HaMA:
A Handicap-based Architecture for Multimedia Document Adaptation

Asma Saighi, Badji Mokhtar University, Department of Computer Science, LRS Laboratory, Annaba, Algeria
Roose Philippe, Liuppa, Univ Pau & Pays Adour, Anglet, France
Nassira Ghoualmi, Badji Mokhtar University, Department of Computer Science, LRS Laboratory, Annaba, Algeria
Sébastien Laborie, Liuppa, Univ Pau & Pays Adour, Anglet, France
Zakaria Laboudi, University of Constantine 2, Department of Computer Science, MISC Laboratory, Constantine, Algeria

ABSTRACT
Nowadays, multimedia documents are omnipresent at any time from and to any devices. However, mobile devices heterogeneity and the various contexts of the user require their adaptation. In this context, the existing systems transform contents to comply with the target constraints. Nevertheless, the current solutions do not exploit the profile semantic benefits to reason upon the context for assisting the adaptation. Furthermore, there is no work that care of adapting HTML pages containing CSS and changing in time, where time specification is declarative (e.g. by means of timesheets). This paper provides an adaptation approach called “Handicap-based Multimedia Adaptation” (HaMA), in which each context constraint corresponds to handicap types in order to discover adaptation services. Thus, a generic ontology is introduced to reason upon the context and then deduces the corresponding handicap in order to infer the suitable adaptation guideline. Also, we propose a method for selecting appropriate services with respect to quality criteria. To validate HaMA, scenarios were implemented.

KEYWORDS
Context Modeling, Contextual Situation, Handicap, Mobile Device, Multimedia Adaptation, QoS

INTRODUCTION
Currently, mobile technology is evolving very fast. Development of mobile devices, laptops, tablets or smartphones yield to information systems called ‘pervasive’ (i.e. make information accessible at any time, anyhow and anywhere). These systems can be used in different contextual situations depending on the user environment, his preferences and his device capabilities. Accessed information, on mobile devices, are multimedia documents composed of several media objects such as videos, audios, images, and texts. Typical examples of multimedia documents are web pages and SMIL (Synchronized Multimedia Integration Language) presentations (Bulterman et al., 2008). In fact, mobile devices have heterogeneous capabilities in terms of static features, such as screen size or dynamic hardware features such as remaining battery level and memory space. Moreover, user’s mobility could prevent from playing specific multimedia documents, which leads to different contextual restrictions. For instance, the user may avoid playing video content during driving his car. Within a contextual situation, three categories of information must be managed:

DOI: 10.4018/IJMDEM.2017070104

Copyright © 2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
Terminal characteristics, such as screen size, battery level and available bandwidth.

- User context, such as localization and ambient noise.
- Document structure, such as preferred temporal or spatial organization.

In this paper, we are mainly interested by adapting multimedia content according to environmental constraints changes and users’ needs, where each constraint corresponds to a physical handicap. The latter can be viewed as: «Reduction in a person’s capacity to fulfill a social role as a consequence of impairment, inadequate training for the role, or other circumstances (Porta, 2014).

This work deals in particular with the adaptation of presentations containing Timesheet. This process requires understanding the contextual information cited above. When a contextual situation raises some constraints, multimedia documents cannot be appropriately executed on the target terminal, which requires a generic approach for modeling the context and performing a real-time adaptation of the document.

Motivation behind adopting a based handicap approach can be justified by the fact that in a multimedia adaptation process, identifying usage situations is a complex task because there are several possible situations. Therefore, it is necessary to reduce the number of adaptation possibilities. The problem concerning mobility situation is the interaction usage (e.g., Inability to: play sound, access to the screen, etc.). Consequently, a model referring to these situations must be defined. In fact, identifying physical handicaps allows referring to this kind of usages to reduce the adaptation possibilities which makes the approach by handicap more efficient than the other ones.

Adaptation operations allow transforming composed multimedia documents according to high level constraints related to:

- User environment
- Available resources
- Content description

This information is specified through a profile. The aim of the adaptation is to make the document compatible with the current context. Two adaptation types are distinguished (Kazi-Aoul, 2008): Global adaptation; where the presentation composition is adapted by transforming the temporal synchronization and the spatial position of the media. Local adaptation; where the media are adapted by applying physical transformations on them (content scaling, transcoding, etc.).

Several works have been carried out on multimedia document adaptation within pervasive systems, among others: (Lemlouma et al., 2001; Jannach & Leopold, 2007; Hai et al., 2012; Adzic et al., 2011; Laborie et al., 2011; Moissinac, 2012; Bettou & Boufaida, 2014; Maredj et al., 2015). By considering some target profiles, these approaches have combined multiple operators: transcoding (e.g., AVI to MPEG), transmoding (e.g., text to speech) and transformation (e.g., text summarization) (Alti et al., 2014). However, they do not exploit semantics for describing the profiles in order to guide the adaptation process. The authors in (Dromzée et al., 2013; Alti et al., 2015) have overcome this limitation by defining a semantic generic profile for multimedia document adaptation. In spite of the exploitation of the semantic benefits by this model to describe profiles, it does not use reasoning mechanisms to assist adaptation process. In fact, reasoning mechanisms allow to the adaptation process understanding the aspects related to the user profile and the contextual situations updates. We point out, that Rule-based reasoning approaches are highlighted for deducing information about the user context from the current one. Moreover, in these approaches, the adaptation of presentations containing Timesheet was not performed yet.

Thus, this paper aims: Firstly, to enhance the existing approaches by assisting the adaptation process. Such assistance can be provided by deducing the corresponding handicap to each context restriction and by the way inferring the adaptation operations. Then, we provide a real time ‘on-demand’ presentation adaptation approach which exploits guidelines of the deduced context-aware
Related Content

Extracting Hierarchy of Coherent User-Concerns to Discover Intricate User Behavior from User Reviews
Ligaj Pradhan, Chengcui Zhang and Steven Bethard (2016). International Journal of Multimedia Data Engineering and Management (pp. 63-80).
www.igi-global.com/article/extracting-hierarchy-of-coherent-user-concerns-to-discover-intricate-user-behavior-from-user-reviews/170572?camid=4v1a

Optimization in Digital Watermarking Techniques
www.igi-global.com/chapter/optimization-digital-watermarking-techniques/43479?camid=4v1a
A Multi-Stage Framework for Classification of Unconstrained Image Data from Mobile Phones

An Experimental Evaluation of Debayering Algorithms on GPUs for Recording Panoramic Video in Real-Time