Chapter 11

Retrieval Of Multimedia Data On The Web: An Architectural Framework

Mohammed Moharrum, Stephan Olariu, and Hussein Abdel-Wahab
Old Dominion University

ABSTRACT

The objective of this chapter is to introduce the reader to a general architectural framework for a broad array of retrievals of multimedia data required by various applications. This framework contains more than the traditional client/server architecture and even more than the existing three-tier architectures. This chapter introduces the reader to many critical issues involved in multimedia retrieval over the Internet. A new architectural framework is proposed to cover a variety of multimedia applications over the Internet and the World Wide Web. This framework has the three main objectives of (1) proposing a layered architecture to facilitated design and separate different issues, (2) covering a large number of multimedia applications, and finally, (3) making use of existing and well-established technology, such as Mobile Agents, SQL databases, and cache managements schemes. The proposed architectural framework separates issues involved in multimedia retrieval into five layers, namely: keyword searching and data servers, proxy servers, domain and department archives, mobile user agents, and the users. Through these five layers, various customized solutions to a large array of problems will be proposed and applied. The chapter offers, but is not limited to, solutions for different problems that arise in retrieval of multimedia data. A list of important open problems is identified at the end of the chapter.

INTRODUCTION

Multimedia data plays an essential role in today's e-business applications. Indeed, a large array of e-business applications relies directly or indirectly on multimedia data, ranging from simple news lines to sophisticated multimedia libraries. We can say without hesitation that most of data being transferred nowadays through the Internet involves some multimedia component.

Overview of the Architecture

The objective of this chapter is to propose a general architectural framework for a broad array of retrievals of multimedia data required by various applications. This framework contains more than the traditional client/server architecture and even more than the existing three-tier architectures. To the best of our knowledge, our model subsumes all the currently existing models.

The most severe problem with multimedia applications is performance. This problem may incorporate many issues that are beyond the control of the application vendor, or even the network administrator. In our proposal, we suggest different architectural levels to act as performance degradation protectors. The main goal of the architectural level hierarchy is to hide the technical details of the search process from the user. The second major goal of the hierarchy is the intelligent filtering of data in order to avoid undue overload on the system.

The proposed framework supports different types of multimedia data retrieval that will serve different application areas. These types include meta-data retrieval and both feature and semantic Content-Based Retrieval (CBR) that will support Content-Based Video on Demand Applications.

As one of the goals of the e-business system is to hide all complicated details from the user, making the most complicated transactions look straightforward, we employ mobile agents to represent the user at different levels and to perform all the necessary work for him.

Our proposal for employing mobile agents includes two entities for each user, namely, a Home base and Mobile Agent Instances. The Home base resides at the server closest to the user, represents the user, and acts on his behalf. In addition, the Home base applies suitable data reduction techniques to data before sending it back to the user. Moreover, the Home base is responsible for collecting data returned by mobile agent instances and for organizing it into media presentations.

Every mobile agent instance propagates and replicates itself in the system, moving as close to the data servers as possible, in order to extract the data requested by the user. In order to reduce network traffic, different mobile units may also apply some data filtering techniques before sending data back.

The proposed architecture contains the following five layers:
1. keyword searching and data servers;
2. proxy servers;
3. domain and department archives;
4. mobile agents for the users; and
5. the users.

Review of Multimedia Content-Based Retrieval Models

In the early days of multimedia databases, multimedia data was being handled externally. As multimedia data is inserted into the database, less effort is devoted to identify, analyze and determine its contents, considering it as black boxes knowing everything about their locations, labels, creators, etc., but knowing nothing about their contents. However, most of the listed applications incorporate queries not only about the external data, but also about the contents of the black boxes. Content-based modeling, indexing, and retrieval makeup the research area that deals with such contents of multimedia data. There are two types of multimedia CBR described below.

Feature content-based querying, indexing, and retrieval (Moharrum, 2000) of multimedia data incorporate retrieving multimedia data based on visual or audible features extracted

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