

# 计算机导论

(双语版)

## Introduction to Computer Science

◇ 范玉涛 主编



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## 内 容 简 介

计算机科学与技术专业的新生在进入大学校门以后对于自己所学的专业既充满无限向往又会有许多的迷惑与不解,因而急切需要了解大学阶段将要学习的专业知识和需要掌握的专业技能。本书共 13 章,涵盖了计算机学科的基础知识和最新热门前沿问题,既注重强化学生的专业知识基础,又紧跟学科发展方向。同时,本书采用双语编写,图文并茂、概念清楚、深入浅出,可以使学生在获取相关专业知识的同时提高科技英语的应用能力,为日后阅读英文文献、学习更新的专业知识打下基础。

本书除了适合计算机科学与技术专业本科生的课程教学外,也可以作为计算机英语资料供更多读者阅读使用。

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# 前言

“计算机导论”作为计算机科学与技术专业学生的第一门专业基础课，旨在为学生提供计算机科学与技术学科的一个整体框架，使学生初步了解计算机的核心概念并培养计算机科学思维，同时掌握必要的操作技能，为将来专业课程的学习奠定基础。

本书既涵盖计算机学科的基础知识，注重夯实学生的学科基础，同时也涉及部分本学科的发展前沿问题。全书共 13 章：第 1 章为绪论，介绍计算机的硬件和软件构成，包括计算机系统的硬件构成、Windows 操作系统的桌面构成、鼠标和键盘的使用、软件的启动和窗口构成、Internet 的基础知识；第 2 章介绍计算机的基础知识，包括计算机的发展历史、计算机系统的构成和计算机的分类；第 3 章介绍计算机的硬件设备，包括集成电路、中央处理器单元（CPU）、主存、外存、输入/输出设备和总线等方面的内容；第 4 章介绍计算机中使用的数制系统，包括二进制、八进制和十六进制的基本概念，以及各种数制系统之间的转换方法；第 5 章介绍计算机中数据的表示方法，包括各种数据类型的基本概念及其在计算机内部的表示方法；第 6 章介绍位运算的概念，包括算术运算（二进制加减法、补码加减法和浮点加减法）与逻辑运算；第 7 章介绍计算机的软件，包括文件的概念、软件的类型、软件保护、系统软件和应用软件的构成及类型；第 8 章介绍计算机程序设计的内容，包括程序设计和算法的基本概念、面向过程和面向对象程序设计方法的概念，以及软件工程的基本概念；第 9 章介绍计算机网络的知识，包括互联网的概念、网络的类型、模型和协议，以及 Internet 和 WWW；第 10 章介绍计算机安全知识，包括计算机安全的概念、威胁计算机安全的因素，以及各种计算机安全策略；第 11 章介绍数据结构，包括数据结构的概念和种类、计算机内存和指针的关系，以及各种常见的线性数据结构（数组、表、堆栈和队列）和非线性数据结构（树、图、记录 and 集合）的概念与应用方法；第 12 章介绍数据库的基础知识，包括和数据相关的各种概念、传统的数据存储方法、关系数据库管理系统（DBMS）的各种概念，以及结构化查询语言（SQL）的概念和用法；第 13 章介绍计算机学科的部分热门前沿课题，内容涉及大数据、嵌入式系统和物联网的基本概念与一般应用方法。

本书采用双语编写，每章都给出了学习目标、术语对照、课后习题、上机/实践内容，并对该章中的难点进行中文对照注释，尽可能地减少学生在采用英语学习专业知识过程中的语言障碍，让他们获得专业知识和语言能力的双重提高。

由于计算机科学技术发展迅速，知识内容更新快，各个主题分支内容繁杂，本书只能给予一个鸟瞰式的概览；同时，由于作者水平有限，书中难免会有疏漏之处，请广大读者批评指正。

编者

2016 年 12 月

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# Chapter One

# Orientation

In this chapter, some concepts associated with computer, software and the Internet are discussed. No matter whether you are familiar with a computer or not, you can learn some basics on computer. There are three parts in this chapter and each part will be further explicated in its following chapters.

