Source Code Optimization Techniques
for
Data Flow Dominated
Embedded Software

by

Heiko Falk
Peter Marwedel

```
for (x4y1 = 0; x4y1 < 9; x4y1++)            {
    for (x4 = 0; x4 < 4; x4++)          {
        for (y4 = 0; y4 < 4; y4++)          {
            if (x1 < 0 || 35 < x1 || y1 < 0 || 48 < y1)
                p1 = 0;
            else
                p1 = tmp[(x1*196 + y1) % 464 + (x1*196 + y1) /
                                                464 * 1024 + 496];

            if (x1 < 0 || 35 < x1 || y1 < 0 || 48 < y1)
                p2 = 0;
            else
                p2 = tmp[(x1*196 + y1) % 496 + (x1*196 + y1) /
                                                496 * 1024];
}
```
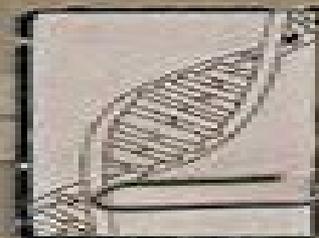
Foreword by Francky Catthoor

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Source Code Optimization Techniques For Data Flow Dominated Embedded Software

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Source Code Optimization Techniques For Data Flow Dominated Embedded Software:

Source Code Optimization Techniques for Data Flow Dominated Embedded Software Heiko Falk,Peter Marwedel,2013-03-19 This book focuses on source to source code transformations that remove addressing related overhead present in most multimedia or signal processing application programs This approach is complementary to existing compiler technology What is particularly attractive about the transformation flow pre sented here is that its behavior is nearly independent of the target processor platform and the underlying compiler Hence the different source code trans formations developed here lead to impressive performance improvements on most existing processor architecture styles ranging from RISCs like ARM7 or MIPS over Superscalars like Intel Pentium PowerPC DEC Alpha Sun and HP to VLIW DSPs like TI C6x and Philips TriMedia The source code did not have to be modified between processors to obtain these results Apart from the performance improvements the estimated energy is also significantly reduced for a given application run These results were not obtained for academic codes but for realistic and rep resentative applications all selected from the multimedia domain That shows the industrial relevance and importance of this research At the same time the scientific novelty and quality of the contributions have lead to several excellent papers that have been published in internationally renowned conferences like e g DATE This book is hence of interest for academic researchers both because of the overall description of the methodology and related work context and for the detailed descriptions of the compilation techniques and algorithms   Embedded Software for SoC Ahmed Amine Jerraya,Sungjoo Yoo,Norbert Wehn,Diederik Verkest,2005-12-30 This title covers all software related aspects of SoC design from embedded and application domain specific operating systems to system architecture for future SoC It will give embedded software designers invaluable insights into the constraints imposed by the use of embedded software in an SoC context   **Computer Information Systems and Industrial Management** Khalid Saeed,Władysław Homenda,2018-09-17 This book constitutes the proceedings of the 17th International Conference on Computer Information Systems and Industrial Management Applications CISIM 2018 held in Olomouc Czech Republic in September 2018 The 42 full papers presented together with 4 keynotes were carefully reviewed and selected from 69 submissions The main topics covered by the chapters in this book are biometrics security systems multimedia classification and clustering and industrial management Besides these the reader will find interesting papers on computer information systems as applied to wireless networks computer graphics and intelligent systems The papers are organized in the following topical sections biometrics and pattern recognition applications computer information systems industrial management and other applications machine learning and high performance computing modelling and optimization and various aspects of computer security   Energy-Efficient Communication Processors Robert Fasthuber,Francky Catthoor,Praveen Raghavan,Frederik Naessens,2013-05-29 This book describes a new design approach for energy efficient Domain Specific Instruction set Processor DSIP architectures for the wireless baseband domain The innovative techniques presented enable co design of

algorithms architectures and technology for efficient implementation of the most advanced technologies To demonstrate the feasibility of the author s design approach case studies are included for crucial functionality of advanced wireless systems with increased computational performance flexibility and reusability Designers using this approach will benefit from reduced development product costs and greater scalability to future process technology nodes   International Symposium on System Synthesis ,2001   Code Optimization Techniques for Embedded Processors Rainer Leupers,2013-03-09 The building blocks of today s and future embedded systems are complex intellectual property components or cores many of which are programmable processors Traditionally these embedded processors mostly have been pro grammed in assembly languages due to efficiency reasons This implies time consuming programming extensive debugging and low code portability The requirements of short time to market and dependability of embedded systems are obviously much better met by using high level language e g C compil ers instead of assembly However the use of C compilers frequently incurs a code quality overhead as compared to manually written assembly programs Due to the need for efficient embedded systems this overhead must be very low in order to make compilers useful in practice In turn this requires new compiler techniques that take the specific constraints in embedded system de sign into account An example are the specialized architectures of recent DSP and multimedia processors which are not yet sufficiently exploited by existing compilers   *Deutsche Nationalbibliographie und Bibliographie der im Ausland erschienenen deutschsprachigen Veröffentlichungen* ,2004   *The British National Bibliography* Arthur James Wells,2005   **Proceedings** ,1997   *Memorandum* ,2000   *Computer & Control Abstracts* ,1996   **CASES ...** ,2005   **ISLPED'01** ,2001   **International Aerospace Abstracts** ,1996   *Electrical & Electronics Abstracts* ,1997   **NASA SP.** ,1991   **Aeronautical Engineering** ,1988 A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in Scientific and technical aerospace reports STAR and International aerospace abstracts IAA   Spring Meeting American Geophysical Union. Spring Meeting,2000   *Large Space Structures & Systems in the Space Station Era* ,1991   *Software Engineering for Embedded Systems* Mike Brogioli,2013-04-01 Optimization metrics for compiled code are not always measured in resulting execution clock cycles on the target architecture Consider a modern cellular telephone or wireless device which may download executables over a wireless network connection or backhaul infrastructure In such cases it is often advantageous for the compiler to reduce the size of the compiled code which must be downloaded to the wireless device By reducing the size of the code needed to be downloaded savings are achieved in terms of bandwidth required for each wireless point of download Optimization metrics such as the memory system performance of compiled code are other metrics which are often important to developers These are metrics correlated to the dynamic run time behavior of not only the compiled code on the target processor but also the underlying memory system caches DRAM and buses etc By efficiently arranging the data within the application or more specifically the order in which data and corresponding data

