CHAPTER THIRTY-TWO

Software

Test everything. Hold on to the good.
I Thessalonians 5:21

32.1 Web Programming

The software for the book is Web-centric in that a reasonably updated Web browser is all that is needed to run it. The software is transferred to the user when clicked; no installation is necessary. As the collection of software expands, *The Capitals* Web page will reflect that. This new medium of software distribution excels the traditional way of bundling software with each book in a floppy disk or a CD-ROM [705].

The Web promises to be a platform that is independent of the computer's operating system and hardware. That means a program or document written in HTML (Hypertext Markup Language [167]) can be run everywhere, and the author is relieved from worrying about the potentially infinite number of computer systems that may access the code. As of now, this promise is not yet fully realized. To start with, the same document or program often elicits different behaviors from browsers of various companies or even browsers of the same family but with different versions. Browsers may implement only a subset of the standard plus a few nonstandard features. Additional complications are the possible versions of Java shipped with the browser and window systems running on top of the operating system. Fortunately, in most cases these problems are either inessential or can be avoided by upgrading the browser and not using nonstandard features.

32.2 Use of *The Capitals* Software

Open *The Capitals* at

www.csie.ntu.edu.tw/~lyuu/capitals.html.

See Fig. 32.1 for a typical look. Now click on any program to run it. For example, click on "mortgage" to generate the calculator in Fig. 32.2. Many financial problems can be solved by using two or more programs simultaneously. For example, one can run "spot & forward rates from coupon bonds" to calculate the spot rates. Then copy these rates into "seq. CMO pricer (vector)" to price CMOs. As another example, consider pricing CMO tranches at 10 years before maturity. We can run

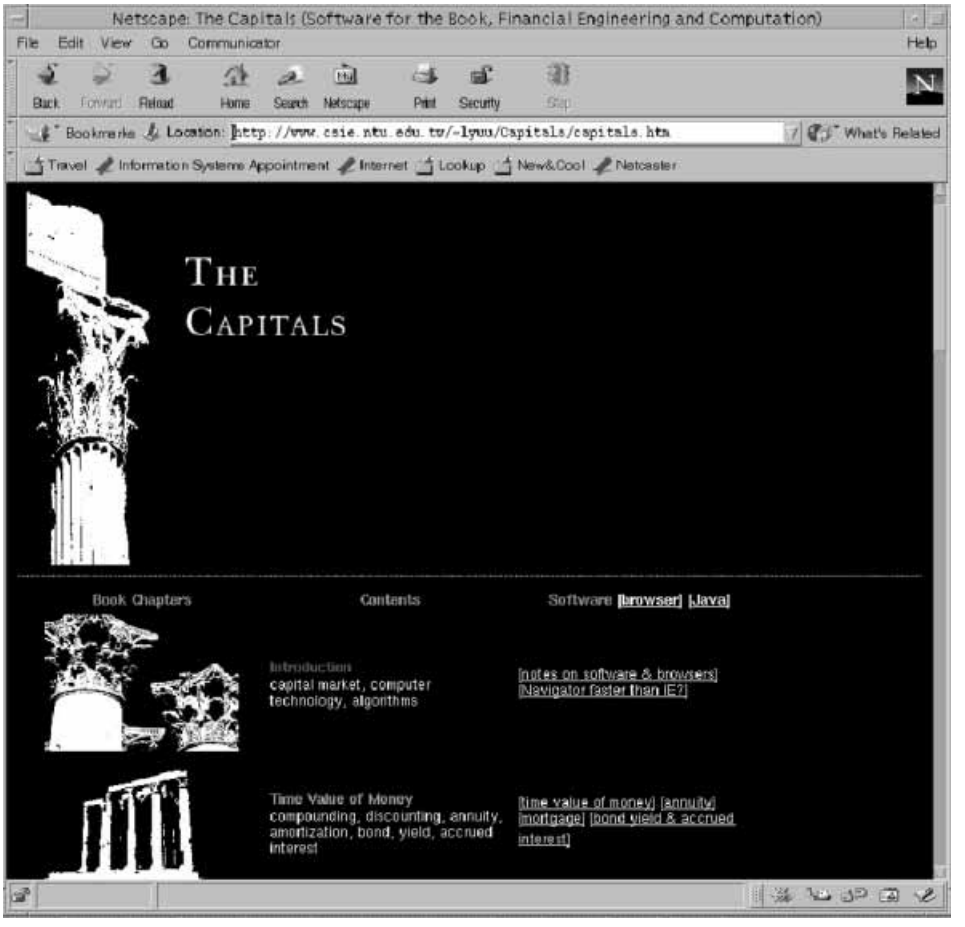

Figure 32.1: *The Capitals* page. This page is displayed by the Netscape browser in a Unix environment. The looks may differ from browser to browser and can be altered by changing the browser's settings.

"seq. CMO (vector)" to derive the tranches' remaining balances at that time. Then plug those numbers as original principals into "seq. CMO pricer (vector)" with 10 years remaining.

