. Firstly, the keywords in the patent title and abstract are extracted and selected to form the technical dictionary. The machine learning method is used to do sentiment analysis on the abstract sentences containing

the topics. After that we obtain the convergence relationship between the themes, which is convergence recognition at the technical topic level. Then, through co-occurrence analysis of IPC of the same patent, we recognize the convergence in the technical field. Finally, based on the convergence relationship obtained from the first two steps, we establish a convergence network of technical topics and technical fields respectively, and through the relationship between the keyword-patent-IPC, the relationship between the two networks is constructed to form a two-layer network of “technical field-technical theme”. We evaluate the convergence between technologies through the topological indicators in complex network theory, the key technology convergence is identified in the end.

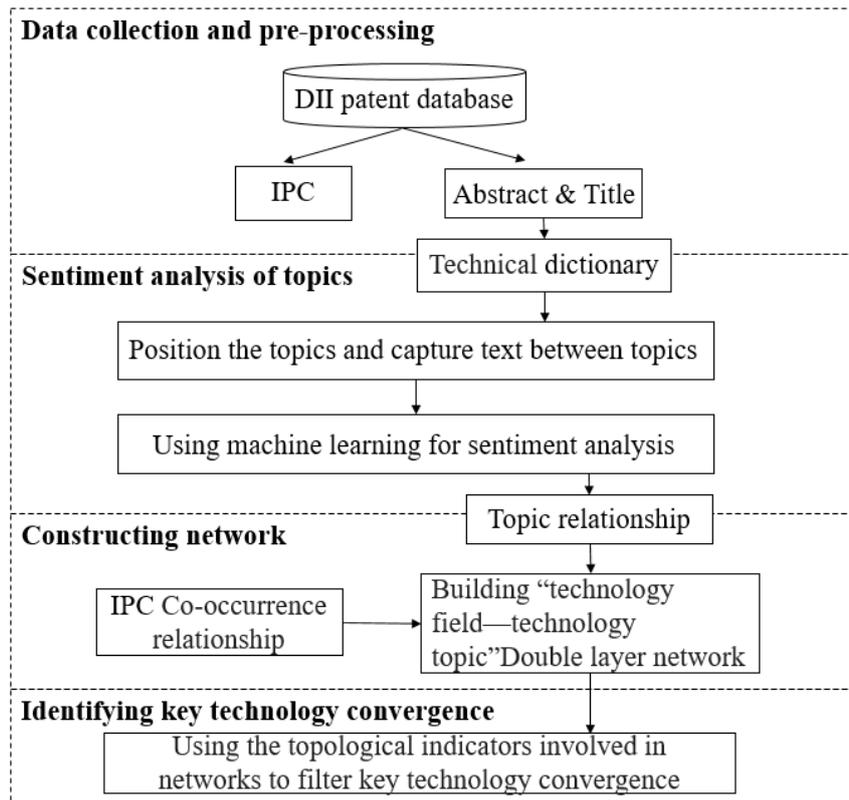


Fig.1 Research framework

Keywords: technology convergence; complex network; sentiment analysis

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