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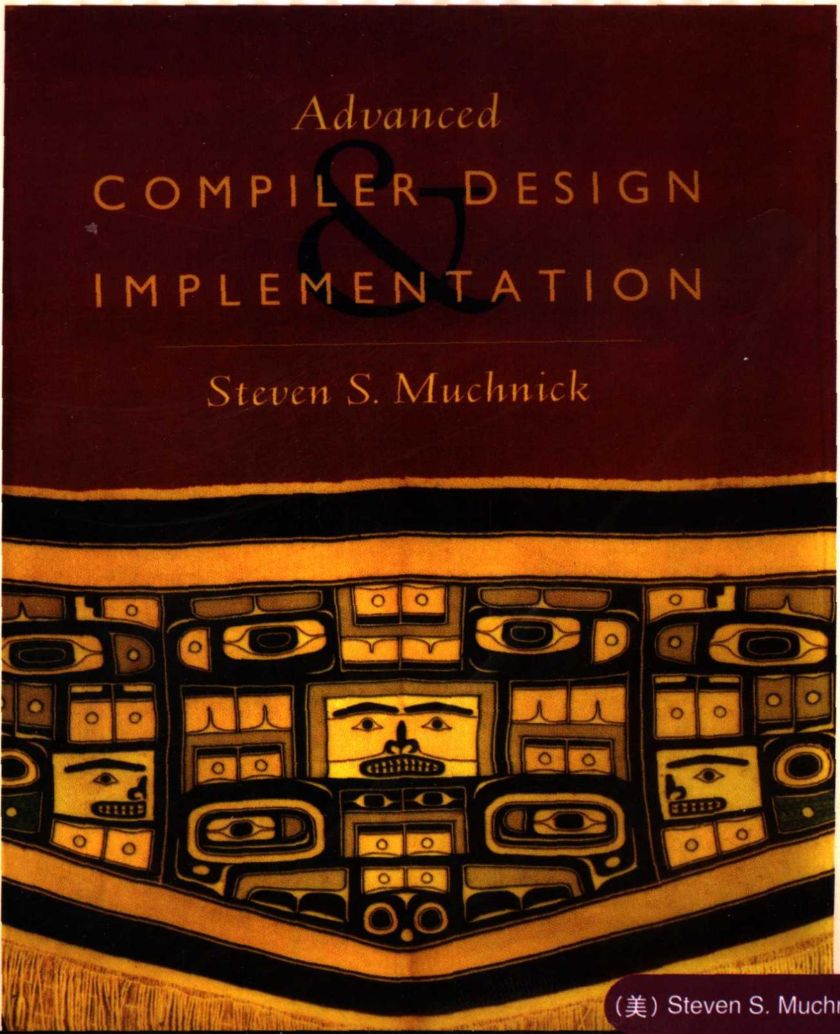
（英文版）



（美）Steven S. Muchnick 著

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高级编译器设计与实现（英文版）

Advanced Compiler Design and Implementation

本书是经典的编译器著作，与“龙书”齐名。书中针对现代语言和体系结构全面介绍了编译器设计与实现的高级论题，从编译器的基础领域中的高级问题开始，然后深入讨论了各种重要的代码优化。本书专为编译器专业人士和计算机专业本科生、研究生编写，在设计和实现高度优化的编译器以及确定优化的重要性和实现优化的最有效的方法等方面，为读者提供了非常有价值的指导。

本书的主要特点

- 为理解高级编译器设计的主要问题奠定了基础。
- 深入阐述了优化问题。
- 使用四个商业编译器（包括 Sun 的 SPARC、IBM 的 POWER 和 PowerPC、DEC 的 Alpha 以及 Intel 的 Pentium 和相关处理器上的编译器）的实例分析说明了编译器结构、中间代码设计和优化的各种方法。
- 给出了大量的定义明确的代码生成、优化和其他方面的算法。
- 用 Informal Compiler Algorithm Notation（ICAN）（一种由作者设计的语言）来以清晰、简洁的方式表达算法。

作者简介

Steven S. Muchnick 具有丰富而广博的经验。他曾经是计算机科学教授，后来他将自己的知识和经验应用于编译器设计，成为两种计算机体系结构（惠普的 PA-RISC 和 Sun 的 SPARC）开发团队的核心成员，并担任这些系统的高级编译器设计与实现的领导人。他的研究和开发经验对于指导读者做出编译器设计决策极具价值。

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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年开始，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、研究及庋藏。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：除“计算机科学丛书”之外，对影印版的教材，则单独开辟出“经典原版书库”；同时，引进全美通行的教学辅导书“Schaum's Outlines”系列组成“全美经典学习指导系列”。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们服务，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

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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。

这三套丛书是响应教育部提出的使用外版教材的号召，为国内高校的计算机及相关专业的教学度身订造的。其中许多教材均已为M. I. T.，Stanford，U.C. Berkeley，C. M. U. 等世界名牌大学所采用。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、有的历经三十年而不衰、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，我们的联系方法如下：

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Introduction to Advanced Topics

We begin by reviewing the structure of compilers and then proceed to lay the groundwork for our exploration of the advanced topics in compiler design and implementation discussed in the remainder of the book. In particular, we first review the basics of compiler structure and then give an overview of the advanced material about symbol-table structure and access, intermediate-code forms, run-time representations, and automatic generation of code generators contained in Chapters 3 through 6. Next we describe the importance of optimization to achieving fast code, possible structures for optimizing compilers, and the organization of optimizations in an aggressive optimizing compiler. Then we discuss the reading flow relationships among the chapters. We conclude with a list of related topics not covered in this book, two short sections on target machines used in examples and notations for numbers and the names we use for various data sizes, and a wrap-up of this chapter, followed by a Further Reading section and exercises, as will be found at the end of all but the last chapter.

1.1 Review of Compiler Structure

Strictly speaking, compilers are software systems that translate programs written in higher-level languages into equivalent programs in object code or machine language for execution on a computer. Thus, a particular compiler might run on an IBM-compatible personal computer and translate programs written in Fortran 77 into Intel 386–architecture object code to be run on a PC. The definition can be widened to include systems that translate from one higher-level language to another, from one machine language to another, from a higher-level language to an intermediate-level form, etc. With the wider definition, we might have, for example, a compiler that runs on an Apple Macintosh and translates Motorola M68000 Macintosh object code to PowerPC object code to be run on a PowerPC-based Macintosh.

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