## Part A Getting Started with Your Computer System

- a. Computer Equipment
- b. Windows Basics
- c. Mouse and Keyboard

## Part B Getting Started with Your Software

- a. Start Software
- b. Window Controls

## Part C Getting Started with the Internet

- a. The Internet
- b. Web Browsers

## Learning Goals

After studying this part, you should be able to:

- ☞ identify the basic components of a desktop computer system;
- ☞ identify the major components of the Windows desktop;
- ☞ gain some basic skills in using mouse and keyboard.

## Keywords and Technical Terms

digital information (数字信息)

hardware (硬件)

system unit (系统单元)

storage device (存储器)

monitor (显示器)

keyboard (键盘)

peripheral equipment (外围设备)

program (程序)

boot process (引导过程)

Start button (开始按钮)

Quick Start (快速启动)

pointer (指针)

home row key (基准键)

computer system (计算机系统)

software (软件)

Central Processing Unit (CPU, 中央处理器)

hard disk (硬盘)

mouse (鼠标)

speaker (扬声器)

input and output (I/O, 输入输出)

operating system (操作系统)

icon (图标)

Task bar (任务栏)

notification area (通知区)

functional key (功能键)

## Part A Getting Started with Your Computer System

We are living in an information age dependent upon **digital information**. Digital information is electronic information, the result of computer processing. Every type of jobs relies upon getting information, using it, managing it, and relaying it to others. Computers enable the efficient processing and storage of information. Then, what does a common computer system for daily use look like?

数字信息 (digital information) 即电子信息, 是计算机的处理结果。

### a. Computer Equipment

A **computer system** refers to a computer and all of its equipment, which is usually divided into two parts: **hardware** and **software**. A desktop computer system is the most widely used, and its name indicates that such a computer is designed for stationary use on a desk or table. Figure 1-1 shows the basic hardware components of a desktop computer system.

计算机系统 (computer system) 指计算机本身及其所有部件, 包括硬件和软件两大部分, 缺一不可。

A computer system is made up of separate components and all of these

系统的主要部件称



components are usually connected by cables. The main component is called the **system unit**. For a typical desktop computer system, it is usually a rectangular case that sits on or underneath a desk. In the system unit, there is a **Central Processing Unit (CPU)** which is the core of the whole system. And all the work of information processing for the computer system is held in the CPU. In addition, some **storage devices**, such as **hard disks**, are included in the system unit. The storage devices keep the necessary information waiting to be processed by the CPU. Other components, such as the **monitor**, the **mouse**, the **keyboard** and the **speakers**, are connected to the system unit. Equipment like speakers, printers, keyboards, scanners, etc., is called **peripheral equipment**, sometimes abbreviated as “peripherals”. The peripherals are used to provide necessary **input and output** for the CPU. Without peripheral equipment for input and output, the computer will not be able to do anything you find useful.

为系统单元 (system unit)。对于典型的桌面计算机系统, 该部件通常是位于桌面上/下的一个长方形箱体。

像扬声器、打印机、键盘和扫描仪等部件称为外围设备 (peripheral equipment)。

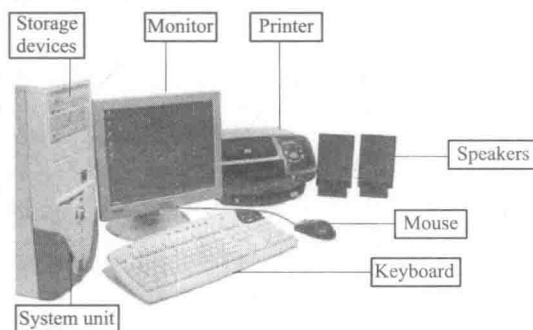


Figure 1-1 Basic Hardware Components of a Desktop Computer System

## b. Windows Basics

Computer systems cannot help users do anything unless they have some type of software (**program**) to do this. Among all the software users need, the most important and basic software is the **operating system** which is responsible for the management and coordination of activities and the sharing of the limited resources of computers.

Windows produced by the Microsoft Corporation is an example of operating systems and maybe is the most widely used one in the world. For a computer system with Windows, if the **boot process** can be successfully completed in a short time, the Windows desktop will be displayed on the screen. The Windows desktop is the base of operations for using a computer.

As shown in Figure 1-2, Windows displays on-screen controls designed to be manipulated by a mouse. Users can easily start programs or applications, copy and move files from one place to another, and drag and drop files and programs where they want them on the computers.

