

Monitoring and Forecasting the Development Trends of Emerging Technologies Using Text Mining and Citation Analysis: The Case of Nanogenerator Technology

Abstract: Monitoring and forecasting the development trends of emerging technology is crucial for government strategic planning, social investment and enterprise practices. Researchers usually use academic papers or patents data and apply citation analysis to identify the technology evolution paths and development trends. The time lag of citation analysis makes the citation analysis results incomplete and cannot fully explain the evolution path of technology. With the development of computer technology, text mining plays an increasingly important role in exploring the development trends of technology. Therefore, this paper proposes a framework that uses academic papers and patents as data resources and integrates the text mining and citation analysis to monitoring the evolutionary path of emerging technologies and forecasting the changing trends of these emerging technologies. The nanogenerator technology is selected as a case study. In this case, firstly, we apply citation analysis to monitoring the basic evolutionary path of nanogenerator technology. Secondly, we apply Hierarchical Dirichlet Process (HDP) model, which is a kind of text mining method to extract the technical topics appearing in academic papers, and we analyze a comparison of the results of citation analysis to improve the technological evolution path in the past few years that is missing due to the time lag of citation analysis. Finally, considering the gaps between academic papers and patents, we also apply the HDP model to extract the technical topics appearing in patents in the past few years, and based on the technical evolution path, we analyze a targeted comparison of the technical topics in academic papers in the corresponding years, so as to forecasting the development trends of the nanogenerator technology patents in each evolution path. This paper contributes to our understanding of how technologies emerge and develop, as well as the technology forecasting methodology, and will be of interest to nanogenerator technology R&D experts.

Keywords: Emerging technologies; Technology trends; Text mining; Citation analysis; Nanogenerator technology