Chapter 3.2
Adaptability and Adaptivity in The Generation of Web Applications

Raoudha Ben Djemaa
MIRACL, Tunisie

Ikram Amous
MIRACL, Tunisie

Abdelmajid Ben Hamadou
MIRACL, Tunisie

ABSTRACT

This article proposes a generator for adaptive Web applications called GIWA. GIWA's objective is to facilitate the automatic execution of the design and the generation of Adaptable Web Applications (AWA). Characteristically, the effort in this work has to be pursued with special attention to both issues applied to AWA: adaptability and adaptivity. The architecture of GIWA is based on three levels: the semantic level, the conceptual level and the generation one. Using GIWA, designers specifies, at the semantic level the features of Web application. The conceptual level focuses on the creation of diagrams in WA-UML language; the extended UML by our new concepts and new design elements for adaptation. At the generation level, GIWA acquires all information about users' preferences and their access condition. Consequently, the generated pages are adaptable to all these information. An evaluation and a validation of GIWA are given in this article to prove our adaptation.

INTRODUCTION

The growing demand for data-driven Web applications has led to the need for a structured and controlled approach to the engineering of such applications. Both designers and developers need a framework that in all stages of the engineering process allows them to specify the relevant aspects of the application. The engineering becomes even more complicated when we include notions of adaptation. Here, we address both adaptations during the presentation generation, for example to reflect user preferences or platform used, as well as adaptation inside the generated presentation.

The need for adaptation arises from different aspects of the interaction between users and Web

applications. Users' categories which deal with these systems are increasingly heterogeneous due to their different interests, preferences, and the use of number of devices (PC, WebTV, PDA, WAP phone, etc...). User's preferences and interests can be deduced from his and browsing history.

Adaptive Web engineering is meant to provide a systematic and disciplined approach for designing, generating and maintaining adaptive Web applications (Cingil, 2000). For this reason, recently several models and methodologies have been proposed for supporting the development of adaptive Web applications. The main goal of such models is to help designers to reason in a structured way about aspects that are specific to hypermedia, such as links, structure and navigation, and to express adaptation in the design process. Moreover, such models and methodologies 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 page (Brusilovsky, 1998). So, methodologies usually provide guidelines for performing such activities and suitable models for expressing the results of such operations.

In our previous works (Ben Djemaa, 2006a; 2006b, 2006c; Ben Djemaa, 2007; Ben Djemaa, 2008) we have presented a methodology for AWA which guides the designer through different steps of the design process, each of them yielding a specific model that is being interpreted by the GIWA tools. The GIWA methodology is based on several following steps: requirement analysis, conceptual design, adaptation design and generation.

The requirement analysis step (Ben Djemaa, 2005) represents the application domain. This step expresses the purpose and the subjects of the Web application through the functionality model and defines the target audience through the audience model. The result of these two models is a set of audience classes together with an informal description of their functional space. In GIWA, the functional space is determined by a semi automatic algorithm called AGCA.

In the Conceptual Design step (Ben Djemaa, 2008), the functional space for each audience class is represented using traditional conceptual modeling: use case diagram, sequence diagram, class diagram, etc. In GIWA, conceptual model is represented in a specific notation called Web Adaptive Unified Modelling Language (WA-UML) (Ben Djemaa, 2008). This new notation increases the expressivity of UML while adding labels and graphic annotations to UML diagrams. This extension of UML defines a set of stereotypes and constraints, which make possible the design of conceptual model. These models are translated and exported in XML files in a data repository.

The adaptation design level (Ben Djemaa, 2007) is based on the profile model, which takes into account the user's devices capabilities (hardware and software), Users' preferences presentation (desired layout, navigation patterns, etc.) and personal information (eg. Age, sex, language, etc...).

In this article we concentrate on the generation level. At this level the designer is invited to instantiate previous models using the specific interfaces offered by GIWA. Only the aspects related to the two first levels (requirement analysis and conceptual design) are instantiated by the designer. Information related to the devices' capabilities are dynamically captured by the system (using Logs files) and then stored in the profile model. At the end of the step of instantiation, the GIWA deployment can be launched.

Characteristically, the effort in this work has to be pursued with special attention to both issues applied to AWA: adaptability and adaptivity. Adaptability can be defined as the facility of an application to be configurable according to a set of decisions taken by the user, which usually define his preferences and/or background. Whereas adaptivity denotes the capacity of the application to alter the profile model according to the user's behaviour during the application run and adapt