用户所需软件中最为重要和基础的是操作系统 (operating system), 它负责管理和协调计算机的各种行为活动和有限资源的共享。

安装了 Windows 的计算机系统, 在用户开机后, 如果引导过程在短时间内成功完成, 则屏幕上就会出现 Windows 桌面。

The Windows desktop is usually divided into several areas. The main part displays small pictures called **icons** that represent software, files and folders containing documents, graphics and other data. The **Start button** is used to display the Start menu, which lists all the programs installed on a computer. When working with computers, users will frequently use the Start button in the lower-left corner of the screen to display the Start menu that provides options for accessing software, finding data, configuring hardware and finding answers to their questions about using Windows. The **Task bar** contains the Start button, the **Quick Start bar** and the **Notification area**. The Quick Start bar is always visible, making it a good place for icons that represent the programs users frequently use. The Notification area displays the current time and the status of programs, devices and Internet connections.

Windows 桌面通常分为若干区域。主体区域显示一些称为图标（icon）的小图片，代表软件、文件和文件夹（包含文档、图片及其他数据）。

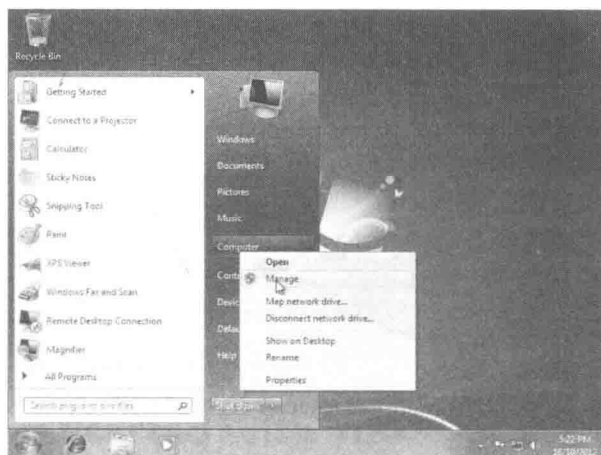


Figure 1-2 Components of the Windows Desktop

### c. Mouse and Keyboard

A mouse is the major device used to manipulate the controls displayed on the Windows desktop. Nowadays, most mice usually have two buttons: a primary button (usually the left button) and a secondary button. Many mice also have a wheel between the two buttons, which allows users to scroll smoothly through screens of information. When users move the mouse with their hands, a **pointer** on the screen will move in the same direction. (The pointer's appearance may change depending on where it is positioned on your screen.) When users want to select an item, they point to the item and then click (press and release) the primary button.

Pointing and clicking with a mouse is the main way to interact with the computer. The following list (Table 1-1) shows some basic mouse actions.

目前，大多数鼠标都有两个按键：主键和次键。很多鼠标在两键之间还装有滚轮，允许用户在信息屏之间平滑滚动。

Table 1-1 Some Basic Mouse Actions

Action	How to	Result
Click	Press the left mouse button once and then immediately release it	Select an object
Double-click	Press the left mouse button twice in rapid succession without moving the body of the mouse	Activate an object
Right-click	Press the right mouse button once, and then immediately release it	Display a shortcut menu
Drag	Hold the left mouse button down while you move the mouse	Move an object

When users work with Windows, the keyboard also helps them to communicate with the computer. Like the keyboard on a typewriter, the computer keyboard has keys for letters and numbers, but it also has special keys. If users want to use it to manipulate the controls of Windows, they need to press some special keys such as Alt, Shift and **functional keys** (F1 to F12). If they want to provide some textual information to the computer, an insertion point that looks like a flashing vertical bar indicates where the text users' typing will appear. Users can change the location of the insertion point by using the mouse or the arrow keys of the keyboard.

When using the keyboard for typing, users should always keep the home row fingers touching **home row keys** even in a difficult reach. When starting typing, move the right finger to the right key and strike it quickly and then return the finger to the original position. Keep fingers curved and hands in line with the keyboard. Don't let wrists touch the keyboard frame. Figure 1-3 shows the fingers chart.

