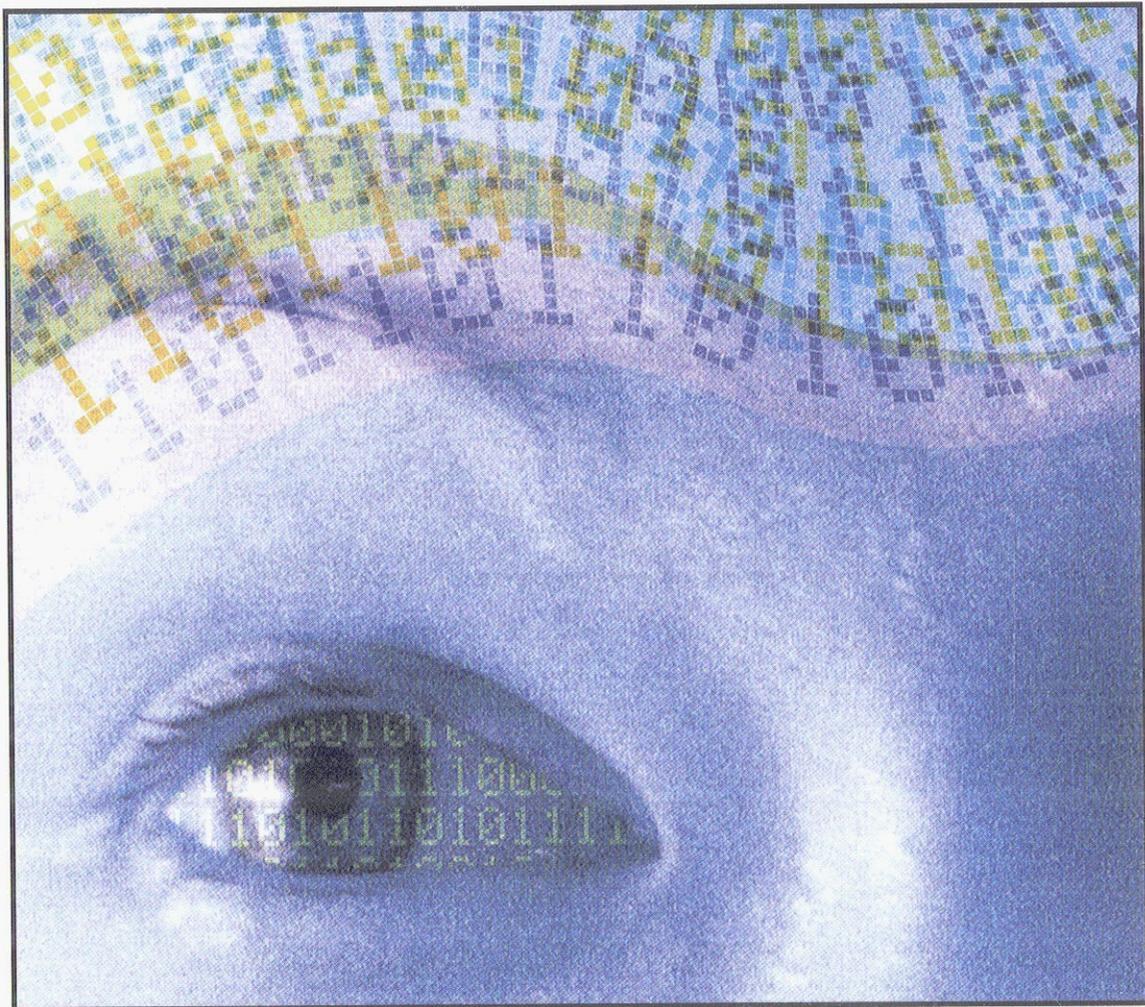


PREMIER REFERENCE SOURCE

Intelligent User Interfaces

Adaptation and Personalization
Systems and Technologies



Constantinos Mourlas & Panagiotis Germanakos

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User profiles serves as the main component of most Web personalization systems. With the use of various techniques that are based on given user preferences, navigation behaviour and the Web-based content returns the requested personalized result. Main scope of this chapter is to present the various techniques employed by such systems with regards to user profiles extraction and introduce a comprehensive user profile, which includes User Perceptual Preference Characteristics. It further analyzes the main intrinsic users' characteristics like visual, cognitive, and emotional processing parameters incorporated as well as the "traditional" user profile characteristics that together tend to give the most optimized, adapted and personalized outcome. It finally presents a Web adaptation and personalization system that implements the proposed comprehensive user profile as well as evaluation results that further support their importance and impact in the information space.

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Navigation, search, and recommendation each have their own set of challenges when it comes to facilitating fast and efficient information access. This chapter considers a number of these challenges and describes how they can be addressed by using techniques that allow information services to respond more intelligently to the needs and preferences of individuals and groups of users. Each challenge is being addressed in the form of a case study focusing on one particular mode of information access (navigation, search, and recommendation) and an application scenario (mobile portals, Web search, and e-commerce), to describe how user profiling, personalization, and adaptive interface design can be combined to produce a more efficient and effective information service.

