Code Generation for Embedded Processors: An Introduction

P. Marwedel

1 New, flexible target technologies

As the tendency towards more complex electronic systems continues, many of these systems are equipped with embedded processors. For example, such processors can be found in cars, and in audio-, video-, and telecommunication–equipment. Essential advantages of these processors include their high flexibility, short design time and (in the case of off-the-shelf processors) full–custom layout quality. Furthermore, they allow an easy implementation of optional product features as well as easy design correction and upgrading. Furthermore, processors are frequently used in cases where the systems must be extremely *dependable*[1] [32]. In such cases, the re-use of the design of an off-the-shelf processor greatly simplifies dependability analysis.

This contrasts with the limitations of *application-specific circuits (ASICs)*: due to their low flexibility, the cost for the design and fabrication of ASICs is still very high. Furthermore, this low flexibility makes a short time-to-market more difficult to achieve. Dependability analysis costs may even exclude ASICs as a target technology.

A short time-to-market can be achieved with *field programmable gate arrays (FPGAs)*. But FP-GAs are not area–efficient. For example, multipliers require a large proportion of the available area. Furthermore, FPGAs with programmable interconnect usually do not allow high clocking frequencies.

Embedded processors come in different types. We will classify them according to three different criteria: flexibility of the architecture, architectural features for certain application domains, and the form in which the processor is available. The three criteria can be used as dimensions to form a 3D processor type space (see fig. 1).

The meaning of these dimensions and their values is as follows:

1. *Architectural features for certain application domains*

   Processors can be designed for restricted or for larger classes of application areas. The two cases considered here are: *"General purpose architecture"* (GPA) and *"digital signal processors"* (DSPs).

   The term "general purpose processor" is used for processors which do not have particular support for special applications, such as Fourier transforms or digital filtering.

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[1]The term *dependability* includes all aspects of system safety, for example: absence of design faults, comprehensive testing after manufacturing, reliable components, and error-detection and recovery mechanisms.

Code Generation For Embedded Processors

Christian Drosten

Code Generation For Embedded Processors:

Code Generation for Embedded Processors Peter Marwedel,Gert Goossens,2013-03-14 Modern electronics is driven by the explosive growth of digital communications and multi media technology A basic challenge is to design first time right complex digital systems that meet stringent constraints on performance and power dissipation In order to combine this growing system complexity with an increasingly short time to market new system design technologies are emerging based on the paradigm of embedded programmable processors This concept introduces modularity flexibility and re use in the electronic system design process However its success will critically depend on the availability of efficient and reliable CAD tools to design programme and verify the functionality of embedded processors Recently new research efforts emerged on the edge between software compilation and hardware synthesis to develop high quality code generation tools for embedded processors Code Generation for Embedded Systems provides a survey of these new developments Although not limited to these targets the main emphasis is on code generation for modern DSP processors Important themes covered by the book include the scope of general purpose versus application specific processors machine code quality for embedded applications retargetability of the code generation process machine description formalisms and code generation methodologies Code Generation for Embedded Systems is the essential introduction to this fast developing field of research for students researchers and practitioners alike   **Code Generation for Embedded Processors** Peter Marwedel,Gert Goossens,1995-06-30 Recently new research efforts emerged on the edge between software compilation and hardware synthesis to develop high quality code generation tools for embedded processors Code Generation for Embedded Processors provides a survey of these new developments Although not limited to these targets the main emphasis is on code generation for modern DSP processors   AVIV Silvina Zimi Hanono,1999   The Compiler Design Handbook Y.N. Srikant,Priti Shankar,2018-10-03 Today s embedded devices and sensor networks are becoming more and more sophisticated requiring more efficient and highly flexible compilers Engineers are discovering that many of the compilers in use today are ill suited to meet the demands of more advanced computer architectures Updated to include the latest techniques The Compiler Design Handbook Second Edition offers a unique opportunity for designers and researchers to update their knowledge refine their skills and prepare for emerging innovations The completely revised handbook includes 14 new chapters addressing topics such as worst case execution time estimation garbage collection and energy aware compilation The editors take special care to consider the growing proliferation of embedded devices as well as the need for efficient techniques to debug faulty code New contributors provide additional insight to chapters on register allocation software pipelining instruction scheduling and type systems Written by top researchers and designers from around the world The Compiler Design Handbook Second Edition gives designers the opportunity to incorporate and develop innovative techniques for optimization and code generation   Special Issue on Code Generation for Embedded Processors Peter Marwedel,1999   **Readings in**

Hardware/Software Co-Design Giovanni De Micheli,Rolf Ernst,Wayne Wolf,2002 This title serves as an introduction ans reference for the field with the papers that have shaped the hardware software co design since its inception in the early 90s

Hardware/Software Co-Design Giovanni DeMicheli,M.G. Sami,2013-11-11 Concurrent design or co design of hardware and software is extremely important for meeting design goals such as high performance that are the key to commercial competitiveness Hardware Software Co Design covers many aspects of the subject including methods and examples for designing 1 general purpose and embedded computing systems based on instruction set processors 2 telecommunication systems using general purpose digital signal processors as well as application specific instruction set processors 3 embedded control systems and applications to automotive electronics The book also surveys the areas of emulation and prototyping systems with field programmable gate array technologies hardware software synthesis and verification and industrial design trends Most contributions emphasize the design methodology the requirements and state of the art of computer aided co design tools together with current design examples **Proceedings of the 1995 IEEE IECON: Signal processing and control, Robotics vision and sensors, Emerging technologies, and Factory automation** ,1995 **18th International Conference on VLSI Design** International Conference on VLSI Design,2005 Proceedings of the Seventh International Workshop on Hardware/Software Codesign (CODES'99) Association for Computing Machinery,1999 **Proceedings of the ASP-DAC ... Asia and South Pacific Design Automation Conference** ,2002 *Real-time Signal and Image Processing* Phillip A. Laplante,2000 An introduction to intermediate readings in real time image and signal processing It covers issues and challenges hardware support algorithms software languages and systems and applications and case studies

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