Engineering Adaptive Web Applications

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Web applications are accessed by much diverse set of users than the traditional desktop applications. The users differ in their background, culture, political and social environment, and interests. The different user types have slightly different requirements for features which such a Web application should have. The different requirements might be satisfied by different variants of features maintained and provided by Web applications. An adaptive Web application can be seen as a family of Web applications where application instances are those generated for particular user based on his characteristics relevant for a domain. This dissertation proposes a new domain engineering framework for such intelligent adaptive Web applications.

1 Introduction

The World Wide Web is becoming a more and more popular platform for providing applications to an ever wider spectrum of users. This development brings with it several challenges in terms of the handling requirements and preferences of the wider spectrum of users. The significance of personalization of the information provided by the application and navigation in the applications is of increasing importance as a means of responding to the needs of different users.

A Web application is an application which is accessible for users on the World Wide Web, usually through a Web browser. An adaptive Web application is one which adapts some of its features by taking knowledge about user and his requirements into account.

In this dissertation, adaptation of Web applications is viewed from two perspectives:

- Adaptation by humans to the changed requirements of stakeholders;
- Dynamic system adaptation to the changed parameters of environment or context.

The customization idea should be taken beyond the static customization done by a development team. True adaptive Web applications adapt to changed environments, user features and other parameters on the fly according to knowledge gathered from their "sensors". This situation and some specific features of Web application processes lead us to investigate how domain engineering principles can be adapted to the new conditions which engineering of adaptive Web applications brings.

The basic principle of adaptation is to select appropriate variants of particular features or a combination of features (either by a human or a system) to satisfy user needs. Features which are adaptable are the ones which vary and thus to be considered as being the variable features of the application. The features which stay unadapted can be considered to be the common features of the application.

This dissertation proposes a domain engineering based framework for adaptive web applications [1]. It provides guidelines how to build the adaptive applications on the web as families. The specifications created within such a method are used as metadata about content, navigation, user, and environment on the Web. The metadata serves as a source for reasoning processes which personalize the presented information and navigation links to the users based on common and variable knowledge about above mentioned aspects of web application.

2 Domain Engineering for Adaptive Web Applications

There are three distinctive features of adaptive Web software applications:

- The World Wide Web is document centric which means that any kind of application has to conform the to standardized HTML presentation styles when generating the user interface; This implies the existence of a specific solution domain which has to be adopted and considered in the engineering methods.
- The standardized browsers of WWW documents do not prescribe nor define any environment, displays or dialogs to be used in any application; This implies that for each application, an environment has to be defined. Therefore environment domain engineering should become an integral part of the engineering methods as well.
- Adaptation to a user requires that an adaptive application should be able to collect, maintain and work with knowledge about a user to be able to decide about variants provided within the application.

Figure 1 depicts activities of the framework for engineering adaptive Web-based information-intensive applications proposed in this thesis. The framework incorporates established Web based application modeling aspects into activities of domain engineering.

Domain analysis for Web-based applications involves *application*, *environment*, and *user domain conceptual* and *feature models* where:

- *Conceptual models* are used to model concepts and their mutual relationships in a particular domain and serve as vocabularies for later feature models and domain designs;
- *Feature models* are used to encode configuration knowledge; i.e., are used to maintain common and variable features of concepts and their dependencies; While the configuration specification is based on user knowledge in ap-

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