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Web-based instruction is prevalent in educational settings, with many issues that still need to be investigated. One of them is the significance of human factors, and how they influence learners' performance and perception in Web-based instruction. In this vein, the study presented in this chapter investigates this issue in a Web-based instructional program, which was applied to teach students how to use HyperText Markup Language (HTML) in a United Kingdom (UK) university.

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Innovative personalization services are required to extend the traditional user profiling techniques with semantic-based information. Using semantic-based information provides additional clues as to the reasons the user may or may not be interested in certain objects. The primary goal of this chapter is to present a comprehensive overview of the state-of-the art techniques and methodologies which integrate personalization technologies with semantic knowledge, exploring the challenges that such research areas pose to today's information society.

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The diversity of service access contexts, which is inevitable in the era of pervasive, "anywhere" computing, and the co-existence of different technologies caused by the evolutionary character of the

transition to next generation systems, will lead to the heterogeneity of the networks and systems that support end-user application provision. The current mobile communications paradigm was not built to support this evolution, and therefore this chapter supports that intelligent mechanisms should exist for identifying the context and the particular high-level requirements of an application and mapping them to appropriate reconfiguration operations on the underlying hardware and software infrastructure. To this end, context management, knowledge building and the respective decision making process are key factors for the service personalisation and system adaptation in future mobile communications. A need for middleware platforms, that will abstract this management load and complexity and enable an end-user seamless service experience, emerges.

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Information users are different in nature—they manifest heterogeneous information seeking behaviours, needs and expectations. Yet, most information retrieval services purport a one size fits all model whereby the same information is disseminated to a wide range of information users despite the individualistic nature of each user’s needs, goals, interests, preferences, intellectual levels and information consumption capacity. This leads to a sub-optimal model because information users, who are intrinsically distinct, are not only compelled to experience a generic outcome but are further required to manually adjust and adapt the recommended information artifacts according to their immediate needs or preferences in order to achieve the desired results. Therefore, this chapter argues that there is both a case and the need to design information services that take into account the individuality of information users, and in turn aim to personalize the information seeking experiences and outcomes for users.

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Citizens possess, amongst others, different access possibilities, skills, expectations and motivation, during their navigation to an e-government portal while searching for a public e-service or during the actual service provision. This variety in citizens’ skills, expectations and in problems they face has as consequence that each citizen has different perceptions concerning the quality of public e-services. It is apparent, therefore, that a “one fits all” e-government services’ assessment is not efficient, since their evaluation should be organized in a way to serve every citizen individually. This chapter supports that for the realization of such a customized and adaptive evaluation of e-government services, an intelligent, semantic-based platform is needed which allows each citizen to put emphasis in quality dimensions related with the problems he/she faces, depending on his/her skills and expectations. It further presents a semantically adaptive interface for measuring portal quality in e-Government.

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The solution to the WWW cognitive overload, and more specifically to e-Government services, it seems that is the issue of personalization. On these grounds, this chapter introduces the design and implementation of Web information systems supporting personalized access to multi-version resources in an e-Government scenario. Personalization is supported by means of Semantic Web techniques and relies on an ontology-based profiling of users. Resources that considers are collections of norm documents in XML format but can also be generic Web pages and portals or e-Government transactional services. It further introduces a reference infrastructure, describes the organization and presents performance figures of a prototype system the authors have been developed.

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The presented work introduces new techniques for supporting the adaptation and personalization issues in the design and development of Intelligent User Interfaces, mainly by adapting services to user preferences and device characteristics of the user. The user characteristics, the data collection particularities and the system capabilities are matched with the visualization method properties in a context-based adaptive visualization environment to be used in the Historical Archive of the University of Athens, in order to support information seeking tasks.

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The integration of semantic knowledge is the primary challenge for the next generation of personalization systems and the automatic collection of data. This chapter provides an overview of approaches for incorporating semantic knowledge into Web usage mining and the personalization processes. It discusses

the issues and requirements for successful integration of semantic knowledge from different sources, such as the content and the structure of Web sites for personalization. It further presents a general framework for fully integrating domain ontologies with Web usage.

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One way to implement adaptive software is to allocate resources dynamically during run-time rather than statically at design time. Design of adaptive software and adaptive execution of processes are key factors that improve versatility of software and decrease maintenance costs. This chapter studies the development of adaptive software focusing on a design strategy for the implementation of parallel media servers with an adaptable behavior. This strategy makes the timing properties and the quality of presentation of a set of media streams predictable. The proposed adaptive scheduling approach exploits the performance of parallel environments and seems a promising method that brings the advantages of parallel computation in media servers. The proposed mechanism provides deterministic service for both Constant Bit Rate (CBR) and Variable Bit Rate (VBR) streams. It further presents an efficient placement strategy for data frames as well as an adaptability strategy that allows appropriate frames to be dropped without sacrificing the ability to present multimedia applications predictably in time. A prototype implementation of the proposed parallel media server illustrates the concepts of server allocation and scheduling of continuous media streams.

