Declarative Specifications for Adaptive Hypermedia Based on a Semantic Web Approach

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Abstract. Adaptation/personalization is one of the main issues for web services. Adaptive web applications have the ability to deal with different users’ needs for enhancing usability and comprehension and for dealing with large repositories. We propose an open-ended adaptive hypermedia environment which is based on the virtual document and semantic web approaches and which is able to manage adaptive techniques at knowledge level. In this paper, we have focused on the way to specify and to manage adaptation in this environment. We propose an approach which is based on a unique evaluation principle of links/contents per document and where the author may assign user stereotypes to adaptive techniques.

Keywords. Adaptive navigation and presentation, Virtual Document, Composition Engine, Semantic Web

1 Introduction

Adaptive web applications have the ability to deal with different users’ needs for enhancing usability and comprehension and for dealing with large repositories. Indeed, adaptive web services - also called Adaptive Hypermedia Systems - can provide different kinds of information, different layouts and navigation tools according to users’ needs [1]. Creating and/or designing adaptive web services can be achieved by virtual documents and the Semantic Web. A virtual document is a document with no persistent state and which is at least partially generated at run time [2]. The Semantic Web is the Internet of meanings. It is a vision for making the contents of the web understandable to the machines in order to enhance reuse, sharing and exchange of resources through the web and to deal with automatic or semiautomatic services. Adaptive Hypermedia systems can be viewed as a kind of these services dealing with different users’ needs and distributed resources.

We have designed an open-ended adaptive hypermedia environment which is based on the virtual document and semantic web approaches and which is able to manage adaptive techniques at knowledge level. In other words, the specification of the adaptive mechanisms is defined by semantic properties associated to a hypermedia docu-
ment - by an author. At present, we have focused our study on the main adaptive navigation techniques. The management of these techniques is based on a unique evaluation principle of links/contents per document. It is also possible to assign user stereotypes to adaptive techniques. Then, an author can determine the relevant adaptation techniques for a given user. Indeed, some experiments have shown that it is necessary to provide the relevant adaptive methods to the current user [3].

First of all, the architecture of our adaptive hypermedia environment is introduced. Next, we focus on the management of the adaptation features. Finally, we conclude by the current state of implementation and some perspectives.

2 The Architecture

In our framework, we consider an adaptive document as an adaptive virtual document. We define it as follows: An adaptive virtual document consists of a set of information fragments, ontologies and a composition engine which is able to select the relevant information fragments and to organize them according to an overall document structure by adapting various visible aspects of the document delivered to the user.

We are interested in adaptive virtual documents for author-oriented web services. Authors have know-how which enables them to choose contents and one or more overall document structures. We propose a composition engine having an architecture based on the three different views of a digital document: semantic, logical and layout. The three views have a specific structure organizing them. The semantic structure of a document conveys the organization of the meaning of the document content. The logical structure reflects the syntactic organization of a document (for example books are organized into chapters and sections). The layout structure describes how the documents have to appear on a device. For each view our adaptive composition engine has a specific adaptation mechanism.

The composition engine is divided into three composition processes: semantic, logical and layout (cf. figure 1). The aim of the semantic composition engine is to compute on the fly an adapted document using: i) a generic document for which node contents are substituted at run time, according to user’s needs, ii) an intelligent search engine, iii) semantic metadata associated with fragments, iv) a user model and v) an information space. The generic document, defined by an author, is a directed graph of which nodes have a content specification according to a metadata schema and edges are semantic relationships chosen by the author. The adapted document consists of a set of selected fragments linked by semantic relationships. The logical composition engine browses the adapted document and computes for each node an XML web page with content and navigation tools. In navigation tools, links have properties for managing adaptation [4]. The layout composition engine generates an HTML page from the XML web page. Adaptation processes take place in the three engines.

1 The information space can be potentially Internet/Intranet, but in our framework, it is limited by an author to ensure semantic coherence of the delivered document.