Chapter 4

A Novel Matching Algorithm for Shopbot Agents acting in Marketplaces

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ABSTRACT

During the last years, the emergence of Semantic Web has produced a vast amount of resources and a variety of content representation schemes. The latter has increased the complexity that the users are facing when searching for information in open environments. A representative example is Electronic Markets (EMs). In EMs users try to find and purchase products through interactions with providers. In such scenarios, shopbots can offer a number of advantages. Shopbots are agents that help users to find the products they want, saving them a lot of time and effort. However, building efficient shopbots is a challenging task. This is more imperative when shopbots interact with providers using different ontological terms for product description. In this chapter, the authors propose a generic ontology to describe products in EMs. They also introduce a matching algorithm that maps the specific provider ontology to the generic one in order to be used by a shopbot. Their algorithm, called $S^+$, is based on a set of linguistic and semantic matching techniques. The authors present their approach and compare it with other proposed algorithms. Finally, they discuss their experimental results that reveal the performance of their methodology.

INTRODUCTION

The rapid development of the Web and the Semantic Web leads to a huge amount of resources as well as of content representation schemes. Hence, one can find numerous information sources and among them a large number of electronic stores. However, there is a lot of information describing these products that is very difficult for customers to retrieve it. Users should search and find the appropriate products that best match to their needs. As we understand this task is out of the human
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limitations. The number of choices for users has grown and for this they need an efficient tool that can help them in finding the appropriate products.

For this reason, autonomous entities were proposed for being responsible to find and return the appropriate products in the smallest amount of time. Such entities can be represented by intelligent agents. These entities can interact in an autonomous way in Electronic Markets (EMs). In such places, the discussed software components can negotiate and agree upon the exchange of products. Entities acting in EMs can represent buyers, sellers or can be other administrative entities helping buyers and sellers to conclude their transactions. An important category of such middle entities is shopbots. Shopbots (Shopping Robots) are agents that can operate online and help users to find and decide which products should buy. A shopbot gets the users preferences and accordingly returns information relevant to products and the characteristics that match the user needs. Shopbots enhance users shopping experiences as they collect product information from a large number of sellers. Hence, users have the opportunity to compare products characteristics. Furthermore, the product list provided by shopbots is in such form that best matches the user preferences. This way, users save time and effort.

In addition, agents are able to search products lists faster than a human and choose products for user desires. The Semantic Web (SW) consists of the extension of the Web providing semantics for the information representation in order to provide a machine understandable view on the information. This way, machines are able to understand information in order to fulfill owners’ requests. Ontologies, the basic component of the SW, help along this line. They facilitate the interoperability of heterogeneous information sources by providing a formalization that makes them machine accessible. Ontologies are the key for the emergence of the SW. They carry knowledge and information for reasoning.

From the above, we can understand that the combination of autonomous intelligent components with ontologies can enhance the way that the information is provided to users. Products can be described by ontological means and, thus, can be processed more efficiently by agents. However, different developers use different ways to create ontologies because they have different view on various domains. Hence, we need two main things:

- An ontology that can be used by a shopbot in order to store the products information. This ontology should be as generic as it can be in order to provide an upper level of abstraction for all the other possible ontologies. Hence, the shopbot should be able to provide to users a uniform view on all the presented products.
- A matching algorithm that will result the information retrieved by all the sub-ontologies and will be stored to the generic product ontology. However, the proposed algorithms in this domain cannot give us good results because they are not designed for the specific scenario.

In this chapter, we propose a generic product ontology and we describe the S+ algorithm. S+ is designed for the specific scenario. The paper is organized as follows. In prior work section, we discuss about the related work in the specific domain. In research challenge section, we present the most important research efforts for the shopbot scenario. Accordingly, in shopbot architecture section, we describe the shopbot behavior concerning its actions in an EM environment. In addition, we present our product ontology which is designed to cover the most important information about a product. This information is necessary to provide the necessary knowledge to users in order to be able to decide the appropriate product. In matching algorithm section, we present the S+, our matching algorithm, and give the most important parts of