在用键盘输入时，用户应保证基键手指始终接触到基键行，即使这样做有些困难。基键行与手指对应关系见图 1-3。

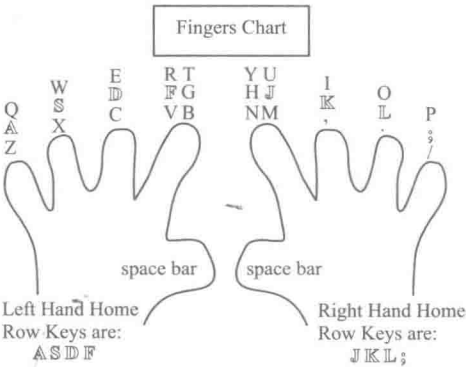


Figure 1-3 Fingers Chart on Keyboarding

Summary

本节介绍了桌面计算机系统的基本构成、Windows 桌面的控制元素，以及键盘和鼠标的基本使用方法。在计算机系统中，系统单元是整个计算机系统的核心，其中最重要的部件就

是中央处理器（CPU）。Windows 作为最流行的操作系统是用户使用计算机的基础，Windows 的桌面提供了各种控制元素，方便用户使用计算机的功能。在使用鼠标操作的时候，要熟练掌握鼠标的各种基本操作；在利用键盘输入时，要保持正确的指法。

## Questions/Exercises

### Blank-filling Exercises

1. A complete computer system usually includes two parts: hardware and \_\_\_\_\_.
2. In the system unit of a computer, the \_\_\_\_\_ is the core of all the computer system.
3. The equipment used to provide necessary input and output for CPU is called \_\_\_\_\_.
4. Windows produced by the Microsoft Corporation is an example of \_\_\_\_\_ and maybe is the most widely used one in the world.
5. The Windows desktop uses small pictures called \_\_\_\_\_ that represent software, files and folders containing documents, graphics and other data.
6. When you move the mouse with your hand, a(n) \_\_\_\_\_ on your screen will move in the same direction.
7. Generally on the top of the standard computer keyboard is the \_\_\_\_\_ including F1 to F12.
8. According to Figure 1-3, when using the keyboard for typing, you should always keep eight fingers touching \_\_\_\_\_ and two thumbs on the space bar.

### Laboratory Exercises

1. Please find out the components of a desktop computer and describe their functions.
2. Find out the power switch of your computer and turn on your computer. Please notice the process before the Windows desktop shows on the screen if your computer has been equipped with some Windows operating system.
3. Practice the operation of mouse and keyboard on the your computer.

## Learning Goals

After studying this part, you should be able to:

- 🔑 understand the idea of computer software or program;
- 🔑 know how to start and exit a software program;
- 🔑 identify the major controls of a software window.

## Keywords and Technical Terms

application software (应用软件)

system software (系统软件)

Title bar (标题栏)

Status bar (状态栏)

word processor (字处理器)

shortcut (快捷方式)

Menu bar (菜单栏)

## Part B Getting Started with Your Software

The component like a monitor is a physical entity, and we usually call those physical entities that can be seen or touched as hardware. The computer hardware is the basic part of a complete computer system. However, a computer system with only hardware is useless, and plenty of software is necessary. It is the computer software that makes the computer powerful. In a computer system, the hardware and the software are interconnected. Without software, the hardware of a computer would have no function. However, without the creation of hardware to perform tasks directed by software via the CPU, software would be useless. Computer software is a program that enables a computer to perform a specific task, as opposed to the physical components of the system (hardware). This includes **application software**, such as a **word processor**, and **system software**, such as an operating system.

计算机软件是计算机系统的重要组成部分。没有软件，硬件不能发挥任何作用。其中应用软件是种类最丰富的软件类型，它的安装使用使得计算机成为功能强大的工具。

### a. Start Software

You can choose many ways to start your software like Microsoft Word, but the most common way is to use the Start button. Click the Start button to display the Start menu, and in the All programs where there lists all software installed on your computer, you can choose Microsoft Word and click it. Wait a few seconds for your computer to display the main screen for Microsoft Word (Figure 1-4). In addition, if your software has a **shortcut** on the Window desktop, you can double click the icon representing the software and it can work for you.

