

经 典 原 版 书 库

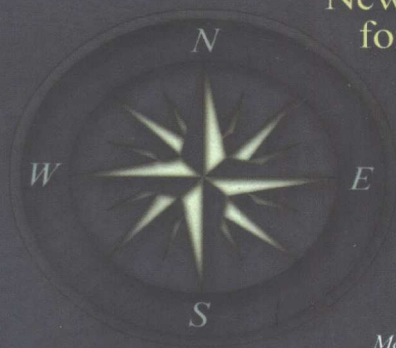
人本界面

设计交互式系统的最新指示

(英文版)

THE HUMANE INTERFACE

New Directions
for Designing
Interactive
Systems



Jef Raskin

*The creator of the
Macintosh goes beyond
today's graphic user
interfaces to show how
the Web, computers, and
information appliances
can be made easier to
learn and use.*

(美) Jef Raskin 著



机械工业出版社
China Machine Press



经 典 原 版 书 库

人本界面

设计交互式系统的最新指示

(英文版)

The Humane Interface

New Directions for Designing
Interactive Systems

(美) Jef Raskin 著



机械工业出版社
China Machine Press



English reprint edition copyright©2002 by PEARSON EDUCATION
NORTH ASIA LTD and China Machine Press.

Original English language title: The Humane Interface, by Jef Raskin,
Copyright © 2000.

All rights reserved.

Published by arrangement with the original publisher, Pearson Education,
Inc., publishing as Addison Wesley Publishing Company, Inc.

This edition is authorized for sale only in People's Republic of China
(excluding the Special Administrative Region of Hong Kong and Macau).

本书封面贴有Pearson Education培生教育出版集团激光防伪标签,无
标签者不得销售。

本书英文影印版由Pearson Education North Asia Ltd. 授权机械工业出
版社在中国大陆境内独家出版发行。未经出版者许可,不得以任何方式
抄袭、复制或节录本书中的任何内容。

版权所有,侵权必究。

本书版权登记号: 图字: 01-2002-3863

图书在版编目(CIP)数据

人本界面设计交互式系统的最新指示 / (美)拉斯金 (Raskin, J.)
著. -北京: 机械工业出版社, 2002.8

(经典原版书库)

书名原文: The Human Interface

ISBN 7-111-10577 -X

I. 人… II. 拉… III. 人-机系统-系统设计-英文版 IV. TP11

中国版本图书馆CIP数据核字(2002)第051857号

机械工业出版社(北京市西城区百万庄大街22号 邮政编码 100037)

责任编辑: 华 章

北京昌平奔腾印刷厂印刷·新华书店北京发行所发行

2002年8月第1版第1次印刷

850mm × 1168mm 1/32 · 8.625印张

印数: 0 001-3 000册

定价: 28.00元

凡购本书,如有倒页、脱页、缺页,由本社发行部调换

出版者的话

文艺复兴以降，源远流长的科学精神和逐步形成的学术规范，使西方国家在自然科学的各个领域中取得了垄断性的优势；也正是这样的传统，使美国在信息技术发展的六十多年间名家辈出、独领风骚。在商业化的进程中，美国的产业界与教育界越来越紧密地结合，计算机学科中的许多泰山北斗同时身处科研和教学的最前线，由此而产生的经典科学著作，不仅擘划了研究的范畴，还揭橥了学术的源变，既遵循学术规范，又自有学者个性，其价值并不会因年月的流逝而减退。

近年，在全球信息化大潮的推动下，我国的计算机产业发展迅猛，对专业人才的需求日益迫切。这对计算机教育界和出版界都既是机遇，也是挑战；而专业教材的建设在教育战略上显得举足轻重。在我国信息技术发展时间较短、从业人员较少的现状下，美国等发达国家在其计算机科学发展的几十年间积淀的经典教材仍有许多值得借鉴之处。因此，引进一批国外优秀计算机教材将对我国计算机教育事业的发展起积极的推动作用，也是与世界接轨、建设真正的世界一流大学的必由之路。

机械工业出版社华章图文信息有限公司较早意识到“出版要为教育服务”。自1998年始，华章公司就将工作重点放在了遴选、移译国外优秀教材上。经过几年的不懈努力，我们与Prentice Hall, Addison-Wesley, McGraw-Hill, Morgan Kaufmann等世界著名出版公司建立了良好的合作关系，从它们现有的数百种教材中甄选出Tanenbaum, Stroustrup, Kernighan, Jim Gray等大师名家的一批经典作品，以“计算机科学丛书”为总称出版，供读者学习、研究及度藏。大理石纹理的封面，也正体现了这套丛书的品位和格调。