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Notions of quality are of paramount importance in distributed multimedia systems, and while efforts to characterize distributed multimedia quality have been forthcoming along the years, the proliferation of multimedia applications, display devices and – last but certainly not least – users, have led researchers to investigate novel ways of exploiting perceptual quality measures to transmit bandwidth-intensive multimedia content over fixed size pipes to an increasing numbers of users. Information transfer constitutes, in most cases, an important side of multimedia applications. Nonetheless, a dimension that is often overlooked in such cases, particularly in respect of quality considerations is the one of cognitive style, especially since it affects the ways through which people organize and perceive information. Accordingly, in this chapter, it is explored the impact of cognitive style on a user's perception of quality for dynamic multimedia content. In particular, it focuses on two dimensions of cognitive style: the Verbalizer / Imager and Field Dependent / Field Independent, because the former refers to information representation, while the latter relates to information organization.

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Limitation of the human memory is a well-known issue that anybody has experienced. Some of these can be addressed by exploiting one of the strengths of computers: the ability to store huge amounts of information for an unlimited time without loss of precision. And actually, state-of-the-art mobile devices in general provide features for creating reminders, linking notes to time and dates, and for managing time. However, these techniques require the user to capture this data manually, and thus the quality of such memories greatly depends on her cognition and carefulness. Thus, this chapter provides a discussion of various challenges related to building and exploiting such augmented personal memories in everyday's life. It concentrates on a number of crucial aspects: the importance of abstraction processes for building this memory and the design of a user interface for supporting interaction between user and memory. It further illustrates authors' approach with examples of processing and exploiting information about the user's location in the shopping assistant SPECTER.

Chapter XIV

Open Learner Modelling As The Keystone Of The Next Generation Of Adaptive Learning

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Learner models, understood as digital representations of learners, have been at the core of intelligent tutoring systems from their original inception. Learner models facilitate the knowledge about the learner necessary for achieving any personalisation through adaptation, while most intelligent tutoring systems have been designed to support the learning modelling process. Learner modelling is a necessary process to achieve the adaptability, personalisation and efficacy of intelligent tutoring systems. This chapter provides an analysis of the migration of open learner modelling technology to common e-learning settings, the implications for modern e-learning systems in terms of adaptations to support the open learner modelling process, and the expected functionality of a new generation of intelligent learning environments. This analysis is grounded on the authors' recent experience on an e-learning environment called LeActiveMath, aimed at developing a web-based learning environment for Mathematics in the state of the art.

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From E-Learning Tools to Assistants by Learner Modelling and Adaptive Behavior 313

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Since humans need assistance in Web-based learning, most current IT systems appear as more or less complex tools. The more ambitious the problems in the application domain are, the more complex are the tools. This is one of the key obstacles to a wider acceptance of technology enhanced learning approaches. In e-learning, they need to learn about the learner and to build an internal model of the learner as a basis of adaptive system behavior. Steps toward assistance in e-learning are systematically illustrated by means of the authors' e-learning projects and systems eBuT and DaMiT. These steps are summarized in some process model proposed to the e-learning community.

Chapter XVI

Using Emotional Intelligence in Personalized Adaptation 326

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The process of training and learning in Web-based and ubiquitous environments brings a new sense of adaptation. With the development of more sophisticated environments, the need for them to take into account the user's traits, as well as the user's devices on which the training is executed, has become an important issue in the domain of building novel training and learning environments. This chapter introduces a system called eQ, to the realization of personalized adaptation, in terms of dealing with the stereotypes of e-learners, having in mind emotional intelligence concepts to help in adaptation to the e-learners real needs and known preferences.

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Security, Privacy, and Personalization

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Technical Solutions for Privacy-Enhanced Personalization 353

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Privacy and personalization are currently at odds. Various technical solutions have been proposed to safeguard users' privacy while still providing satisfactory personalization, e.g., on web retail or product recommendation sites. Technical solutions for privacy protection represent a special kind of so-called Privacy-Enhancing Technologies (PET). This chapter proposes an evaluation framework for PETs that considers the following dimensions: (a) What high-level principles the solution follows, (b) what privacy concerns the solution addresses, and (c) what basic privacy-enhancing techniques the solution employs. It describes and categorizes major privacy principles from privacy laws as well as other de-

sirable principles in the context of privacy protection, it discusses privacy concerns and how different privacy principles address them, and further describes the techniques that have been used in the main types of privacy-enhancing personalization solutions, and how they relate to the major privacy concerns and privacy principles, with the necessary analysis findings.

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