Chapter XIX

Adapted Multimodal End-User Interfaces for XML-Content

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ABSTRACT

Personalization of user interfaces for browsing content is a key concept to ensure content accessibility. This personalization is especially needed for people with disabilities (e.g., visually impaired) and/or for highly mobile individuals (driving, off-screen environments) and/or for people with limited devices (PDAs, mobile phones, etc.). In this direction, we introduce mechanisms, based on a user requirements study, that result in the generation of personalized user interfaces for browsing particular XML content types. These on-the-fly generated user interfaces can use several modalities for increasing communication possibilities: in this way, interactions between the user and the system can take place in a more natural manner.

ADAPTED MULTIMODAL END-USER INTERFACES FOR XML-CONTENT

Currently, Web content providers mainly drive the presentation of content and the end-user navigation (i.e. scanning) possibilities within this content. As a result, user interfaces for browsing this content—with common Web browsers—remain almost identical, using the same modes of interaction whatever the user.

However, people with special needs (e.g. visually impaired users or highly mobile individuals) that cannot access Web content using traditional modes of interaction (e.g. visual mode) require a customized presentation and adapted scanning possibilities to access this content.
For instance, in order to easily access available information, blind users need a fine-tailored multimodal browsing system that takes advantage of several modalities/media (e.g. a text-to-speech synthesizer and a Braille display) for communicating the content.

These additional functionalities not only depend on a user profile, on his preferences but also depend on the content type that has to be browsed (Schweikhardt, Bernareggi, Jessel, Encelle, & Gut, 2006): for instance, presentation intents (e.g. modalities that have to be used) and scanning possibilities will not be the same if the user browses a mathematical content or a musical content.

In order to fulfill these requirements, we develop a user profile model for representing for each content type, users preferences in terms of content presentation and scanning possibilities inside content. For a given type of content, a transformation process is generated with the help of such a user profile. Finally, an adapted content browsing user interface is generated thanks to this transformation process (Encelle, 2005).

In this paper, the problem of content accessibility is addressed using personalization mechanisms.

We firstly introduce the context of our work and the terminology we use. In the following two sections, we discuss related work and we introduce some guidelines for designing personalization systems. In the following section, we identify end-users’ personalization requirements for a content browsing system and we introduce the model and mechanisms we developed for specifying these requirements (section “The Concepts of Profile...”).

Two representations of the end-user browsing requirements are also described: a user-friendly one and a system-friendly one. In the following section, the transformation process, from the end-user browsing requirements to the generation of personalized user interface is explained. We present the results of utility and usability evaluations of the proposed mechanisms for personalizing content browsing (section “Evaluation”) and we conclude.

### CONTEXT OF WORK AND TERMINOLOGY

XML is currently the well established standard for representing and exchanging semi-structured documents or data. The XML philosophy is to separate style (i.e. presentation) from substance (i.e. content). Thanks to this separation principle, the same content can be presented in several different ways (using a visual, an auditory or a tactile presentation). This possibility of giving multiple presentations of the same content increases its accessibility. As a consequence, our work tends to personalize XML content browsing.

By “browsing” we mean, from a user point of view, the task of “active” reading of a given content. From a system point of view, this activity is broken up into two types of task: a task that consists in a content presentation to the user, and a navigation task that targets, according to a user action, a particular XML element in order to present it in detail. As a consequence, a “browsing” activity is viewed as a series of coupled tasks (presentation, navigation).

Moreover, communication modalities used to facilitate content browsing have to be indicated by the user. For a given device, we assume that its communication modalities are always available.

### RELATED WORK

In order to make Web content accessible, transformations (i.e. adaptations) of content must be performed. We distinguish two kinds of adaptations: adaptation performed at authoring-time (i.e. during the writing of documents) and adaptation performed at run-time (i.e. during content consultation).

**Authoring-Time Content Adaptation**

Authoring-time adaptation firstly results in a set of “accessibility” rules/guidelines that developers