“计算机科学丛书”的出版工作得到了国内外学者的鼎力襄助，国内的专家不仅提供了中肯的选题指导，还不辞劳苦地担任了翻译和审校的工作；而原书的作者也相当关注其作品在中国的传播，有的还专诚为其书的中译本作序。迄今，“计算机科学丛书”已经出版了近百个品种，这些书籍在读者中树立了良好的口碑，并被许多高校采用为正式教材和参考书籍，为进一步推广与发展打下了坚实的基础。

随着学科建设的初步完善和教材改革的逐渐深化，教育界对国外计算机教材的需求和应用都步入一个新的阶段。为此，华章公司将加大引进教材的力度，在“华章教育”的总规划之下出版三个系列的计算机教材：针对本科生的核心课程，剔抉外版菁华而成“国外经典教材”系列；对影印版的教材，则单独开辟出“经典原版书库”；定位在高级教程和专业参考的“计算机科学丛书”还将保持原来的风格，继续出版新的品种。为了保证这三套丛书的权威性，同时也为了更好地为学校和老师服务，华章公司聘请了中国科学院、北京大学、清华大学、国防科技大学、复旦大学、上海交通大学、南京大学、浙江大学、中国科技大学、哈尔滨工业大学、西安交通大学、中国人民大学、北京航空航天大学、北京邮电大学、中山大学、解放军理工大学、郑州大学、湖北工学院、中国国家信息安全测评认证中心等国内重点大学和科研机构在计算机的各个领域的著名学者组成“专家指导委员会”，为我们提供选题意见和出版监督。

“经典原版书库”是响应教育部提出的使用原版国外教材的号召，为国内高校的计算机教学度身订造的。在广泛地征求并听取丛书的“专家指导委员会”的意见后，我们最终选定了这30多种篇幅内容适度、讲解鞭辟入里的教材，其中的大部分已经被M.I.T.、Stanford、U.C. Berkley、C.M.U.等世界名牌大学采用。丛书不仅涵盖了程序设计、数据结构、操作系统、计算机体系结构、数据库、编译原理、软件工程、图形学、通信与网络、离散数学等国内大学计算机专业普遍开设的核心课程，而且各具特色——有的出自语言设计者之手、有的历三十年而不衰、有的已被全世界的几百所高校采用。在这些圆熟通博的名师大作的指引之下，读者必将在计算机科学的宫殿中由登堂而入室。

权威的作者、经典的教材、一流的译者、严格的审校、精细的编辑，这些因素使我们的图书有了质量的保证，但我们的目标是尽善尽美，而反馈的意见正是我们达到这一终极目标的重要帮助。教材的出版只是我们的后续服务的起点。华章公司欢迎老师和读者对我们的工作提出建议或给予指正，我们的联系方式如下：

电子邮件：hzedu@hzbook.com

联系电话：(010) 68995265

联系地址：北京市西城区百万庄南街1号

邮政编码：100037

专家指导委员会

(按姓氏笔画顺序)

尤晋元	王珊	冯博琴	史忠植	史美林
石教英	吕建	孙玉芳	吴世忠	吴时霖
张立昂	李伟琴	李师贤	李建中	杨冬青
邵维忠	陆丽娜	陆鑫达	陈向群	周伯生
周克定	周傲英	孟小峰	岳丽华	范明
郑国梁	施伯乐	钟玉琢	唐世渭	袁崇义
高传善	梅宏	程旭	程时端	谢希仁
裘宗燕	戴葵			

PREFACE

I don't know what percentage of our time on any computer-based project is spent getting the equipment to work right, but if I had a gardener who spent as much of the time fixing her shovel as we spend fooling with our computers, I'd buy her a good shovel. At least you can buy a good shovel.

—Erasmus Smums

Creating an interface is much like building a house: If you don't get the foundations right, no amount of decorating can fix the resulting structure. *The Humane Interface* reexamines the cognitive foundations of human-machine interaction to elucidate a crucial aspect of why interface designs succeed or fail. One finding is that present-day graphical user interfaces, such as those of the Windows and Macintosh operating systems, which are based on an architecture of operating system plus application programs, are inherently flawed. A different approach is required if computers are to become more pleasant and if users are to become more productive. This book describes some of the fundamental flaws in user interfaces and describes solutions for overcoming those flaws.

Although the techniques covered in *The Humane Interface* apply to a wide range of products—including web sites, application software, handheld personal data managers and other information appliances, and operating systems—this book does not present a survey of the field of human-machine

interface design. Rather, this book strikes out in new directions while also reviewing those established parts of interface design that are needed in the development of the new material.

