

MICHEL STEUWER

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EDUCATION

University of Edinburgh, UK

07/2013 – 11/2013

Visiting Researcher funded by the HiPEAC Network of Excellence

University of Edinburgh, UK

07/2012 – 10/2012

Visiting Researcher funded by the HPC-Europaz project

University of Münster, Germany

2010 – present

PhD in Computer Science

Research interests: GPU Programming, Algorithmic Skeletons, Code Generation, Performance Portability

I'm interested in researching technologies and techniques that help application developers to write programs at a high-level of abstraction while achieving high-performance at the same time.

My work focuses on recurring patterns of parallel programming, a.k.a. algorithmic skeletons, and how these can be efficiently be implemented on modern micro architectures like GPUs.

University of Münster, Germany

2005 – 2010

Diploma in Computer Science (equivalent to a MSc. degree)

Final Grade in Computer Science: very good (best possible grade)

Diploma Thesis: "Developing a Portable Multi-GPU Skeleton Library"

As my diploma project I developed an innovative high-level programming library for simplified programming of GPUs, which was later extended into the SkelCL research project.

The results of my diploma project showed, that we can greatly simplify the programming of GPU systems without sacrificing performance.

RESEARCH PROJECTS

Skeleton Building Blocks

Automatic GPU-Code Generation from Skeleton Building Blocks

In this joined work with Christophe Dubach and Christian Fensch we build a unique system to automatically generate efficient OpenCL implementations from high-level expressions.

By uniquely bridging algorithmic patterns with hardware paradigms using a rule rewriting system, we can automatically explore different implementations of the same algorithm.

Results show, that we can match the performance of hand written OpenCL as well as highly tuned BLAS code on different hardware architectures.

This work is currently under review for publication at the PLDI 2014 conference.

SkelCL

A High-Level Programming Model for Single- and Multi-GPU Systems

I'm the lead designer and developer of SkelCL, a novel high-level programming model and library for programming heterogeneous systems.

It combines algorithmic skeletons, container data types and data (re)distribution mechanisms to greatly simplify the programming of heterogeneous systems comprising of multiple parallel processors, *e. g.*, multiple GPUs.

SkelCL is open source software and available at: <http://github.com/skelcl/skelcl>.

dOpenCL

An Implementation of the OpenCL Standard for Distributed Systems

Together with Philipp Kegel, I developed dOpenCL, an OpenCL implementation targeting distributed systems. dOpenCL allows to program all parallel processors (e.g., CPUs or GPUs) of a distributed System using OpenCL as the single programming model.

AWARDS

HiPEAC Collaboration Grant

2013

Awarded by the HiPEAC Network of Excellence

Funding for a four month research collaboration with Christophe Dubach at Edinburgh University. Prestigious award received by only 20 students per year in entire Europe.

HPC-Europa 2 Transnational Access Programme

2012

Awarded by the HPC-Europa 2 Project

Funding for a three month research collaboration with Thibaut Lutz and Murray Cole at Edinburgh University.

PUBLICATIONS

- Michel Steuwer, Malte Friese, Sebastian Albers, and Sergei Gorlatch
Introducing and Implementing the Allpairs Skeleton for GPU Systems,
in International Journal of Parallel Programming (in press, available online).
Presented at the int'l. Symposium on High-level Parallel Programming and Applications, July 2013.
- Michel Steuwer and Sergei Gorlatch
High-Level Programming for Medical Imaging on Multi-GPU Systems using the SkelCL Library,
presented at the International Conference on Computational Science (ICCS), June 2013.
- Philipp Kegel, Michel Steuwer, and Sergei Gorlatch
dOpenCL: Towards uniform programming of distributed heterogeneous multi-/many-core systems,
in Journal of Parallel and Distributed Computing, 73(12), 2013.
- Michel Steuwer, Philipp Kegel, and Sergei Gorlatch
Towards High-Level Programming of Multi-GPU Systems using the SkelCL Library,
presented at the workshop on Accelerators and Hybrid Exascale Systems as part of IPDPS, May 2012.
- Michel Steuwer, Philipp Kegel, and Sergei Gorlatch
SkelCL – A Portable Skeleton Library for High-Level GPU Programming,
presented at the workshop on High-Level Parallel Programming Models and Supportive Environments as
part of IPDPS, May 2011.

REFERENCES

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