INTRODUCTION

As handheld computing is a fairly new computing area, there is as yet no generally accepted formal definition. For the purposes of this book, therefore, it will be defined as follows:

Handheld computing is the use of handheld devices such as smart cellular phones and PDAs (Personal Digital Assistants) to perform wireless, mobile, handheld operations such as personal data management and making phone calls.

As explained earlier, handheld computing can take one of two forms: server- and client-side handheld computing, which are defined as follows:

- **Server-side handheld computing:** Here, handheld devices are used to perform wireless, mobile, handheld operations that require the support of a server. Examples of such applications include: (a) instant messages, (b) mobile web content, (c) online video games, and (d) wireless telephony.

- **Client-side handheld computing:** This refers to the use of handheld devices to perform handheld operations that do not need the support of a server. Examples of these applications include: (a) address books, (b) standalone video games, (c) note pads, and (d) to-do-lists.
The terms “computing” and “programming” are sometimes confusing and often misused. It is important to remember that “handheld programming,” defined as programming for handheld devices, is different from “handheld computing” and is made up of two kinds of programming:

- **Server-side handheld programming**: This includes the design and development of handheld software such as CGI programs that reside on servers.
- **Client-side handheld programming**: This refers to the design and development of handheld software such as Java ME programs that reside on the handheld devices themselves.

Server-side handheld computing and programming usually involve complicated procedures and advanced programming such as TCP/IP network programming. Here we will focus on the most popular server-side handheld application, mobile web content design and development, which can be conveniently considered in terms of three themes:

- **WML (Wireless Markup Language)**, which will be discussed in Chapters VI and VII,
- **WMLScript**, which will be explained in Chapter VIII, and
- **database-driven mobile web content development**, which will be covered in Chapter IX.

Other kinds of server-side handheld applications, such as instant messaging, are related to advanced network programming such as TCP/IP and readers may refer to other technical reports or books for more information. The rest of this chapter describes the background and discusses system setup for server-side handheld computing and programming. A case study, adaptive mobile web browsing using web mining technologies, is given at the end of this chapter.

**Mobile Web Content**

A web site normally displays its content on browsers such as Internet Explorer or Netscape Navigator for PCs by using HTML (HyperText Markup Language) (W3C, 1999). For handheld devices, however, the situation is less clear-cut and there are currently several markup languages available for showing mobile web contents on microbrowsers, with no single language dominating the market. For example, i-mode devices use cHTML (W3C, 1998) and WAP devices use WML (Wireless Application Protocol Forum, Ltd., 2001). Even worse, no one microbrowser dominates the microbrowser market, and a microbrowser may be able to show mobile content us-
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