If we are to surmount the inherent problems in present human-machine interfaces, it is necessary that we understand the teachings of this volume; it is not, however, *sufficient*. Many important aspects of interaction design are not included here because they are well covered in the literature. This book is intended to complement existing—or to be a prolegomenon to future—treatments of interface design.

The audience for this book includes

- Web designers and managers who want to give their sites a special ease of use that appeals to audiences and helps customers to find the information they need and to buy what they want
- Product designers and product managers who need to be able to create web sites or products that will win and retain customers by offering ease of use and ready learnability and by having a first-rate feature set
- Corporate managers who correctly insist on making products that have low maintenance and that reduce the need for help desks
- Programmers who do interface design—and who doesn't these days?—and who want to understand more of the factors that make their work most useful
- IT (information technology) managers who need to know which interface features will minimize their costs for training and which interface designs are likely to aid productivity
- Consumers who want to learn what to hope for in terms of pleasant interaction with computers and other equipment, and what is wrong with the way today's software is designed
- Computer science and cognitive psychology students who want to understand what lies behind heuristics of interface design

Finally, this book is for human-machine interface researchers, who may find that they will never again be able to view interfaces in quite the same way they did before reading *The Humane Interface*.

ACKNOWLEDGMENTS

Friendly counsel cuts off many foes.

—William Shakespeare (*King Henry VI, Act III, Scene 1*)

To list those who have helped is difficult, because they are so numerous, and the debt is so enormous. Many friends, colleagues, relations, reviewers, and some generous strangers I know only via the Internet have contributed ideas, critiques, suggestions, and detailed editorial work. Please forgive (and inform) me if you've helped and I've left you out or gotten your name or title wrong.

Thanks to the groups at Addison Wesley Longman, whether editors, designers, in PR, marketing, or whatever, all of whom seem to have been chosen not only for their competence, but also for their friendliness and forbearance. On the other hand, the anonymous reviewers they chose were merciless, for which I am also grateful.

Among the following list are friends, acquaintances, colleagues, my brother, my son's horn teacher, a fellow model airplane enthusiast—a seemingly unlikely lot. Only a few are experts in human-computer interface design, but all have read my manuscript and made essential contributions to the book or have contributed over the years to its concepts: David Alzofon (who also drew Quasimodo), Bill Atkinson, Thomas Atwood, Paul Baker, Jerry Barenholtz, John Bumgarner, David Caulkins, William Buxton, Ph.D., Renwick Curry, Ph.D., Robert Fowles, Josh Garrett, Ph.D., Jean-François

Groff, Scott Kim, Ph. D., Kathleen Mandis, Pamela Martin, Troy May, Miriam Meisler, Ph.D., Douglas McKenna, Michael S. Miller, David Moshal, M.D., Andrew Nielsen, Jakob Nielsen, Julie Ososke, Ian Patterson, Michael Raskin, Ph.D., Erasmus Smums, Spider Robinson, Minoru Taoyama, Shay Telfer, Yesso Tekerian, Bruce Tognazzini, David Wing, Terry Winograd, Ph.D., the local chapter (BayCHI) of the ACM's Special Interest Group in Computer-Human Interaction, which has let me preach and debate my theses, and the students at the Center for Computer Research in Music and Acoustics at Stanford University and its director, John Chowning.

I am lucky to have a literate as well as a loving wife, Linda Blum, R.N., who has never cared that writing a technical book is no way to support a family, so long as it was a worthy endeavor. Her attention to the ideas, direction, and details of this book have improved many a page. I can take no credit in choosing my parents, but they deserve much credit for teaching me to value people over things and to relish the arts as well as the sciences, choices that lead directly to this work. My son Aza contributed far beyond what you'd expect from someone of his youth, including ideas, editing, and hard work on the illustrations. He and his sisters were amazingly patient with me as I wrote. Especially important in my life is L. Roland Genise, my best teacher, who, during high school, gave me the twin gifts of intellectual self-confidence and a love of mathematics. Among those who have shared warm friendship, philosophy, and music, and who have been devastating editors of my earlier works, I am lucky to be able to name Brian Howard and Douglas Wyatt. I have disagreed with a few details of the writings of Dr. Donald Norman in this book, but these are minor points as I regard his work as essential reading in the field; without his critiques and teachings this book would not have come about. I am grateful to Bill Verplank, a quiet and agreeable sort whose comments are delivered so gently that you don't realize the rug's been pulled out until you hit the floor. His was one of the voices that convinced me to completely change the tone and orientation of the book, for the better. Another who hammered this book into shape was Lyn Dupré, a fierce and nitpicking professional editor. She wrote *BUGS in Writing*, which you should read. Many concepts, a few of which are cited in the text, came from or were polished during discussions and work done with my friend James Winter, M.D., Ph.D. The delightfully acerbic computer scientist Dick Karpinski, who styles himself aptly as the world's largest leprechaun, has been helpful in manifold ways, whether expounding on a technical point, introducing me to a key person or book, or dropping by with dim sum. And, whom I've saved for last, there's Peter Gordon, a man of wisdom, persistence, and (especially) patience, who was my advocate at

