

学校编码: 10384

分类号 _____ 密级 _____

学号: 23120101152966

UDC _____

厦门大学

硕士学位论文

基于 Eclipse 的嵌入式集成开发环境设计 及应用开发

Eclipse Based Embedded Integrated Development

Environment Design and Its Applications

唐宇杰

指导教师姓名: 郭东辉 教授

专业名称: 电子与通信工程

论文提交日期: 2013 年 5 月

论文答辩日期: 2013 年 6 月

答辩委员会主席:

评 阅 人:

2013 年 6 月

厦门大学学位论文原创性声明

本人呈交的学位论文是本人在导师指导下,独立完成的研究成果。本人在论文写作中参考其他个人或集体已经发表的研究成果,均在文中以适当方式明确标明,并符合法律规范和《厦门大学研究生学术活动规范(试行)》。

另外,该学位论文为()课题(组)的研究成果,获得()课题(组)经费或实验室的资助,在()实验室完成。(请在以上括号内填写课题或课题组负责人或实验室名称,未有此项声明内容的,可以不作特别声明。)

声明人(签名):

年 月 日

厦门大学学位论文著作权使用声明

本人同意厦门大学根据《中华人民共和国学位条例暂行实施办法》等规定保留和使用此学位论文，并向主管部门或其指定机构送交学位论文（包括纸质版和电子版），允许学位论文进入厦门大学图书馆及其数据库被查阅、借阅。本人同意厦门大学将学位论文加入全国博士、硕士学位论文共建单位数据库进行检索，将学位论文的标题和摘要汇编出版，采用影印、缩印或者其它方式合理复制学位论文。

本学位论文属于：

1. 经厦门大学保密委员会审查核定的保密学位论文，于 年 月 日解密，解密后适用上述授权。

2. 不保密，适用上述授权。

（请在以上相应括号内打“√”或填上相应内容。保密学位论文应是已经厦门大学保密委员会审定过的学位论文，未经厦门大学保密委员会审定的学位论文均为公开学位论文。此声明栏不填写的，默认为公开学位论文，均适用上述授权。）

声明人（签名）：

年 月 日

厦门大学博硕士学位论文摘要库

摘 要

随着计算机和微电子技术的发展,各种信息电子产品已经成为市场量最大更新最快的商品。而嵌入式系统开发是信息电子新产品的研发核心,嵌入式系统软硬件集成开发环境的使用可以大大提高信息电子产品开发的效率,作为其开发环境中核心工具之一即交叉编译器及其可靠性直接关系到开发信息电子产品的质量与成败。本文的主要工作是针对实际项目的需求,为自主设计的8位微控制器的嵌入式系统应用来开发一款可实现软硬件协同设计的集成开发环境。

论文首先介绍嵌入式系统软硬件集成开发环境相关产品及技术现状,分析嵌入式系统开发的关键技术及其研究进展,说明基于Eclipse平台来设计软硬件集成开发环境所具有的可扩展性、灵活性等优点;接着,论文分别就8位微处理器嵌入式系统应用的编译器移植与优化设计、编译器测试及可靠性分析等内容进行具体论述;最后,把编译器集成到基于Eclipse平台为基础具有软硬件协同设计功能的开发环境,实现编译器与自主开发的可视化编辑器的整合,并进行软硬件协同设计的验证测试。本论文工作的主要成果体现在以下几个方面:

(1) 在编译器移植与优化设计方面,以SDCC编译器为基础,根据自主开发的8位微处理器特点及其指令集,开发出兼容的SDCC编译器,并根据嵌入式系统SOC应用所集成不同编解码模块与接口,提出了编译器优化方案。

(2) 在编译器测试与可靠性分析方面,利用在线仿真器获取目标代码的执行结果与参考编译器进行比较验证,提高了测试的可靠性与灵活性;并引入代码覆盖测试工具实现对测试进展程度的客观评估,同时也使得测试更有针对性。

(3) 在可视化集成环境开发方面,基于开源的Eclipse平台集成了可兼容自主开发8位处理器的SDCC编译器,设计以UML为基础的可视化编辑器,实现具有软硬件协同设计与验证功能的嵌入式系统集成开发环境。