启动安装在计算机上的各种软件常用的两种方法是：通过开始菜单和桌面上代表该软件的图标。

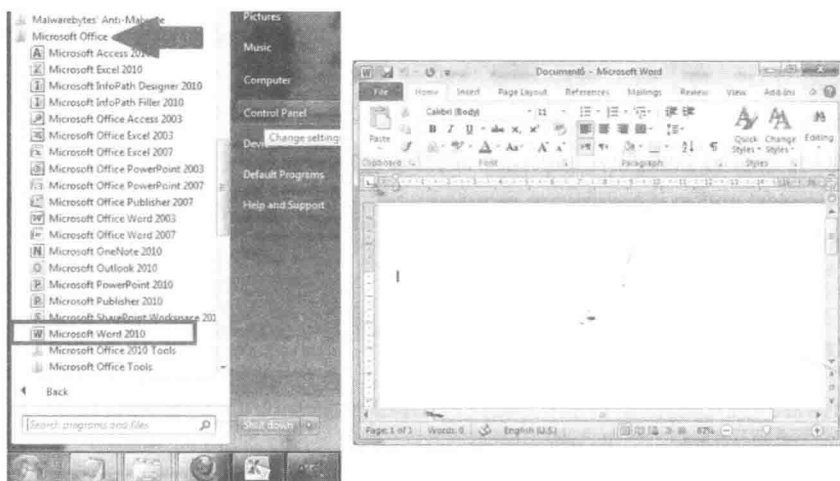


Figure 1-4 Start Microsoft Word through the Start Button

## b. Window Controls

No matter what way you use to launch the software that has been installed on your computer, it appears in a rectangular area called a “window” which typically includes a **Title bar**, a **Menu bar**, and various controls as shown in Figure 1-5.

安装在计算机上的各种应用软件启动后都以矩形窗口的方式出现。

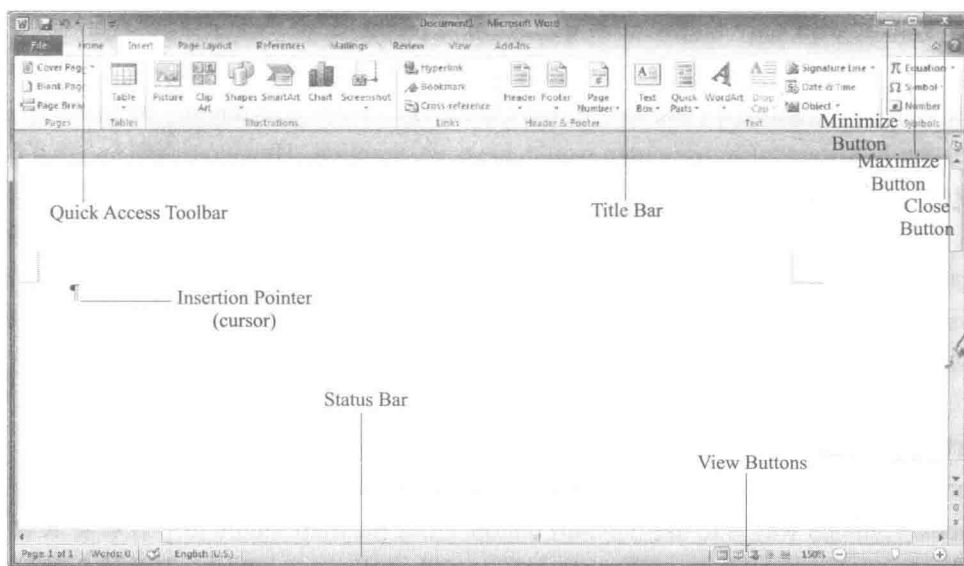


Figure 1-5 Window Controls of Microsoft Word

The Title bar is at the top of the window and contains the filename of the open file, the program name and the program window sizing buttons. The large workplace is where you complete your work with the software. According to the different software you are running, the appearance of the

应用软件的窗口主要包括标题栏、菜单栏、状态栏和各种控制元素，可以方便用

workplace will be a little different. An area at the bottom of the program window is called **Status bar**. The Status bar contains information about the open file or the current task on which you are working.