Addison-Wesley. Our correspondence must never be made public as it would reveal a penchant for extended word play and awful puns that would forever besmirch both our names, but which lightened the burden of endless details that must be attended to in putting together even so slim a book as this.

Thanks to Agfa Corporation for supplying the digital camera used in creating some of the illustrations.

Thanks, also, to the following readers, who first offered me particular corrections, or suggested changes, that have now been incorporated into the book: Eric Blossom, Jon Bondy, Paul Cubbage, Peter Jones, G. A. Michael, Cam Mitchner, Rich Morin, Martin Portman, and Elisabeth Riba. The author is also grateful to Rich Morin for supporting the www.jefraskin.com Web site.

INTRODUCTION

The Importance of Fundamentals

One person, one computer.

—Apple Computer slogan

Imagine that you have just boarded an airliner resplendent in its livery: fitted with a wide choice of video and audio for every glove-soft, leather-covered, oversized seat; its galleys provisioned with fine food and drink. You take your seat and look out the freshly cleaned large window. With a sigh of anticipation for a particularly pleasant flight, you reach into a small compartment in front of you to see what is there. A not-too-small bottle of your favorite beverage comes to hand first, followed by a little booklet about this remarkable airliner.

As the flight attendants swing the doors shut and you settle in, you read the booklet. You learn that the aircraft is the work of some of the finest interior designers from all over the world, that chefs from five-star restaurants have created the menu and personally prepared the dishes, and that because the internationally acclaimed artists who designed the exterior made the craft look so much faster than any other airliner, there had been no

need to include professional aeronautical engineers in the aircraft's development team.

In the small print used for legalese, the booklet warns that the ride tends to be bumpy, even in the absence of turbulence, and that the plane crashes regularly. However, the booklet promises, until any of those events occur, you will be comfortable and well entertained.

Suddenly, the latching of the doors seems menacing instead of promising. Your equanimity is gone; you are trapped. This flight, the only one to your destination, is doomed, and you are on it. At this point, you'd rather be sitting on a hard seat, no drink in your hand and no window by your side but in an aircraft blessed by great engineering.

This absurd situation closely parallels the nature of most human-machine interfaces today. Our computers and cellular telephones have the latest chips and electronics; today's operating systems are a feast for the eyes, with glorious colorful backgrounds and three-dimensional *tromp l'oeil* effects. You click on a button, and lo! it appears to move most realistically; you hear a digital stereophonic, full-fidelity rendering of a switch clicking, and your ears are enchanted by a resonant harp glissando as a window opens before you.

But when you start to use the system, it begins to poke you with uncomfortable corners of unexpected behavior. You cannot find the command you want among the thousands that the system provides. Simple, routine tasks take forever to do. The program you bought last year does not run under the improved operating system, so you have to buy an upgrade. And, of course, the system crashes regularly.

Some engineering fundamentals that are not widely known underlie good interfaces. And why should those fundamentals be studied? How interfaces should look and work seems well established: They've been incrementally improved for two decades now; we have interface guidelines published by the major software producers to ensure future compliance; development tools allow us to put together interfaces quickly such that they look just like other modern interfaces—just as my mythical airliner *looked just like* a well-designed, safe, and comfortable flying machine.

But consider what these interfaces fail to do for us. When you want to set down an idea, you should be able to go to your computer or information appliance and just start typing: no booting, no opening the word processor, no file names, no operating system. (My definition of an operating system: What you have to hassle with before you get to hassle with the application.) You should not have to learn an entire new application to perform what you know to be only a few simple tasks that you'd like to add to

the repertory of your system. Regrettably, the design of interfaces has taken a wrong turn, leading to a level of difficulty unjustified by technological or logical necessity.

Millions of us have a love-hate relationship with information technology: We can't live without it, but at the same time, we find it difficult to live with. The problem of making technology comfortable does have solutions, but we can't buy them now; they will be available to us only if we drop a lot of the baggage of the past. The customary, desktop-based, applications-oriented interfaces turn out to be part of the problem. This book offers some alternatives. After all, computer problems are not like the weather: We *can* do something about them.

