

Chapter IX

Context and Adaptivity–Driven Visualization Method Selection

Maria Golemati

University of Athens, Greece

Costas Vassilakis

University of Peloponnese, Greece

Akrivi Katifori

University of Athens, Greece

George Lepouras

University of Peloponnese, Greece

Constantin Halatsis

University of Athens, Greece

ABSTRACT

Novel and intelligent visualization methods are being developed in order to accommodate user searching and browsing tasks, including new and advanced functionalities. Besides, research in the field of user modeling is progressing in order to personalize these visualization systems, according to its users' individual profiles. However, employing a single visualization system, may not suit best any information seeking activity. In this paper we present a visualization environment, which is based on a visualization library, i.e. is a set of visualization methods, from which the most appropriate one is selected for presenting information to the user. This selection is performed combining information extracted from the context of the user, the system configuration and the data collection. A set of rules inputs such information and assigns a score to all candidate visualization methods. The presented environment additionally monitors user behavior and preferences to adapt the visualization method selection criteria.

INTRODUCTION

New visualization systems are continually equipped with advanced features in order to enhance search and browsing activities. However, regardless of a thorough visualization design, systems remain unable to satisfy any possible need and task. This is due to not only the huge volumes of information which exist in digital format and the diversity in digital collections' parameters, but also because users who rely on electronic media in order to forage the information they need, often come up with specific and complicated demands. As this new era in information approach is getting shaped, a number of extra factors emerge.

To effectively achieve an information retrieval goal, any individual user's characteristics play a decisive role as they present different behavior when solving different tasks or even the same task under different circumstances. Thus, recording these characteristics a system could be evaluated as suitable or not for a specific user or user group. On the other hand, the particularities of a searching task, as well as the corpus which hosts the possible results, provide key information for the effectiveness of a specific system in the completion of a specific task. Consequently, any individual visualization system is never enough for any possible need and task.

The development of user-adaptive systems is a promising approach to address this problem, as these systems are designed to be customized to the needs and desires of their specific users. Building and then exploiting user models, user-adaptive systems incorporate dynamic processes which allow humans to define their function according to the surrounding situation.

In this paper, 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. 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 (display and input devices available), while system constraints and resource availability (memory size and processor speed) are also taken into account.

In the next section of this paper, background issues and related work in the field of user modeling and user adaptive systems is surveyed. In the following sections, we analyze the notion of context modeling in our system and describe the process of visualization method selection, which is also exemplified through a hypothetical user session with the proposed system. In the last two sections, future trends are discussed and conclusions are drawn.

BACKGROUND

The problem of context management constitutes a new approach to the design of context-aware systems. (Zimmermann A., Specht M. & Lorenz A., 2005) refers to this problem combining personalization and contextualization. It defines that *an adaptive system (contextualized and personalized or both) follows an adaptation strategy (e.g. pacing or leading) to achieve an adaptation goal (e.g. intuitive information access or easy use of a service). To achieve an adaptation goal, it considers relevant information about the user and the context and adapts relevant system components on the basis of this information*".

(Domik G. O. & Gutkauf B, 1994) claims that a visualization system needs to adapt to desires, abilities and disabilities of the user, interpretation aim, resources (hardware, software) available, and the form and content of the data to be visualized. It distinguishes four different models: user model, problem domain/task model, resource model and data model and gives the design of computer tests and games to test user abilities (color perception,

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