Chapter VII
A Survey on Approaches to Adaptation on the Web

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ABSTRACT

Approaches to adaptation have been proposed by many different research communities, Hypermedia System and Intelligent Tutoring in particular. The task of adaptation breaks down to a mediation of resource provision and resource demand. In doing so, it is necessary to obtain some representation of them, either directly or through intermediate models that can be further processed to arrive at this information. Correspondingly, major differences in adaptation approaches manifest themselves in the employed sources, the way they are represented and the techniques used to derive the user demand from them. Therefore, we like to structure this survey according to these model-related aspects.

INTRODUCTION

Approaches to adaptation have been proposed by many different research communities, Hypermedia System and Intelligent Tutoring in particular. The task of adaptation breaks down to a mediation of resource provision and resource demand. In doing so, it is necessary to obtain some representation of them, either directly or through intermediate models that can be further processed to arrive at this information. Correspondingly, major differences in adaptation approaches mani-

fest themselves in the employed sources, the way they are represented and the techniques used to derive the user demand from them. Therefore, we like to structure this survey according to these model-related aspects.

In particular, it starts with an initial overview of the approaches, which are distinguished in terms of the number of sources that are employed to model the different aspects of adaptation. Other major differences shall become more apparent in subsequent sections devoted to one specific model-related aspect. There is one section that puts the underlying techniques into generic categories. These techniques for model processing are determined by the chosen formalisms for model representation, which are discussed subsequently in a separate section. Thereafter, specific attributes that have been used to capture the different sources are presented. Here, the focus necessarily rests on the user and the domain model because generic information and techniques for the representation of other sources are simply not available from the surveyed approaches. The survey ends with a final discussion on the relative strengths and weaknesses of these approaches—from which consequences and requirements for the proposed ontology can be derived.

OVERVIEW OF ADAPTATION APPROACHES

Single-Model Adaptation

Adaptive functionalities of many general information systems, commercial recommendation systems in web stores (EBay, 2005) (Amazon, 2005), are implemented through filtering-based approaches (Schafer, Konstan, Riedi, 1999). As discussed below, they exploit information extracted from usage as well as from the content of the resources in order to suggest further items potentially interesting to the user. In this regard, filtering denotes the mining of (meta-)

relationships between users and contents useful for recommendations.

Collaborative Filtering

This filtering approach bases on the extraction of similarities among users through the analysis of profiles reflecting users' past behavior. It supports the recommendations of items that have been used (selected, read, acquired, liked etc.) by similar users. In other words, users recognized as being similar are assumed to have the same preferences, i.e. are interested in the same items. Accordingly, the individual profile is populated with the entire preferences of a user class—see details on this approach and applications in (Good et al., 1999) (Herlocker et al., 1999) (Konstan et al., 1997).

Content-Based Filtering

This approach bases on the extraction of relationships between the user and the resources. Rather than making recommendations on the basis of other users' preferences, it proposes items that match the user profile. As suggested by the name, the focus lies on information about the content of the resources. In fact, the approach can be reduced to the mining of similarities among items because most of the time, the profile contains only items previously visited by the user. So, items are recommended that are similar to the ones used in the past (Pemberton, Rodden, Procter, 2000).

In Syskill & Webert for instance, a system for identifying interesting resources, the user rates a number of documents from a content domain on a binary "hot" and "cold" scale. Resources similar to those with hot ratings are computed using words probabilities, a measure that has been derived from this learning set of documents (Pazzani, Muramatsu, Billsus, 1996). Surveys conducted in (Schafer, Konstan, Riedi, 1999) (Montaner, Lopez, Dela, 2003) provide details on many other examples of this type of approaches.

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