Chapter III
Personalization Based on Semantic Web Technologies

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ABSTRACT

Personalization techniques provide optimized access to content and services, based on the preferences and the characteristics of each individual user. Nowadays many applications, either Web-based or not, call for personalized behavior. Obviously, such behavior leads to an increased demand for knowledge management, since personalization is based on user profiles, user preferences, usage policies, and other knowledge components. The main topic of this chapter is the investigation of how well Semantic Web technologies apply to personalized applications. Semantic Web is a relatively new platform for developing (distributed) knowledge-based applications that has gained great popularity in previous years. Hence, this chapter surveys the most prominent techniques for personalization in the context of the Semantic Web. It discusses and compares different approaches to architectural and engineering techniques and other issues relevant to this hot topic. The chapter provides foundational knowledge on this topic, as well as discussion on some key implementation issues.
INTRODUCTION

Nowadays we witness a shift in many computing paradigms. Firstly, the Web is evolving from a Web of documents, and content in general, to a Web of applications and services. The so-called Web 2.0 has paved the way for social networking through many innovative applications. Moreover, the vision of Semantic Web (SW) has been realized to a certain degree and has produced many modern and useful tools\(^1\) for knowledge engineering and management.

On the other hand, all application domains, either Web-based or not, call for advanced user experience. The human has come to the center of the computing environments (i.e., human-centered computing) and this implies that systems should become more personalized. Such personalization aims at increasing efficiency and effectiveness, hiding complexity or adding intelligence to the man-machine interaction.

In the present chapter, we investigate how the merging of the aforementioned paradigms (i.e., Web-oriented knowledge technologies and personalized applications) can be performed. We do not deal with a specific type of applications, but rather try to describe a framework for designing and developing such applications. Some assumptions made are that applications exploit domain semantics and adhere to a model-driven design. We call them Semantic Web Enabled Applications (SWEA). Before delving into the technical part of the chapter, we should give some definitions that will clarify some terms and concepts discussed in the following sections.

Definition 1. **Semantic Web Enabled Application (SWEA).** An application or service component that is relying on Semantic Web technologies. This may be a Semantic Web application or any other application that exploits the respective technologies (e.g., semantic TV). In practice, they are applications that are built with software engineering methods based on SW ontologies and/or rules (Happel, 2006).

Definition 2. **Adaptable and Adaptive System.** A system is called “adaptable” when it allows a user to adapt the behavior of the system to her current needs and preferences. On the other hand, an “adaptive” system supports this capability in an autonomous way. In particular, it knows and/or captures the user needs (preferences, interests, experience etc.) and it automatically adapts itself to these inferred needs. These definitions are in line with those given in (Baldoni, 2005).

Definition 3. **Personalization.** The process of delivering content and/or services to a user based on her preferences, interests, needs, and context in general. The purpose of this process is to adapt the content/services to the specific user characteristics in order to achieve optimum performance (the definition of “performance” is domain-dependent).

Consequently, we call an application as “personalized” or “user adaptive” if it is aware of the user profile, can detect the user context and needs and is able to adapt itself in order to meet these needs. As already mentioned, in this chapter we deal with personalized SWEAs.

The chapter is organized as follows. **Semantic Web for Personalization** provides a discussion on the current status regarding Semantic Web and personalized applications. **Architecture of a Personalized Semantic Web Enabled Application** presents a reference architecture for personalized SWEAs. Some issues about user modeling are elaborated in **User Modeling.** In **Rule-based Adaptation** we present some background knowledge and discussion on rule-based personalization. The chapter concludes with several directions for future research.
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