关键词: 软硬件协同设计, Eclipse, SDCC, 编译器优化与测试, 可视化编辑器;

厦门大学博硕士学位论文摘要库

ABSTRACT

Along with the development of computer and micro electronic technology, the information electronic products have become the biggest demanded and fastest updating products. The embedded system developing technology is the key of information electronic producing, with the using of software and hardware integrated developing environment can improve the effect of product development, and the cross-compiling and reability as the core tools are related to the quality of product directly. In the Thesis, an integrated developing environment with software and hardware co-design was developed for a self-design 8-bit microcontroller embedded systems.

The products and current statuses of embedded systems software hardware integrated developing environment are introduced firstly. Then the key technologies and research progress of embedded system development are analyzed, which indicated the eclipse based software and hardware co-design integrated developing environment has advantages of strong extensibility and high flexibility. Further, compiler transplantation, optimizing design, compiler testing and reliability analysis are achieved and introduced in detail for 8-bit embedded system application. At last, the developed compiler is integrated to eclipse, which has software and hardware co-design and compiler visual editor integrated tool, and software-hardware co-testing functions.

The main achievements of the thesis are showed as below:

1. In the side of compiler transplantation and optimizing design, a SDCC compiler was developed according to the features and api of the self-developed 8-bit microcontroller, and a optimizing design solution was proposed for the different coding/decoding modules and interfaces integrated in the soc application of the embedded system.

2. In the side of compiler testing and reliability analysis, a execution results of

target codes from online emulator was compared to the results got by the refer compiler, which improved the reliability and flexibility of testing. Then code coverage testing tools are introduced to get more targeted and objective evaluation.

3. In the side of visual integrate development environment, a UML baed visual editor is design with the SDCC integrated eclipse platform, which achieved software and hardware co-design and validation function.

Key words: Software and HardwareCo-design, Eclipse, SDCC, Compiler Optimization and Testing, Visual Editor

厦门大学博硕士学位论文摘要库

目录

第一章 绪论	1
1.1 项目背景及其意义.....	1
1.2 相关产品技术现状.....	2
1.3 关键技术及进展.....	4
1.3.1 编译器优化及其移植技术.....	4
1.3.2 编译器测试及分析技术.....	5
1.3.3 嵌入式集成开发环境技术.....	7
1.4 论文主要工作及章节安排.....	9
第二章 集成开发环境与编译器原理	11
2.1 集成开发环境与工具介绍.....	11
2.1.1 概述.....	11
2.1.2 Eclipse 平台介绍.....	13
2.1.3 平台开发工具.....	22
2.2 编译器及其原理.....	23
2.2.1 概述.....	23
2.2.2 编译器原理.....	23
2.2.3 SDCC 编译器.....	25
2.3 测试与分析.....	29
2.3.1 软件测试概述.....	29
2.3.2 可靠性分析.....	29
2.4 本章小结.....	31
第三章 编译器移植与优化分析	33
3.1 8 位微处理器介绍.....	33
3.2 SDCC 编译器移植.....	34
3.2.1 main.c 文件的设计.....	35

3.2.2 ralloc.c 文件的设计	37
3.2.3 gen.c 文件的设计	40
3.3 编译器优化方案	42
3.3.1 常量传播优化技术	42
3.3.2 SDCC 中的常量传播优化问题	42
3.3.3 SDCC 中的常量传播改进	44
3.4 编译器原型系统的实现	45
3.5 本章小结	49
第四章 编译器测试及其可靠性分析	50
4.1 编译器测试原理	50
4.2 编译器测试方案设计	50
4.3 测试结果与可靠性分析	53
4.3.1 测试分析方法	53
4.3.2 测试结果与分析	55
4.4 本章小结	60
第五章 可视化集成开发环境设计	61
5.1 集成开发环境设计概述	61
5.1.1 系统功能分析	61
5.1.2 XMUIDE 集成开发环境设计	61
5.1.3 集成开发环境各插件概述	62
5.2 基于 Eclipse 的编译器集成设计	63
5.2.1 工程向导设计	63
5.2.2 编译工具链集成设计	66
5.2.3 文件上传工具设计	68
5.3 可视化编辑器的设计	71
5.3.1 SDCC Editor 设计	71
5.3.2 Design Editor 设计	76
5.4 本章小结	87
第六章 嵌入式软硬件协同设计应用	88

