Extending a Conceptual Modeling Language for Adaptive Web Applications

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ABSTRACT

The complexity of adaptive Web applications (AWA) is increasing almost every day. Besides impacting the implementation phase, this complexity must also be suitably managed while modeling the application. To this end, the paper proposes an approach for AWA called GIWA based on WA-UML (Web Adaptive Unified Modeling Language). This extension defines a set of stereotypes and constraints, which make possible the modeling of AWA. GIWA’s target is to facilitate the automatic execution of the design and the automatic generation of adaptable web interface. The GIWA methodology is based on different steps: requirement analysis, conceptual design, adaptation design and generation. Using GIWA, designers can specify, at a requirement analysis, the features of web application to be generated. These features are represented, at the conceptual level using WA-UML. At the adaptation level, GIWA acquires all information about users’ preferences and their access condition to be used at the generation level. The last level is based on java swing interface to instantiate models which are translated in XML files. GIWA uses then XSL files (user preferences) and RDF files (devices’ capability) to generate the HTML page corresponding to the user.

Keywords: adaptive Web application; GIWA; generating adaptive presentations; UML extension; WA-UML

INTRODUCTION

Web applications have become increasingly popular in the last five years as tools for user-driven access to information. By definition, a Web application is a Web system (Web server, network, HTTP, browser) in which user input (navigation and data input) effects the state of the business (Conallen, 2000). This definition attempts to establish that a Web application is a software system with a business state, and that its front end is in large part delivered via a Web system.

However, adaptive Web applications (AWA) is a new direction of research within the area of user-adaptive systems. AWA enhances classic Web application with an intelligent agent which supports the user by adapting the content and the presentation of a Web page to their rights, needs, individual characteristics, and materiel configuration (WAP, browser). AWA avoids
the ‘incorrect adaptation’ problem of classic adaptive systems by providing space for user-driven adaptation. AWA also avoids the ‘lost in hyperspace’ problem of classic hypermedia systems by providing intelligent guidance. More generally, an AWA is said to be adaptable when the user gets the impression that the system has been designed specifically for them.

For these types of applications, the need for adaptation arises from different aspects of the interaction between users and Web applications. User categories, which deal with these systems, are increasingly heterogeneous due to their different interests and preferences. The Web can be accessed through a number of different devices (PC, WebTV, PDA, WAP phone, etc.). Finally, taking into account the user preferences (desired layout, navigation patterns, etc.) and browsing history can lead to a more effective interaction. This leads to the fact that there is a higher need to automate, at least partially, the design process of hypermedia presentation as used in hypermedia and Web applications.

In fact, adaptation can be useful in various Web application fields, such as online advertising, direct Web marketing, electronic commerce, online learning and teaching, and so forth. The number of possible personalization variants seems countless. As with other Web features, a great variety of technologies and systems have been developed and are available in the market, but little or no attention has been paid to the process of modeling and designing AWA.

In AWA, the personalization of presentations and contents (i.e., their adaptation to users’ requirements and preferences) is becoming a major requirement. To facilitate the Web engineering of AWA there is an obvious need for a design methodology. This methodology should allow designers to specify applications in an appropriate level of abstraction depending on the different stages of the engineering project (requirements analysis, design, and implementation). As a consequence, adaptive Web engineering represents an active research area. So, developing adaptive Web engineering results in providing a systematic and disciplined approach for designing, implementing and maintaining adaptive Web/hypermedia applications.

For all these reasons, in the last few years, several models and methodologies have been proposed for supporting the development of adaptive Web/hypermedia applications. The main goal of such models is to help designers reason in a structured way on aspects that are specific to hypermedia, such as links, structure, navigation, etc and to express adaptation in the design process. Moreover, they should help engineers to manage the overall complexity of Web development, which requires a variety of activities, such as organizing the structure, choosing the contents, and the presentation modality, some of them involving automated generation of Web pages. So, methodologies usually provide guidelines for performing such activities and suitable models for expressing the results of such operations.

These methodologies and languages should facilitate different aspects of AWA design, such as conceptual design, hypermedia design, presentation design, adaptation design, and so forth.

Some of the works in the hypermedia modeling field only focus on the notation, like the UML extension proposed by Conallen (2000), or the design process, such as OOHDM (Schwabe & Rossi, 1998), UWE (Koch, 2001), OOOWS (Fons et al., 2003), KIWI (Villanova-Oliver et al., 2002), and so forth. The latter use standard notation, like E-R notation, OMT or UML, merely for the conceptual design and define their own notation and graphical techniques for the other steps. In the same vein, in previous works (Djemaa, 2006a, 2006b; Djemaa, 2007), we have presented a user driven method for modeling AWA, called GIWA.

This article addresses the issue by proposing a specific modeling language (WA-UML) as a basis for our design methodology for AWA (called GIWA). GIWA methodology (Djemaa, 2007) is an audience-driven Web application and includes several features in order to provide a better support for an automated design of adaptive Web applications.
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