Identifying Core Patents by Citations, Bibliographic Coupling and Co-citation

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Introduction

Core patents are patents which can generate the most impact, and thus the most important, in a certain technological field. Identifying core patents is crucial to grasp and trace the technology development trend. The objective of this research therefore focuses on developing new methodologies in order to evaluate the importance of a patent and thus identify core patents. There are various approaches used to evaluate patent importance, in which this research chose patent citation network (PCN) analysis because a patent's citations can be considered endorsement to its importance, which, usually, is approximated by the number of times a patent is cited (Albert et al., 1991; Narin, 1994; Harhoff et al., 1999; Trajtenberg et al., 1997; Wartburg et al., 2005; Atallah and Rodriguez, 2006). Trajtenberg et al. (1997) measured the importance of a patent by counting both its number of direct citations and their respective number of direct citations with a discounted factor. Atallah and Rodriguez (2006) summed up all its direct and indirect citations with a weight mechanism to estimate the importance of a patent, assuming higher-ordered indirect citations contribute less to the importance of a patent. However, the discounted factor and the weight mechanism both had some fallacies. Additionally, not all direct citations are relevant to a patent (Akers, 2000; Wartburg et al., 2005), thereby causing incorrect evaluation of its importance. To estimate patent importance more accurately, a direct citation's relevance should be verified before being taken into consideration. On the other hand, bibliographic coupling (BC) and co-citation (CC) are commonly used to identify relevant documents via direct citations as BC strength and CC strength represent the extent of the correlation between documents (Kessler, 1963; Small, 1973).

Methodology

In this study, therefore, a PCN is first filtered where a direct citation linking two patents is excluded as lack of relevance if the two patents do not meet a BC threshold or a CC threshold. The BC and CC thresholds are determined respectively as the mean BC strength of BC pairs without direct citation and the mean CC strength of CC pairs without direct citation. An extracted patent citation network (EPCN) is thereby established by the foregoing filtering. Additionally, a link is supplemented between two patents without direct citation in the PCN if the two patents do meet a second BC

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threshold or a second CC threshold. The second BC and CC thresholds are determined respectively as the mean BC strength of BC pairs with direct citation and the mean CC strength of CC pairs with direct citation.

The importance of a patent then can be approximated by counting its direct and indirect citations in the EPCN, or by counting its direct and indirect citations/links in the supplemented EPCN. Alternatively, a weight mechanism can be used to incorporate indirect citations by modifying the models elaborated by Trajtenberg et al. (1997) and Atallah and Rodriguez (2006) respectively. A case study is conducted using granted patents in a specific technology field retrieved from United States Patent and Trademark Office (USPTO) to demonstrate the feasibility of the research methodology.

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