Chapter 6.17
Information Delivery for Mobile Business:
Architecture for Accessing Large Documents through Mobile Devices

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ABSTRACT

In this information-centric age, an organization needs to access the most update and accurate information for fast decision making. Mobile access to Internet provides convenient and portable access to a huge information space. However, loading and visualizing large documents on mobile devices is impossible due to their natural shortcomings such as screen size and computing power. In this chapter, we introduce the fractal summarization model, based on fractal theory, for document summarization on mobile devices. This model generates a brief skeleton of summary at the first stage, and the details of the summary on different levels of the document are generated on demands from users. Such interactive summarization reduces the computation load, which is ideal for wireless access. On the other hand, the hierarchical display in fractal summarization is more suitable for navigation of a large document and it is ideal for small area display. The automatic summarization together with the three-tier architecture and the information visualization are potential solutions to the existing problems in information delivery to mobile devices for mobile business.

INTRODUCTION

Access to the Internet through mobile devices is growing significantly in recent years. The wireless application protocol (WAP) and wireless markup language (WML) provide the universal open

standard and markup language. Many information-centric applications have been developed for mobile devices (Buyukkokten, Garcia-Molina, Paepcke, & Winograd, 2000; Buyukkokten, Garcia-Molina, & Paepcke, 2001a, 2001b, 2001c; Yang & Wang, 2002, 2003b, 2003c). For example, users can now surf the Web, check e-mail, read news, and quote stock prices, using mobile devices. At present, most mobile applications are customer-centered m-services applications. However, mobile computing should not be limited to user-centered applications only. It should be extended to decision support in an m-commerce organization. With a fast-paced economy, organizations need access to large documents or other information sources for fast decision making. As a result, there is an urgent need of a tool for browsing large documents on mobile devices.

Although the development of wireless mobile devices is fast in recent years, there are many shortcomings associated with these devices, such as screen size, bandwidth, and memory capacity. There are two major categories of wireless mobile devices, namely, WAP-enabled mobile phones and wireless personal digital assistants (PDAs). At present, the typical display size of popular WAP-enabled handsets and PDAs is relatively small in comparison with a standard personal computer. The comparatively limited memory capacity of a mobile device also greatly limits the amount of information that can be stored. A large document cannot be entirely downloaded to the mobile device and presented to the user, as the current bandwidth available for WAP is relatively narrow as compared with the broadband Internet connection for PCs.

Despite their convenience, mobile devices impose many constraints that do not exist on desktop computers. The low bandwidth and small resolution are major shortcomings of mobile devices. Information overloading is a critical problem; advance-searching techniques solve the problem by filtering most of the irrelevant information. However, the precision of most of the commercial search engines is not high. Users may only find a few relevant documents out of a large pool of searching results. Given the large screen and high bandwidth for desktop computing, users may still need to browse the search results one by one and identify the relevant information using desktop computers. However, it is impossible to search and visualize the critical information on a small screen with an intolerable slow downloading speed using mobile devices. Automatic summarization summarizes a document for users to preview its major content. Users may determine if the information fits their needs by reading their summary instead of browsing each whole document one by one. The amount of information displayed and downloading time are significantly reduced.

Traditional automatic summarization does not consider the structure of a document, but considers the document as a sequence of sentences. Most of the traditional summarization systems extracted sentences from the source document and concatenated them together as summary. However, it is believed that the document summarization on mobile devices must make use of a "tree view" (Buyukkokten et al., 2001a, 2001b, 2001c) or "hierarchical display" (Mani, 2001). Similar techniques have been applied to Web browsing (Brown & Weihl, 1996): an outline processor organizes the Web page in a tree structure, and the user clicks the link to expand the subsection and view the detail. Hierarchical display is suitable for navigation of a large document, and it is ideal for small area display. Therefore, a new summarization model with hierarchical display is required for summarization on mobile devices.

Summarization on mobile devices in the context of Web pages has been investigated by Buyukkokten et al. (2000, 2001a, 2001b, 2001c). However, a large document exhibits totally different characteristics from Web pages. A Web page usually contains a small number of sentences that are organized into paragraphs, but a large document contains many more sentences that are organized into a more complex hierarchical structure.

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