6.1 嵌入式系统实例简介	88
6.2 集成开发环境的搭建	90
6.3 软硬件协同测试验证	97
6.4 本章小结	99
第七章总结与展望	100
7.1 工作总结	100
7.2 工作展望	101
参考文献	103
致 谢	108

厦门大学博硕士学位论文摘要库

厦门大学博硕士学位论文摘要库

1	Introduction	1
1.1	Background and Significance	1
1.2	Current Status of Products and Technologies	2
1.3	Key Technologies	4
1.3.1	Compiler Optimization and Its Porting Technology	4
1.3.2	Compiler Testing and Analysis Technology	5
1.3.3	Embedded Integrated DevelopTechnology	7
1.3	Main Work and Arrangement of The Thesis	8
2	Integrated Develop Environmentand Compiling Principle	11
2.1	Introduction of Embedded Integrated Developing Enviroment	11
2.1.1	Overview of Integrated Developing Enviroment	11
2.1.2	Introduction of Eclipse	14
2.1.3	Tools of Platform Developing	22
2.2	Principle of Compiler	23
2.2.1	Overview of Compiler	23
2.2.2	Principle of Compiler	23
2.2.3	SDCC Architecture	25
2.3	Testing and Analysis	29
2.3.1	Overview of Software Testing	29
2.3.2	Analysis of Software Reliability	29
2.4	Section Conclusion	31
3	Compiler Porting and Optimizing	33
3.1	Introduction of 8bit CPU	33
3.2	SDCC Compiler Porting	34
3.2.1	The Design of main.c	35

3.2.2	The Design of ralloc.c	37
3.2.3	The Design of gen.c	40
3.3	SDCC Compiler Optimizing	42
3.3.1	Constant Propagation Optimizing Technique	42
3.2.3	Problem of Constant propagation Optimizing Technique in SDCC	42
3.2.3	Improvement of Constant ropagation Optimizing Technique in SDCC	44
3.4	Implementation of Compiler Prototype	45
3.5	Section Conclusion	49
4	Compiler Testing and Reliability Analysis of Compiler	50
4.1	Principle of Compiler Testing	50
4.2	Schematic Design of Compiler Testing	50
4.3	Compiler Testing Results and Reliability Analysis	53
4.3.1	Method of Testing Result Reliability Analysis	53
4.3.2	Testing Results and Analysis	55
4.4	Section Conclusion	60
5	The Design of Visual Integrated Developing Environment	61
5.1	Overview of VIDE Development	61
5.1.1	System Function Introduction	61
5.1.2	Design of Integrated Developing Environment	61
5.1.2	Overview of Plug-in in XMUIDE	62
5.2	Eclipse Based Compiler Integrating Design	63
5.2.1	Design of Project Wizard	63
5.2.2	Design of Compiler Tool Chain Integrating	66
5.2.3	Design of Files Upload Tool	68
5.3	Visual Editor Design	71
5.3.1	SDCC Editor Design	71
5.3.2	Design Editor Design	76
5.4	Section Conclusion	87
6	Application of Embedded SW/HW CoDesign	88

6.1 Introduction of Embedded System Examples	88
6.2 Building the example in Integrated Development Environment	90
6.3 Software and Hardware CoVerification	97
6.4 Section Conclusion	99
7 Summary and Future Work	100
7.1 Summary	100
7.2 Future Work	101
References	103
Acknowledge	108

厦门大学博硕士学位论文摘要

厦门大学博硕士学位论文摘要库

Degree papers are in the "[Xiamen University Electronic Theses and Dissertations Database](#)". Full texts are available in the following ways:

1. If your library is a CALIS member libraries, please log on <http://etd.calis.edu.cn/> and submit requests online, or consult the interlibrary loan department in your library.
2. For users of non-CALIS member libraries, please mail to etd@xmu.edu.cn for delivery details.

厦门大学博硕士论文摘要库