Streamlining Knowledge Map Construction for an Online Auction House Using Automatic Term Filtering

Shailaja Venkatsubramanyan, San Jose State University, USA

ABSTRACT

Organizations are building automated technical support software that can help both consumers and field support engineers with problem resolution. The goal of the automated technical support system is reducing operational cost and increasing customer satisfaction. This paper examines the set of challenges that knowledge engineers face in building automated technical support software. This paper uses a technical services engagement with a major online auction house with tens of millions of users to highlight the challenges and present an automated knowledge map generation technique. The objective of this automated technique was to improve the quality of expressions extracted from documents, which would reduce the burden on knowledge engineers to construct knowledge maps. The technique was run on large corpora of documents in the online auction house and found a significant increase in the quality of the knowledge map. Further experimentation showed that the technique works well for other domains as well.

Keywords: Knowledge Engineering, Knowledge Maps, Ontologies, Term Extraction, Term Filtering

1. INTRODUCTION

Technical support is a critical part of any organization focusing on advanced technology. The deployment and operation of such advanced technologies in both business and consumer fields invariably results in problematic issues that need to be resolved in an efficient and timely manner. As a result, organizations are building automated technical support software that can help both consumers and field support engineers with problem resolution, the goal being to reduce operational cost and increase customer satisfaction (Cui, 2006). These support software are typically built on top of a knowledge map or an ontology and use a search-like interface to guide the user of the software towards the resolution of the problem. The advantage of using the software is that customers may be able to resolve their technical issues without calling service personnel. Alternatively, service personnel at phone-in help desks can...
use support software to access knowledge required to resolve customer issues in a more structured manner.

There are significant challenges in building automated technical support software in the advanced technology domain. First, the concepts and activities in these domains (both hardware and software) have complex physical and logical relationships peculiar to products. Such concepts are typically hard to manually translate to any knowledge management format. In fact, one key complaint of organizations deploying a technical support solution is the time and personnel cost of trying to embody the complexities of the state of the art into a machine-readable format (Van Elst & Abecker, 2002). Second, the technology in advanced technology domains is continually evolving primarily due to the need for product differentiation (Sherif, 2005). This hampers the ability of subject matter experts to come up with a common set of concepts and activities to describe the domain that is comprehensible to the user. As the standardization process for such highly evolving fields lag behind the latest developments, different vendors use conflicting terminology that may need to be resolved while trying to navigate to the root cause of a problem. Finally, any completely manual process in the construction of a knowledge map is tedious, time-consuming and prone to errors (Maedsche, 2001). As the quality of the knowledge map (defined with respect to the number of terms that are useful in problem resolution) is critical to the problem resolution process, reducing the cost of labor to build a knowledge map is typically not a viable option.

This paper uses a technical services engagement with a major online auction house having tens of millions of users in order to highlight the importance of the issues discussed above and present an automated knowledge map generation technique that is aimed at resolving the issues involved in building technical support software. The technique uses an existing set of product literature as input and builds a knowledge map by parsing the documents. The use of automation greatly reduces the manual cost of as well as the errors involved in generating a high-quality knowledge map, though the challenge in the automation process is to increase the quality of the map to the largest extent possible.

The objective of this research was to improve the quality of expressions extracted from documents. This, in turn, would reduce the burden on knowledge engineers or ontologists who use the terms to construct knowledge maps or ontologies. The algorithm was run on a large corpora of documents in the online auction house, and found that the percentage of useful terms increased significantly. Furthermore, the results of this algorithm were replicated in other domains as well. Overall, this also resulted in a reduction in the number of person-weeks required to create a knowledge map.

2. KNOWLEDGE MANAGEMENT APPROACH

To build a technical support approach, one of the tasks to be achieved is to organize the content in a structured manner. The following are the four basic steps: (i) creating taxonomies using a process known as knowledge engineering, (ii) building classification models, (iii) populating taxonomies with documents, and (iv) deploying populated taxonomies in enterprise portals (Chung, 1999). This section defines a knowledge map, a typical user interaction with the technical support solution that uses the knowledge map, and the process usually undertaken in order to construct the knowledge map. The knowledge map construction can be viewed as a process that involves the knowledge engineer, subject matter experts, technical support documentation and software tools for phrase extraction and document classification. On the other hand, the user interaction is a service provided to the end users who need technical support for issues faced by these users. This service requires a user interface, a backend knowledge management system, and a feedback system that evaluates the quality of the service. For the purpose of this paper, we focus on the knowledge management system in the service.
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