Given the prevalence of the Internet and the obvious importance of products that facilitate group interaction, it may seem odd that *The Humane Interface* concentrates on single-user interface design. One reason is that the design of single-user interfaces is not a solved problem. The primary reason is that the quality of any interface is ultimately determined by the quality of the interaction between one human and one system—between you and it. *If a system's one-on-one interaction with its human user is not pleasant and facile, the resulting deficiency will poison the performance of the entire system, however fine that system might be in its other aspects.*

CONTENTS

PREFACE	xi
ACKNOWLEDGMENTS	xiii
INTRODUCTION: <i>The Importance of Fundamentals</i>	xvii
ONE <i>Background</i>	1
1-1 Interface Definition	2
1-2 Keep the Simple Simple	2
1-3 Human-Centered Design and User-Centered Design	3
1-4 Tools That Do Not Facilitate Design Innovation	4
1-5 Interface Design in the Design Cycle	5
1-6 Definition of a Humane Interface	6
TWO <i>Cognetics and the Locus of Attention</i>	9
2-1 Ergonomics and Cognetics: What We Can and Cannot Do	9
2-2 Cognitive Conscious and Cognitive Unconscious	11
2-3 Locus of Attention	17
2-3-1 Formation of Habits	18
2-3-2 Execution of Simultaneous Tasks	20
2-3-3 Singularity of the Locus of Attention	24
2-3-4 Origins of the Locus of Attention	27
2-3-5 Exploitation of the Single Locus of Attention	29
2-3-6 Resumption of Interrupted Work	31

THREE	<i>Meanings, Modes, Monotony, and Myths</i>	33
3-1	Nomenclature and Notations	33
3-2	Modes	37
3-2-1	Definition of Modes	42
3-2-2	Modes, User-Preference Settings, and Temporary Modes	47
3-2-3	Modes and Quasimodes	55
3-3	Noun-Verb versus Verb-Noun Constructions	59
3-4	Visibility and Affordances	62
3-5	Monotony	66
3-6	Myth of the Beginner-Expert Dichotomy	68
FOUR	<i>Quantification</i>	71
4-1	Quantitative Analyses of Interfaces	71
4-2	GOMS Keystroke-Level Model	72
4-2-1	Interface Timings	73
4-2-2	GOMS Calculations	76
4-2-3	GOMS Calculation Examples	77
4-2-3-1	Hal's Interface: Solution 1, Dialog Box	78
4-2-3-2	Hal's Interface: Solution 2, GUI	80
4-3	Measurement of Interface Efficiency	83
4-3-1	Efficiency of Hal's Interfaces	87
4-3-2	Other Solutions for Hal's Interface	90
4-4	Fitts' Law and Hick's Law	93
4-4-1	Fitts' Law	93
4-4-2	Hick's Law	96
FIVE	<i>Unification</i>	99
5-1	Uniformity and Elementary Actions	101
5-2	Elementary Actions Cataloged	103
5-2-1	Highlighting, Indication, and Selection	105
5-2-2	Commands	109
5-2-3	Display States of Objects	115
5-3	File Names and Structures	117
5-4	String Searches and Find Mechanisms	124

5-4-1 Search-Pattern Delimiters	127
5-4-2 Units of Interaction	129
5-5 Cursor Design and a Strategy for Making Selections	133
5-6 Cursor Position and LEAP	136
5-7 Applications Abolished	139
5-8 Commands and Transformers	143
SIX <i>Navigation and Other Aspects of Humane Interfaces</i>	149
6-1 Intuitive and Natural Interfaces	150
6-2 Better Navigation: ZoomWorld	152
6-3 Icons	168
6-4 Techniques and Help Facilities in Humane Interfaces	174
6-4-1 Cut and Paste	177
6-4-2 Messages to the User	178
6-4-3 Simplified Sign-Ons	183
6-4-4 Time Delays and Keyboard Tricks	184
6-5 Letter from a User	187
SEVEN <i>Interface Issues Outside the User Interface</i>	191
7-1 More Humane Programming Language Environments	192
7-1-1 System and Development Environment	192
7-1-2 Importance of Documentation in Program Creation	194
7-2 Modes and Cables	195
7-3 Ethics and Management of Interface Design	198
EIGHT <i>Conclusion</i>	205
APPENDIX A: <i>The One-Button Mouse History</i>	207
APPENDIX B: <i>SwyftCard Interface Theory of Operation</i>	211
REFERENCES	215
INDEX	221