

Research Fronts and New Applications of RFID Technology

A Bibliometric Analysis of the Research Literature

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Abstract

The master thesis presents an analysis of the research literature about radio-frequency identification (RFID). It consists of a theoretical part and a practical part. The theoretical part explains the technology behind RFID and shows the existing application spectrum of this diverse and prominent technology. It also discusses the norms and standards in this area. Furthermore the theoretical part contains a short introduction into scientometrics which is the basis for the following analysis.

The practical part represents the analysis, which was conducted with the bibliometric visualisation software Bibliometric Technology Monitoring (BibTechMon). With this software knowledge inherent in the analysed data can be discovered. BibTechMon was developed at the Austrian Institute of Technology (AIT) which was also a cooperation partner of this master thesis. For this analysis 8,994 bibliographic records have been analysed. The data was retrieved from “Web of Science”. In the main part of the thesis the research fronts of RFID technology are identified and on this basis future application domains are derived.

Keywords: RFID, Bibliometrics, Science mapping, Visualization, Research front

In: F. Pehar/C. Schlögl/C. Wolff (Eds.). Re:inventing Information Science in the Networked Society. Proceedings of the 14th International Symposium on Information Science (ISI 2015), Zadar, Croatia, 19th–21st May 2015. Glückstadt: Verlag Werner Hülsbusch, pp. 557–561.

1 Introduction

RFID is a hot topic within the technological sector, however the status of research and future application domains are not fully clear. RFID is highly discussed within sciences so that a lot of articles have been published. In this work it is being tried to give an overview about the current status of research. Furthermore the research fronts are presented and future perspectives of application are derived. In particular the following research questions are addressed:

- Which scientific disciplines have the articles been attributed?
- Which scientists are publishing most papers?
- Which organisations are conducting most research on this topic?
- Which are the most promising RFID application domains?

2 Methods and data sources

The data is being retrieved from “Web of Science”. All citation databases of “Web of Science” have been used. In total 8.994 records were analysed. These data have been imported to BibTechMon which generates graphs, so called networks using co-occurrences. BibTechMon is based on the bibliometric method of co-word analysis which uses co-frequencies of words. This method can be used for processing, structuring and visualisation of huge sets of data (Noll et al. 2001). Technically this software generates an index number based on the co-frequencies. The index numbers again get processed into a graph. One of these indices is the Jaccard-Index which generates the co-frequency of two words (c_{ij}) related to the absolute occurrence (c_i and c_j) (Rip & Courtial 1984).

3 Results

The above mentioned research questions have been answered by analysing the visualisations generated by BibTechMon. The first question discusses to which scientific disciplines the articles have been attributed. For this purpose the distribution of the articles of “Web of Science” subject categories has been analysed as shown in figure 1. Hereby the size of the nodes indicates the amount of the publications in each subject category. The distance between two nodes indicates how closely two subject categories are related to each other.

