

Lixun Zhang

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Education

The University of Texas at Austin

PH.D. IN COMPUTER SCIENCE

- Dissertation: A Particle Filter Program Generator on GPU.

Austin, Texas

Jan. 2013 - Dec. 2021

Tsinghua University

B.S. IN ENGINEERING, AUTOMATION

Beijing, China

Sep. 2008 - Jul. 2012

Research Projects

Implementation of Monte Carlo Localization on Heterogeneous Systems

May. 2021 - Aug. 2021

- Implemented the Monte Carlo Localization algorithm in CUDA.
- Partitioned the particles among multiple threads: one launches the GPU kernel and others run on CPU in a multi-threaded manner.
- Mutex and condition variables were used to synchronize between threads.
- Simulated the localization of the fifth autonomous car system using ROS.

Implementation of Particle Filter on Heterogeneous Systems

Jan. 2021 - Apr. 2021

- Partitioned the particles among two processes: one runs on CPU and the other launches the GPU kernel.
- POSIX shared memory and System V semaphore were used to communicate and synchronize between the two processes.
- Conducted experiments on NVIDIA GTX TITAN and Jetson TX2 to obtain the optimal partition among CPU and GPU.

An Analytical Performance Model for GPGPU kernels

Jan. 2019 - Dec. 2020

- Developed a mathematical model to estimate the execution time of simple kernels based on static analysis of CUDA assembly code and knowledge of GPU architecture.

Laser Power Control for Selective Laser Sintering

Sep. 2016 - Aug. 2017

- Achieved motion detection of galvanometer by comparing two consecutive images taken by infrared cameras in LabVIEW.
- Built an automatic laser power control system at both vector-level and layer-level control granularity to eliminate thermal gradients in the post-sintering temperature on the Laser Additive Manufacturing Pilot System at the department of mechanical engineering.

A MATLAB to CUDA translator for Particle Filter Applications

Sep. 2014 - Aug. 2015

- Developed a front-end in C to translate MATLAB code of particle filter estimator into CUDA code.
- Developed domain-specific optimization passes in C for the generated CUDA code.

CUDA Implementation of Particle Filter for Real World Applications

Jun. 2013 - Aug. 2014

- Applications include Vacuum Arc Remelting and Early Kick Detection.
- Implemented sampling, importance, and resampling modules in CUDA.
- Analyzed and improved GPU kernel performance through profiling.

Internship

MathWorks

Natick, MA

COMPILER ENGINEER, CODE GENERATION

Jun. 2016 - Aug. 2016

- Developed a C++ pass to analyze for loops in the IR to find loop invariant variables.
- Generated intrinsic functions which expand to OpenMP pragmas in the code generation phase.
- Performed timing experiments of the generated code on multi-core systems.

Course Projects

CS380C Compilers

Jan. 2015 - May. 2015

- Wrote LLVM passes to perform domain-specific local optimizations.
- Implemented an iterative data-flow analysis framework and used it to implement both a forward data-flow analysis (Reaching Definitions) and a backward data-flow analysis (Liveness) using LLVM.
- Wrote LLVM passes to perform Dead Code Elimination and Loop Invariant Code Motion.

Teaching Assistant Courses

CS375 Compilers

Jan. 2018 - Dec. 2021

- Developed lexical analyzer (in lex and C), parser (in Yacc), and code generator (in C) for Pascal.
- Developed an autograder in Bash script for programming assignments.

CS380P Parallel Systems

Jun. 2019 - Aug. 2019

- Developed programming assignments for course projects: prefix sum using pthread, Kmeans using CUDA and Thrust, tree comparison using Go, and Barnes-Hut using MPI.
- Developed an autograder in Bash script for programming assignments.