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Integrating semantic Web services ranking mechanisms using a common preference model

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ABSTRACT

Service ranking has been long-acknowledged to play a fundamental role in helping users to select the best offerings among services retrieved from a search request. There exist many ranking mechanisms, each one providing *ad hoc* preference models that offer different levels of expressiveness. Consequently, applying a single mechanism to a particular scenario constrains the user to define preferences based on that mechanism's facilities. Furthermore, a more flexible solution that uses several independent mechanisms will face interoperability issues because of the differences between preference models provided by each ranking mechanism. In order to overcome these issues, we propose a Preference-based Universal Ranking Integration (PURI) framework that enables the combination of several ranking mechanisms using a common, holistic preference model. Using PURI, different ranking mechanisms are seamlessly and transparently integrated, offering a single façade to define preferences using highly expressive facilities that are not only decoupled from the concrete mechanisms that perform the ranking process, but also allow to exploit synergies from the combination of integrated mechanisms. We also thoroughly present a particular application scenario in the SOA4All EU project and evaluate the benefits and applicability of PURI in further domains.

1. Introduction

Service oriented computing [1] has brought a paradigm shift where complex applications are now built upon software components – services – that can be reached over the Internet. Although most services are exploited within large corporations nowadays, the number of publicly available services is envisioned to increase in the future [2]. Precisely, the combination of service oriented computing and semantic technologies, which is known as Semantic Web Services (SWS), provides tools to properly manage that amount of available knowledge [3]. Service retrieval is a key process in this vision, where SWS offerings are retrieved from repositories with respect to a concrete user request [4].

In this current scenario, where service repositories are being actively developed [5,6] in order to cope with the growth in the number of services, ranking mechanisms have been long-acknowledged to be required for the selection of the best retrieved offerings with respect to certain user-defined preferences. Although there exist several approaches on SWS ranking, there is a lack of a generic and flexible preference model that offers a comprehensive collection of facilities to define user preferences related to the services to be selected. In turn, each ranking mechanism provides an *ad hoc* preference model that constrains the expressiveness of user preferences, which are tightly coupled with the underlying ranking mechanism applied.

However, in order to allow the expression of complex preferences for end users, they should be provided with more flexibility to define preferences, so a service retrieval and ranking system may integrate several ranking mechanisms, providing a higher number of facilities to state user preferences. Nevertheless, interoperability issues between preference models may appear, as they cannot be easily combined, and potential synergies may remain unexploited.

In this article, we present a preference-based ranking integration framework named PURI, which provides a solution to previously identified issues. Our integrated ranking solution gives both developers and end users control on how the ranking process should be performed, because user-specified preferences can combine every facility that the integrated ranking mechanisms provide, seamlessly integrating them and making the most of each ranking approach, according to the user's particular needs. The main contributions of our proposed integrated ranking solution can be summarized in the following four key features:

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