户利用它们来完成相应的操作。

## Summary

本节介绍了在 Windows 操作系统下如何启动软件的方式和标准的 Windows 窗口构成。在桌面上的“开始”按钮—“所有程序”中，可以找到安装在计算机中的所有软件，完成启动。另外，如果该软件已经被创建了桌面的快捷方式，也可以双击桌面上的相应图标完成启动。对于 Windows 下的所有应用程序的窗口，大致都会有标题栏、菜单栏、基本工作区和状态栏，方便用户使用该软件。

## Questions/Exercises

### Blank-filling Exercises

1. A computer system with only hardware is useless, it is \_\_\_\_\_ that makes the computer system powerful and versatile.
2. Computer software is generally grouped into two categories: system software, such as Microsoft Windows, and \_\_\_\_\_ like Microsoft Word.
3. To start your software under Windows, the most common way is to use \_\_\_\_\_ on the lower left corner of the Windows desktop.
4. In Microsoft Windows, each software or program appears in a window on the top of which is \_\_\_\_\_ showing the filename of the open file, the program name and the program window sizing buttons.
5. An area at the bottom of the program window is called \_\_\_\_\_ which contains information about the open file or the current task on which you are working.

### Laboratory Exercises

1. Please try to start the Windows Paint through the Start button. Try to start the Internet Explorer through the Internet Explorer icon on the Windows desktop.
2. Identify the windows of the software you start according to the above exercise and notice the differences between the two types of software.

## Learning Goals

After studying this part, you should be able to:

- ✓ know the power of the Internet;
- ✓ know how to use a browser or a search engine to find out specific information on the Web.

## Keywords and Technical Terms

Internet (因特网)

E-commerce (电子商务)

World Wide Web (WWW, 万维网, 简称 Web)

UNIX (多用户、多任务操作系统)

E-mail(电子邮件)

Web site (网站)

Web page (网页)

browser (浏览器)

Uniform Resource Locator (URL, 统一资源定位器)

## Part C Getting Started with the Internet

### a. The Internet

Today, whether you want to find the latest financial news, browse through library catalogs, exchange information with colleagues, or join in a lively political debate, you can seek help from the **Internet**.

The Internet links computer networks all over the world so that users can share resources and communicate with each other. It is always available for you to use, 24 hours a day, 7 days a week, 365 days a year. You do not have to wait for it to open or wait for someone to make it available. It is just there, whenever you need it and for whatever you need.

The availability and accessibility to information via the Internet has transformed the world into a global village. With little time consumption, major tasks can be performed through the Internet using very little resources. The spread of the Internet around the globe has created job opportunities and expanded the work circle. The Internet has revolutionized the way business is done, thanks to innovations such as online shopping, Internet banking and **E-commerce**. The Internet has also introduced tremendous flexibility in the education sector. Through E-learning, you can attain a degree without physically appearing in a classroom.

因特网 (Internet) 连接了全球的计算机网络, 网络用户可以共享资源并相互沟通交流。通过因特网获取和访问信息, 可以节省时间、削减功耗、提升机遇, 因特网极大地改变着人类的学习和生活方式。

### b. Web Browsers

The most widely used part of the Internet is the **World Wide Web** (simply the Web). Before the Web, information retrieval on the Internet was

万维网 (World Wide Web), 简称 Web, 是因特网上最广泛的应用之一, 其主要特点就是易用、多媒体



text-based and required that users know basic **UNIX** commands. The Web has gained Internet popularity largely because of its ease of use (point-and-click graphical interface) and multimedia capabilities, as well as its convenient access to other types of Internet services (such as **E-mail**).

All the Web information is accessible from **Web sites** located on various computers. The information is displayed as a series of screens called **Web pages**. To use the Web is to use some tools to visit the Web site for what you want. A **browser** is just a tool that lets you type in a unique Web page address called a **Uniform Resource Locator (URL)** and jump from the page to other Web pages by using links. For Windows users, the most common browser is Internet Explorer (IE). Figure 1-6 shows the Window of Internet Explorer.

功能和便于访问其  
他因特网服务。

通过网站 (Web site)  
可以访问万维网提  
供的信息。网站由网  
页 (Web page) 组成。  
浏览器 (browser) 作  
为访问网页的工具,  
需要在其地址栏中给  
出网页的 URL 地址  
才可以访问该网页。



Figure 1-6 The Window of Internet Explorer

If you are looking for information but do not know the Web site where it might be located, you can use a **search engine** to find it out. The most famous search engine is Google. You only need to type “www.google.com” into the address box of your Web browser like IE and then press the Enter key on your keyboard; your browser will display the home page of Google (Figure 1-7). Type what you want Google to search for into the blank search box and then press the Enter key, and Google will display a list of Web pages that relates to what you want.



Figure 1-7 Home Page of Google