Some programs can be applied to situations not originally intended. For instance, CMO programs can be used for individual mortgages by allocating the entire principal to the first tranche; the cash flow of an SMBS can be tabulated by "pool P&I tabulator (vector)," and so on.

The following guidelines are recommended to run *The Capitals* software smoothly.

- Netscape Navigator 4.0 or higher, or Microsoft's Internet Explorer 4.0 or higher.
- Enable Java.
- Use Java 1.1.4 or higher.

Check "notes on software & browsers" for additional information.

The programs at *The Capitals* are written in JavaScript [357] and Java [356, 467].[1] Because it is the Java-enabled Web browser that interprets and executes the code, user interaction and processing are offloaded to the user's computer. This client/server

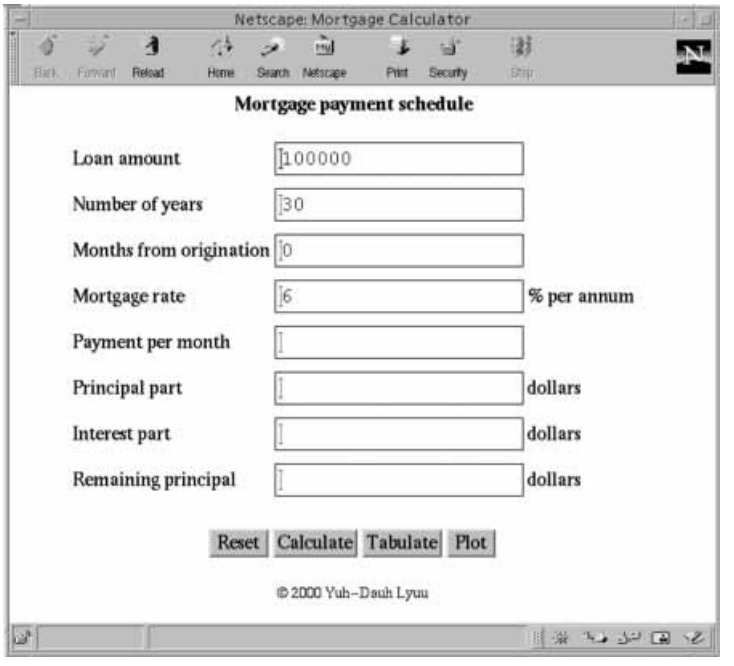

Figure 32.2: Mortgage calculator.

architecture is more efficient than having many clients' computing and interaction tasks running on the server, slowing it down for everybody. The unstated assumptions have been that the user's computer is reasonably powerful and the network is reasonably fast [719]. Java programs that run in a Web browser are called **Java applets** (see Fig. 32.3) [264].

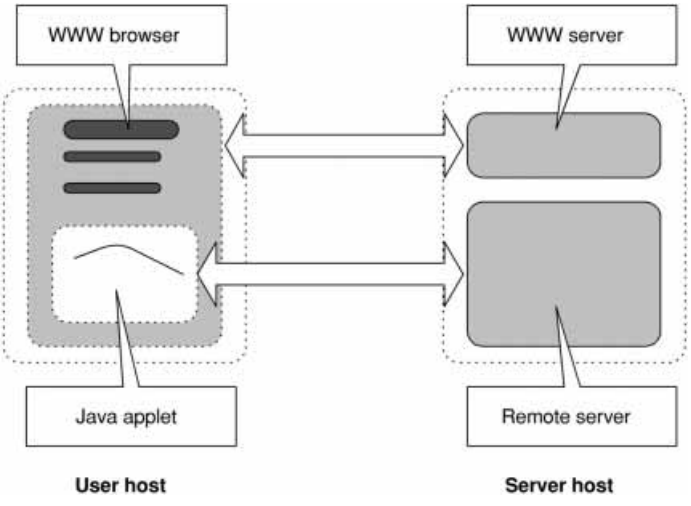

Figure 32.3: Java client/server architecture on the Web. The Java programming language was released by Sun in May of 1995. It promised platform-independent client/server software systems [356, 416].

32.3 Further Topics

Some computation-intensive tasks can take advantage of parallel processing for much faster performance. A good example is Monte Carlo MBS pricing. It starts by breaking the job into several tasks, each of which, on a different computer, simulates a fraction of the interest rate scenarios and calculates the average price. The averages are then collected to obtain the overall average price. Note that once the work has been divided, no communication among the tasks is needed before the collection stage. Good speed-ups have been obtained [528, 601, 794, 892, 893]. In contrast, a task that cannot be structured in such a way as to limit the amount of communication, hence dependency, among the tasks will not result in good performance [588]. Only computation-intensive problems are worthwhile to parallelize.

The Web technology is young and evolving quickly. Users and developers have been willing to tolerate many annoyances because they are witnessing something that promises to change the way society works. If the history of the auto industry is any guide, it will take decades for the technology to mature. Fortunately, thanks to the efforts and dedication of many corporations and computer professionals, the Web has become the most important and easy-to-use platform for software.

NOTE

1. JavaScript is not Java, but it has a similar syntax.

> There is nothing new to be discovered in physics now [1900].
>
> William Thomson (aka Lord Kelvin) (1824–1907)