structures are accessed by the application dynamically at run time significant performance improvements can be gained at the memory system level In addition vectorizing compilers can also improve performance due to spatial locality of data when SIMD instruction sets are present and varying memory system alignment conditions are met

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151. 124. Page 152. 2. ART OF EARLY. CIVILIZATIONS repare yourself, for you are about to embark on a magical journey through art. 1 Chapter 5: Changing Ocean, Marine Ecosystems ... - IPCC Coordinating Lead Authors: Nathaniel L. Bindoff (Australia), William W. L. Cheung (Canada), James G. 4. Kairo (Kenya). Social Studies 10 Course Outline - Oak Bay High School The goal of this unit is to study Canada's western expansion across the Prairies and its impact on ... This unit uses the textbook Horizons: Canada Moves West, ... Skill Practice 1 Classify the following as chemical changes (C) or physical changes (P). ... Given your answers to question 1 and the fact that this reaction takes place at 25oC ... Skill Practice 23 2004 by Jason Neil. All rights reserved. Skill Practice 23. Name: Date: Hour: _____. Draw Lewis structures for each of the following. 1. NO3. 1-. 2. CH4. Skill Practice 26 Skill Practice 26. Name: Date: Hour: _____. 1. What does it mean to say that a bond is polar? One of the atoms ... Skill Practice 16 - Atomic Size Skill Practice 16. Atomic Size. Practice. Name: KEY. Date: Hour: 1. What force of attraction does the second energy level of a phosphorus atom "feel" from the ... Skill Practice 13 Obtain permission for classroom use at www.ChemistryInquiry.com. Skill Practice 13. Name: Date: Hour: _____. 1 ... Sample Guided Inquiry Chemistry Lessons Please evaluate all of the materials for the unit. You will find ChemQuests, Skill Practice assignments, review sheets, video explanations, and labs. To ... Skill Practice 9 Skill Practice 9. Practice Problems. Name: Average Atomic Mass. Date: Period: _____. A certain element exists as ... Skill Practice 14 (ANSWER KEY) Skill Practice 14 (ANSWER KEY). Lewis Practice. Name: Date: Hour: _____. How many valence electrons does each of ... Skill Practice 30-33 answers.doc View Homework Help - Skill Practice 30-33 answers.doc from CHEM 202 at Simon Fraser University. Skill Practice 30 Name: _ Date: _ Hour: _ 1. Chemical Principles - 6th Edition - Solutions and Answers Find step-by-step solutions and answers to Chemical Principles - 9780618946907, as well as thousands of textbooks so you can move forward with confidence. Student Solutions Manual for Zumdahl's Chemical ... Zumdahl. Student Solutions Manual for Zumdahl's Chemical Principles with OWL, Enhanced Edition, 6th. 6th Edition. ISBN-13: 978-1111426309, ISBN-10: 1111426309. Chemical Principles Steven Zumdahl Solution Manual: Books Student Solutions Manual for Zumdahl's Chemical Principles with OWL, Enhanced Edition, 6th. by Steven S. Zumdahl · 4.04.0 out of 5 stars (1) · Paperback ... Student Solutions Manual for Zumdahls Chemical ... Student Solutions Manual for Zumdahls Chemical Principles with OWL, Enhanced Edition, 6th. by Zumdahl, Steven S. Used. Condition: UsedGood; ISBN 10: 1111426309 ... Solutions Manual Chemical Principles 6th edition by ... Solutions Manual of Organic Structures From Spectra by Field & Sternhell | 4th edition. Solutions Manuals & Test Banks | Instant Download. 9781133109235 | Student Solutions Manual for Jan 1, 2012 — Rent textbook Student Solutions Manual for Zumdahl/DeCoste's Chemical Principles, 7th by Zumdahl, Steven S. - 9781133109235. Price: $48.49. Chemical Principles | Rent | 9780618946907 Zumdahl. Every textbook comes with a 21-day "Any Reason" guarantee. Published by Brooks Cole. Chemical Principles 6th edition solutions are available for ... Student Solutions Manual for Zumdahl S Chemical ... Student Solutions Manual for Zumdahl S Chemical Principles by Zumdahl, Steven S. ; Item Number. 374968094927 ; Binding.

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