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I. Umit Akgun

Education

Ozyegin University, Istanbul, Turkey
Master of Science, Computer Science 2011–2014
- Cumulative GPA: 3.33/4.00; Compiler Optimization
- Thesis: Performance Evaluation of Unfolded Sparse Matrix-Vector Multiplication
- Advisor: Asst. Prof. T. Barış. Aktemur
- Research Interests: Compiler design, programming language design and semantics, runtime program generation, software analysis, software engineering

Ege University, Izmir, Turkey
Bachelor of Science, Computer Engineering 2005-2009
- Cumulative GPA: 3.18/4.00; Operating Systems, Embedded Systems
- Senior Project:Operating System For Wireless Sensor Networks : SIMIT
- Advisors: Prof. Aylin Kantarcı
- Research Interests: Operating Systems, Wireless Sensor Network, Network Programming, Embedded Systems.

MEV Izmir Science High School, Izmir, Turkey 2005
- GPA: 4.96/5.00

Research Interests

Compiler Design, Operating Systems, Programming Language Design and Semantics, Multicore Programming, Runtime Program Generation, Software Analysis, Software Engineering, Domain Specific Languages, Embedded and Real-Time Systems, Network Programming, Distributed and Parallel Computing.

Software Proficiencies

- *Fluent* C/C++,Java, Swift, Objective-C, Scala
- *Working Knowledge* C#, Python, Haskell, Rust, Perl
- *Scripting, Typography* Bash, Ksh, Zsh, Lex Yacc, LaTeX
- *Assembly* i386, x86/64(SIMD), ARM, PowerPC
- *Development Environment* XCode, Android Studio, Emacs, Vim, Git, IntelliJ, Eclipse, SVN, Linux, OS X, Windows,

Professional Experience

ING Bank, Istanbul
Software Engineer (iOS Development) Aug 2014–...
I was working on ParaMara application which is designed and developed by Objective-C. I was responsible for coding key features of ParaMara. Currently, I'm working on New ING Mobile application which is designed and developed by pure Swift. I'm leading iOS Team which consists of four developers and mostly working on creating a new flexible and stable security framework for financial mobile applications.

SIEMENS, Istanbul
Software Engineer (Embedded Systems and Real-time Frameworks) May 2013–Aug 2014
I was working on real-time and embedded systems especially Software PLC. We developed with C++ applying some best practices and design patterns. We built a framework for Siemens PLCs which are widely used in automation systems. My specialties based on software design and architecture. I was working on network communication part of PLCs as well. We developed multi-threaded network oriented programs.

TUBITAK (The Scientific and Technological Research Council of Turkey equivalent NSF), Istanbul
Software Engineer (Embedded Systems and Operating System) 2010–2013
I was working on real-time and embedded operating systems. Extensive C programming skills on embedded real-time systems for avionics software. I have involved multithreaded applications, memory management, pthread library, thread manager and memory manager for our operating system. I gained solid debugging skills to solve system problems, maintenance of lightweightIP networking stack written by Adam Duncan; I have a desire for high quality software systems, drives juniors to excel in software engineering principles. Our team were consisting of five software engineers. Also I was working on multicore concurrent programming. I implemented lock-free data structures.(linked list, priority queue).

Ozyegin University, Istanbul
Research Assistant 2011–2014
I was doing research on LLVM, code generation, compiler design and programming languages at University of Ozyegin. (You can reach more information in Runtime Program Generation and Empirical Optimization section)

IBM Global Services, Istanbul
UNIX/Linux System Administrator 2009–2010 I was UNIX/Linux administration for IBM Global Services. I have worked on management of SAP and DB2. In addition, I also worked on database backup recovery operations.

Ege University Computer Engineering Department, Izmir
I wrote interprocess communication systems and kernel memory management algorithms for eGIS operating that is written by Kasim Sinan Yildirim. And I had many contribution to several part of (real-time concept) eGIS. During the internship, researched real-time operating systems and developed several embedded applications such as QNX operating system and Wireless Sensor Network Routing Algortihms.

Honors & Awards

Ozyegin University, Full Tuition Scholarship 2011-2014
MEV Izmir Science High School Physic Olympiad School Team 2003-2005

Thesis

MSc. : Performance Evolution Of Unfolded Matrix-Vector Multiplication Code
Sparse matrix-vector multiplication (spMV) is a kernel operation in scientific computation. There exist problems where a matrix is repeatedly multiplied by many different vectors. For such problems, specializing the spMV code based on the matrix has the potential of producing significantly faster code. This, in fact, has been one of the motivational examples of program generation. Using program generation, spMV code can be unfolded fully to eliminate loop overheads as well as enable optimizations with high impact. In this dissertation we focus on specialization of spMV by unfold- ing the code according to a given matrix. We provide an experimental evaluation of performance using 70 sparse matrices collected from real-world scientific computation domains. We present optimizations with which high-performant assembly code can be generated much more rapidly than the general-purpose compiler icc. We finally present how one of the optimizations we studied can be integrated into a compiler as a code transforming pass.

BSc. : Embedded Operating System For Wireless Sensor Networks
My thesis is on an operating system. WSN's operating systems are embedded operating systems(Some of them RTOS). So the efficiency and robustness were kept in mind when developing the operating system. I examined other WSN's operating systems and several realtime operating systems. I worked on thread management, IPC and scheduling algorithm especially and trying to progress in these subjects. The operating system was developed completely with the help of open-source tool (gcc, gdb, ddd ...). (whole development process on GNU/Linux (Debian)).

Recently worked on Projects

Runtime Program Generation and Empirical Optimization
This project is generously funded by TUBITAK. The goal of this project is to combine the advantages of runtime program generation (RTPG) with empirical optimization (EO). RTPG can specialize a program according to runtime inputs that are not available at compile-time, hence provides data-specific optimization opportunities. Empirical Optimization (aka auto-tuning) aims to find the most efficient version of a program on a specific architecture by performing install-time experiments. The project will explore the combination of these two techniques; in particular, how we can use empirical optimization to drive the decisions taken during runtime generation.
Compiler for runtime program generation
Sparse matrix-dense vector multiplication library

Software Pattern Recognition
This project main purpose was software pattern search in source code. These patterns are well know design patterns or user defined patterns. Later developments took place within the scope of the project. I extracted AST(Abstract Syntax Tree) from the source code and searching patterns in this AST. Our ultimate goal was not only own patterns, also we recognize user defined relationships. This project has been written in Java and it targets only Java code as an input. I wrote many software design pattern code. And I trained my program these samples. My program extract all AST's of these design patterns. We tried well-known Java frameworks to our program. As you know, some

design patterns have a similar software model. Our program search design pattern AST's in given code and generate statistical data. These data shows us which part of program similar to which design pattern.

Languages

- English : Fluent (TOEFL score : 96)
- Turkish : Native

References

- Dr. Tankut Baris Aktemur, Assistant Professor
- Dr. Ismail Ari, Assistant Professor
- Dr. Fatih Ugurdag, Associate Professor
- Dr. Aybars Ugur, Associate Professor
- Dr. Aylin Kantarci, Associate Professor