Michel Steuwer

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Personal Details

Birthday	21 May 1985
Birthplace	Duisburg, Germany
Nationality	German

University Education

since 2010 **Ph. D. studies**, *University of Münster*, Münster, Germany.

Supervisor: Prof. Sergei Gorlatch

Main research interests: High-level abstractions for parallel programming, Exploiting modern parallel processors, including multi-core CPUs and GPUs.

2005–2010 **Diploma degree in computer science with a minor in mathematics**, *(equivalent to a M. Sc. degree) University of Münster*, Münster, Germany.
Final grade in computer science: very good (85 %)

Research Visits

02/2014 **Visiting researcher (1 Month)**, *Edinburgh University*, Edinburgh, UK.

07/2013 – 11/2013 **Visiting researcher (4 Month)**, *Edinburgh University*, Edinburgh, UK.
Funded by the HiPEAC Network of Excellence

07/2012 – 10/2012 **Visiting researcher (3 Month)**, *EPPC (Edinburgh Parallel Computing Centre)*, Edinburgh, UK.
Funded by the HPC-Europa2 project

Reviewer

I have been active as an external reviewer for the Parallel Computing Technologies (PaCT), PARCO, Euro-Par, EuroMPI and CCGrid conferences. The Science of Computer Programming journal and the Journal of Supercomputing. As well as the HLPGPU2012 HiPEAC Workshop.

Languages

German	**Native**
English	**Fluent**

Research Projects

since 2011 **dOpenCL**, *An implementation of the OpenCL standard targeting distributed systems*.
Ongoing research. Preliminary results published in: [2,8].

Together with other research groups we are leading the development of OpenCL implementations targeting distributed systems, by developing dOpenCL. dOpenCL allows to program all parallel processors (e.g., CPUs or GPUs) of a distributed Systems using OpenCL as the single programming model.

since 2010 **SkelCL**, *A high-level programming library for heterogeneous systems*.
Ongoing research. Preliminary results published in: [1, 3-7, 10-11].

I am the lead developer of SkelCL, a novel high-level programming model and library for programming heterogeneous systems. It uniquely combines algorithmic skeletons, container data types and data (re)distribution mechanisms to greatly simplify the programming of heterogeneous systems comprising of multiple parallel processors. SkelCL is open source software and can be found online at: http://skelcl.uni-muenster.de.

01/2010 – 09/2010 **Diploma project**, *Developing a Portable Multi-GPU Skeleton Library*.
Results published in [9].

As my diploma project I developed the predecessor to SkelCL, an innovative high-level programming library for simplified programming of GPUs. We published the results of my diploma project in [9] and showed, that we can greatly simplify the programming of GPU systems without scarifying performance.

Presentations

05/2014 Invited Talk: *SkelCL: High-Level Programming of Multi-GPU Systems*
Institute for Computational and Applied Mathematics, University of Münster, Germany

05/2014 Invited Talk: *SkelCL: High-Level Programming of Multi-GPU Systems*
Workshop on Fast Data Processing on GPUs in Dresden, Germany.

01/2014 Talk: *Extending the SkelCL Skeleton Library for Stencil Computations on Multi-GPU Systems*
HiStencils 2014 workshop in Vienna, Austria.

12/2013 Invited Talk: *SkelCL: High-Level Programming of Multi-GPU Systems*
Research group on elementary particle physics, University of Wuppertal, Germany.

07/2013 Talk: *Introducing and Implementing the Allpairs Skeleton for GPU Systems*
HLPP 2013 workshop in Paris, France.

06/2013 Talk: *High-Level Programming for Medical Imaging on Multi-GPU Systems using the SkelCL Library*
ICCS 2013 conference in Barcelona, Spain.

08/2012 Talk: *Using the SkelCL Library for High-Level GPU Programming of 2D Applications*
ParaPhrase 2012 workshop held in conjunction with Euro-Par 2012 in Rhodes, Greece.

06/2012 Talk: *High-Level Programming for Heterogeneous Systems with Accelerators*
PDESoft 2012 workshop in Münster, Germany.

05/2012 Talk: *Towards High-Level Programming of Multi-GPU Systems Using the SkelCL Library*
AsHES 2012 workshop held in conjunction with IPDPS 2012 in Shanghai, China.

04/2012 Invited talk: *A Skeleton Library for Heterogeneous Multi-/Many-Core Systems*
NAIS workshop in Edinburgh, UK.