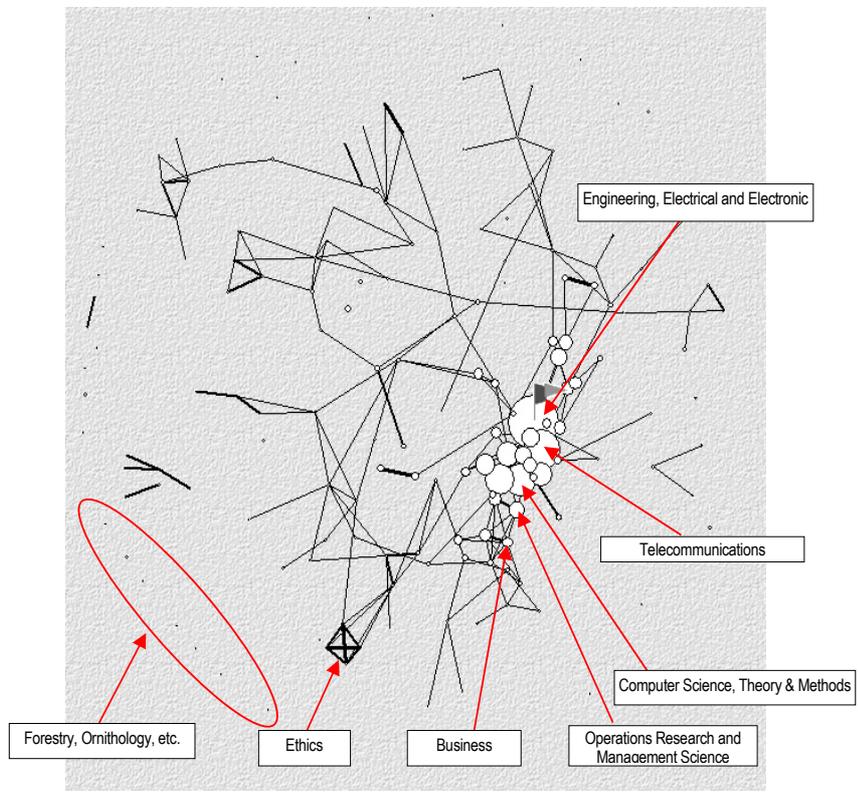


Figure 1. Science disciplines (n = 8,994)

The next research question is dedicated to the authors. The authors are ranked by the amount of their publications in order to identify the scientists with the highest research output. The networking activities of the scientists are displayed in a separate graph.

In addition to the authors the organisations (e.g. universities) are addressed in an own research question. Furthermore the Austrian organisations are analysed in more depth. Hereby there is a focus on Styria which is a kind of “RFID-Mecca” (SFG, 2015) in Austria.

The last research question deals with the research fronts. Research fronts are topics which are in favour of the current research interest. Technically articles with similar references are getting clustered and ranked by the amount of citations. This is a technique known as bibliographic coupling which was introduced by M. Kessler (1963). The research fronts are presented in a 3D-graph which is shown in figure 2.

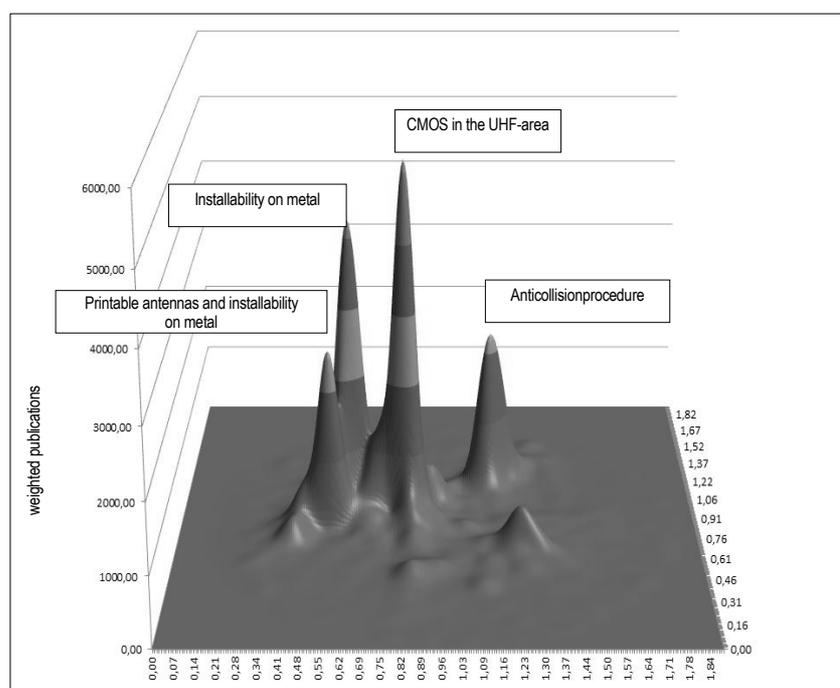


Figure 2. Research fronts as a 3D-Graph (n = 8,994)

The peaks in figure 2 represent the most significant research fronts. Hereby the height of the peak represents the publications weighted with the amount and the Jaccard-Index of the bibliographic coupled publications. The distance of the peaks shows the proximity of the content. Prominent topics within the research fronts are authentication, anticollision-protocols, and antenna design.

4 Limitations

Typical for such an analysis is that the quality of the results depends on the quality of the data, hence different data yield to different results. To show this sensitivity an analysis by omitting databases (proceedings) within “Web of Science” is being presented to show differences in the result.

Acknowledgments

I would like to thank Mr. Edgar Schiebel from the Austrian Institute of Technology (AIT) who assisted me in conducting the analyses by means of BibTechMon which was developed by him at the AIT.

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