Chapter 6
Request-Driven Cross-Media Content Adaptation Technique

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ABSTRACT

Devices, standards and software develop rapidly, but still often independently of each other. This creates problems in terms of content suitability on various devices. Also, in mobile environment, user and system-level applications must execute subject to a variety of resource constraints. In order to deal with these constraints, content adaptation is required. In this chapter, we justify the need of distributed cross media content adaptation and the potential of utilizing Web Services as the adaptation providers. We introduce request-driven context to complement constraint-driven and utility-driven approaches. We describe the request context mapping and propose a novel path’s determination scheme for determining the optimal service proxies to facilitate the adaptation tasks. To better illustrate the disjoint portions in content passing between service proxies, two communication models were associated. Then, within Web Services, we explain the related protocols and socket connection between adaptation’s services. We conclude with discussion regarding the strengths of the proposed architecture.

INTRODUCTION

With advances in mobile devices (e.g., mobile phones and PDAs) capabilities and wide range of networks, the use of Web on mobile devices is fast becoming widespread and popular. Although, a wide range of devices can now access the Web, it is common that devices and software develop rapidly and often independently of each other. Also, in mobile environment, user and system-level applications must execute subject to a variety of resource constraints such as network bandwidth, battery power and available screen resolution. All these pose significant challenges in terms of Web content suitability for heterogeneous devices. In order to deal with these challenges, content adaptation is an attractive solution to increase the usability and suitability of Web content in heterogeneous
devices. As a result, content adaptation has been receiving significant amount of attention within research community.

In this chapter, we address the problem of cross media content adaptation. In cross media content adaptation, a media needs to be converted from one form into another (e.g., text to speech, audio to text, video to audio, video to images, video to text); translated (e.g., one text language into others, one audio language into others); summarized (e.g., video abstraction, video key frame extraction, content filtering); or even integrated (e.g., integrating video into animation, emerging technologies). To achieve this, a flexible platform for passing and delivering the content (e.g., original, partially adapted or fully adapted) across the distributed proxies and servers location is crucial. The platform should be reliable, scalable and consistence in performing adaptation. Moreover, cross media content adaptation must be able to facilitate resources’ constraints (especially for mobile devices), media utility and user’s accessibility (i.e., user perceived utility).

Over the past years, a considerable amount of researches on content adaptation using methods such as content selection, transcoding, or distillation have been discussed. Transcoding is a technique of converting one encoding to another, in digital to digital conversion. Distillation-based adaptation extracts the most important aspects of a Web page (e.g., page title, main text column). These methods can be performed at a particularly designated proxy or at an origin server or at the client device itself (Fawaz et al., 2008; Md Fudzee & Abawajy, 2008). The common thread among all these methods is that they perform well in browsing (e.g., adapting layout, text column) and single element content adaptation (e.g., converting format within a content media). However, cross media adaptation requires more than various adaptations such as fidelity adaptation (i.e., convert two bits image into black and white image), modality adaptation (i.e., change one column text into two column), layout adaptation (i.e., change the orientation of the Web) and structure rearrangement (i.e., organize long text into read more option) (Lei & Georganas, 2001; Berhe et al., 2004, 2005; Md Fudzee & Abawajy, 2008; Shahidi, 2008). To this end, most of existing studies focus on device resource constraints’ (Mohan et al., 1999; Lum & Lau, 2002, 2003; Hsiao et al., 2008; He et al., 2007; Zhang, 2007) and do not consider the end-user perceived utility. Thus, how to support transparent delivery and convenient use of Web content across a wide range of networks and devices while providing the best user perceived utility is still an open problem.

In this chapter, we focus on the problem of content adaptation that is tailored to user preferences and to device capabilities. For instance, one may request to have Spanish news to be translated into English audio and this user need can be captured through query-based or other interactive techniques. As such adaptation services are computationally expensive; they should be deployed on distributed infrastructures. To this end, we propose a distributed request-driven cross-media content adaptation technique to address user-driven cross-media adaptation. To the best of our knowledge, this is the first attempt to introduce desire/request-driven content adaptation.

The rest of the chapter is organized as follows. Section 2 presents the background in content adaptation. In Section 3, the service oriented architectural design of the distributed multimedia content adaptation is presented. The content adaptation conceptual framework and the interaction protocol are also discussed. We also describe the semantic representation, discuss the request context mapping using rule-based technique and adaptation task scheduling approach used to achieve the stated aim of the content adaptation. A score tree scheme for the path determination is also discussed. In Section 4, the requirements of distributed adaptation via Web Services are elaborated on the connection conceptuality. This
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