Discovering Emerging Technology Trends: With TRIZ and Technology Roadmapping

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Introduction

Profiling historical development patterns for a Newly Emerging Science & Technology (NEST) helps understand key technological system components, current R&D emphases, and key players. Bibliometrics and text mining contribute strongly to such analyses. More challenging is to extend such analyses to anticipate likely future developmental paths and prospects for a NEST under study.

Over the past year, we have focused on "Term Clumping" steps, which emphasize the efforts to clean and consolidate rich sets of topical phrases and terms in a collection of Science, Technology and Innovation (ST&I) documents relating to a topic of interest. We applied these "Term Clumping" steps to the Dye-Sensitized Solar Cells (DSSCs) dataset, and consolidated the ~90,000 phrases and terms, retrieved by Natural Language Processing (NLP), to 8,000 topical factors, and then clustered a select subset into 11 clusters.[1] Also, we are combining qualitative and quantitative methodologies to compose a Technology Roadmap Model (TRM), a useful instrument to indicate technology development trends in a visual way.[2] In this instance, engaging these topical factors into our TRM study provides a good challenge. We also pursue topical analyses to identify technological development trends.

TRIZ suggests concepts can be translated into topics and actions (verbs) to be mined. In this paper, based on bibliometric and text mining techniques, we introduce TRIZ as an important tool to connect the topical factors after "Term Clumping" steps with TRM. The prospect is that TRIZ conceptualizations may help identify system components and to track evolving problem solutions by text analyses (e.g., "extract nearby phrases").

Data and Methods

We have been addressing DSSC data deriving from a multi-step Boolean search algorithm adapted and applied via search interfaces to two leading, global ST&I databases – the Science Citation Index Expanded of Web of Science (WoS) and EI Compendex. The resulting abstract record sets were merged in VantagePoint, [3] with duplicate records consolidated. [4] The resulting 5784 publication abstracts and titles

cover the time span of 2001 (the inception of DCCS research occurred in 1991[5]) through 2011 (not complete for this last year), and the focus of the present analyses is the 8038 topical factors after the "Term Clumping" steps, [1] especially, the top 1000 terms and phrases.

The framework of our topical analyses with TRIZ and TRM is shown in Figure 1. The target is to inform technology management and policy.
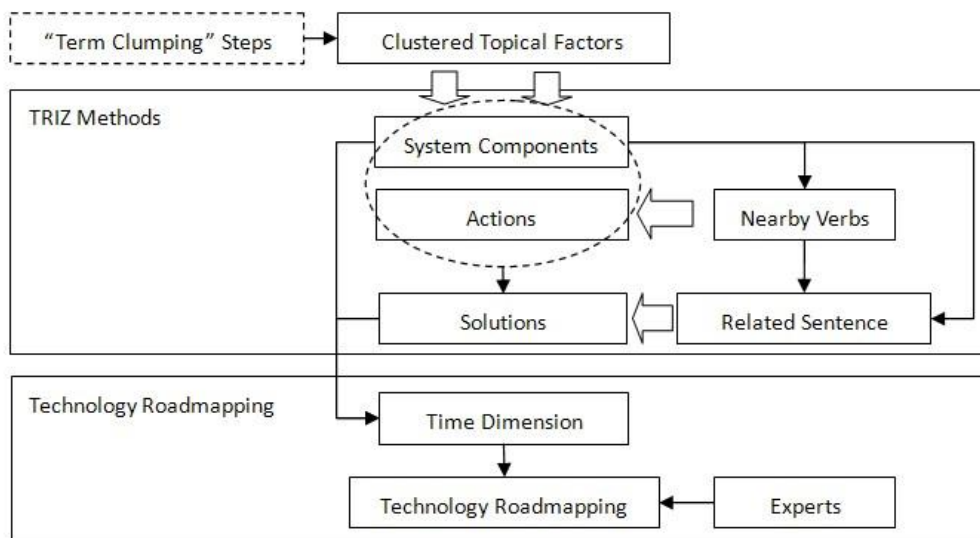

Figure 1 Framework for Topical Analyses with TRIZ and TRM

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