Chapter 2.10

Context–Aware Applications for the Web:
A Model–Driven Development Approach

Florian Daniel
University of Trento, Italy

ABSTRACT

Adaptivity (the runtime adaptation to user profile data) and context-awareness (the runtime adaptation to generic context data) have been gaining momentum in the field of Web engineering over the last years, especially in response to the ever growing demand for highly personalized services and applications coming from end users. Developing context-aware and adaptive Web applications requires addressing a few design concerns that are proper of such kind of applications and independent of the chosen modeling paradigm or programming language. In this chapter we characterize the design of context-aware Web applications, the authors describe a conceptual, model-driven development approach, and they show how the peculiarities of context-awareness require augmenting the expressive power of conceptual models in order to be able to express adaptive application behaviors.

INTRODUCTION

The evolution of the Information Technology in the last years has seen the World Wide Web transforming from a read-only hypertext media into a full-fledged, multi-channel and multi-service application delivery platform. Current advances in communication and network technologies are changing the way people interact with Web applications. They provide users with different types of mobile devices for accessing – at any time, from anywhere, and with any media – services and contents customized to the users' preferences and usage environments. More and more users themselves ask for services and

applications highly tailored to their individual requirements and, especially due to the increasing affordability of new and powerful mobile communication devices, they also begin to appreciate the availability of ubiquitous access. In order to cope with the growing demand for novel, user-centric application features, such as adaptivity and context-awareness, appropriate development methods for Web applications are required.

Adaptivity is increasingly gaining momentum in the context of modern software systems. Runtime adaptivity provides highly flexible and responsive means for the customization of contents and services with respect to the user's identity. Varying device characteristics in mobile and multi-channel computing environments can be adequately taken into account and leveraged by means of adaptive software designs, whose development is facilitated by the availability of standardized communication protocols (e.g. HTTP) and markup languages (e.g. HTML or WML), supported by most of today's mobile devices. Multi-channel deployment does no longer require completely different, parallel design approaches and rather represents a presentation issue on top of unified engineering solutions.

But adaptivity may also enable an application to take into account a wider range of properties describing the interaction between the user and the application, thus paving the way for context-awareness. *Context-awareness* (Dey & Abowd, 2000; Schilit & Theimer, 1994) is often seen as recently emerged research field in information technology and in particular in the domain of the Web. From the perspective of application front-end development it can however be interpreted as natural evolution of personalization and adaptivity, addressing not only the user's identity and preferences, but also his/her usage environment. Personalization has already demonstrated its benefits for both users and content providers and has been commonly recognized as fundamental factor for augmenting the efficacy of the overall communication of contents. Context-awareness

goes one step further in the same direction, aiming at enhancing the application's usefulness and efficacy by combining personalization and adaptivity based on an application-specific set of properties (the context) that may affect the execution of the application.

In this chapter, we focus on the development of context-aware applications for the Web and, in particular, we describe a *model-driven* development method that allows developers to approach the problem at a level of abstraction that enables him/her to focus on the real design challenges of such class of applications, leaving low-level implementation concerns to supporting CASE (Computer-Aided Software Engineering) tools. Considering that software systems are continuously getting more complex and difficult to maintain – partly due to the previously described requirements –, we believe that efficient abstraction mechanisms and design processes, such as those provided by visual, model-driven design methods, are becoming crucial. The focus on essential design issues and the ease of reuse in model-driven design methods may significantly accelerate the overall design process. As we will show in this chapter, starting from application models, code generation techniques may then provide for the automatic generation of application code or templates, thus assuring the fast production of consistent and high quality implementations.

MOTIVATING EXAMPLES

Active application features, such as context-aware or adaptive behaviors, may augment the effectiveness of interactions and the efficiency of resource consumption in all those situations where services and contents offered by an application strongly depend on environmental situations, users' abilities or disabilities, or the state or health of a software system. For example, typical applications demanding for active features and adaptivity are:

Related Content

A New Framework for Intelligent Semantic Web Services Based on GAIVAs
Andrés Iglesias (2008). *International Journal of Information Technology and Web Engineering (pp. 30-58).*
www.irma-international.org/article/new-framework-intelligent-semantic-web/2650

Sports Work Strategy of College Counselors Based on MySQL Database Big Data Analysis
Xiao Zhang, Ali Yu, Xin Wangand Xue Zhang (2023). *International Journal of Information Technology and Web Engineering (pp. 1-14).*
www.irma-international.org/article/sports-work-strategy-of-college-counselors-based-on-mysql-database-big-data-analysis/332788

A Novel Architecture for Deep Web Crawler
Dilip Kumar Sharmaand A. K. Sharma (2013). *Network and Communication Technology Innovations for Web and IT Advancement (pp. 106-129).*
www.irma-international.org/chapter/novel-architecture-deep-web-crawler/72756

Algorithm for Secure Hybrid Cloud Design Against DDoS Attacks
Akashdeep Bhardwajand Sam Goundar (2018). *International Journal of Information Technology and Web Engineering (pp. 61-77).*
www.irma-international.org/article/algorithm-for-secure-hybrid-cloud-design-against-ddos-attacks/209721

Efficiency and Risk Management Models for Cloud-Based Solutions in Supply Chain Management
Dothang Truong (2016). *Web-Based Services: Concepts, Methodologies, Tools, and Applications (pp. 1694-1711).*
www.irma-international.org/chapter/efficiency-and-risk-management-models-for-cloud-based-solutions-in-supply-chain-management/140871