01/2012 Talk: *Towards a High-Level Approach for Programming Distributed Systems with GPUs*
COST Action IC0805 ("ComplexHPC") meeting in Timisoara, Romania.

12/2011 Invited talk: *SkelCL – A High-Level Programming Library for GPU Programming*
Jülich Supercomputing Centre (JSC), Germany.

05/2011 Talk: *SkelCL – A Portable Skeleton Library for High-Level GPU Programming*
HIPS 2011 workshop held in conjunction with IPDPS 2011 in Anchorange, Alaska, USA.

09/2008 Invited talk: *Development of an Online Game as a Student Project*
ITSoftTEAM workshop in Chernihiv, Ukraine.

Publications

Journal Articles

2014 [1] **M. Steuwer** and S. Gorlatch, SkelCL: A High-Level Extension of OpenCL for Multi-GPU Systems, *Journal of Supercomputing*, (in press).

2013 [2] **M. Steuwer**, M. Friese, S. Albers, and S. Gorlatch, Introducing and Implementing the Allpairs Skeleton for GPU Systems, *International Journal of Parallel Programming*, (in press).

[3] P. Kegel, **M. Steuwer**, and S. Gorlatch, dOpenCL: Towards uniform programming of distributed heterogeneous multi-/many-core systems, *Journal of Parallel and Distributed Computing*, 73(12):1639–1648.

Conference Proceedings

2014 [6] Breuer S., **Steuwer M.**, and Gorlatch S., Extending the skelcl skeleton library for stencil computations on multi-gpu systems, In *Proceedings of the 1st International Workshop on High-Performance Stencil Computations*, pages 749–758.

[4] S. Gorlatch and **M. Steuwer**, Towards High-Level Programming for Systems with Many Cores, In *Perspectives of Systems Informatics 9th International Andrei Ershov Memorial Conference (PSI 2014)*, (to appear).

[5] J. J. Fumero, **M. Steuwer**, and C. Dubach, A composable array function interface for heterogeneous computing in java, In *ACM SIGPLAN International Workshop on Libraries, Languages and Compilers for Array Programming*, (to appear).

2013 [7] **M. Steuwer** and S. Gorlatch, SkelCL: Enhancing OpenCL for High-Level Programming of Multi-GPU Systems, In *Parallel Computing Technologies 2013* edited by V. Malyskin, volume 7979 of *Lecture Notes in Computer Science*, pages 258–272. Springer Berlin Heidelberg.

[8] **M. Steuwer** and S. Gorlatch, High-Level Programming for Medical Imaging on Multi-GPU Systems using the SkelCL Library, *Procedia Computer Science*, 18:749–758.

2012 [9] **M. Steuwer**, P. Kegel, and S. Gorlatch, Towards High-Level Programming of Multi-GPU Systems Using the SkelCL Library, In *2012 IEEE International Symposium on Parallel and Distributed Processing Workshops and Phd Forums (IPDPSW)*, pages 1858–1865.

[10] **M. Steuwer**, P. Kegel, and S. Gorlatch, A High-Level Programming Approach for Distributed Systems with Accelerators, In *New Trends in Software Methodologies, Tools and Techniques – Proceedings of the Eleventh SoMeT'12* edited by F. Hamido and R. Roberto, pages 430–441.

[11] **M. Steuwer**, S. Gorlatch, M. Buß, and S. Breuer, Using the SkelCL Library for High-Level GPU Programming of 2D Applications, In *Euro-Par 2012: Parallel Processing Workshops* edited by C. Ioannis, A. Michael, B. Rosa, C. Mario, C. Alexandru, M. Danelutto, F. Desprez, B. Krammer, J. Sahuquillo, S. Scott, and J. Weidendorfer, Lecture Notes in Computer Science, pages 370–380. Springer.

[12] P. Kegel, **M. Steuwer**, and S. Gorlatch, dOpenCL: Towards a Uniform Programming Approach for Distributed Heterogeneous Multi-/Many-Core Systems, In *2012 IEEE International Symposium on Parallel and Distributed Processing Workshops and Phd Forums (IPDPSW)*, pages 174–186.

2011 [13] **M. Steuwer**, P. Kegel, and S. Gorlatch, SkelCL - A Portable Skeleton Library for High-Level GPU Programming, In *2011 IEEE International Symposium on Parallel and Distributed Processing Workshops and Phd Forums (IPDPSW)*, pages 1176–1182.

Book Chapter

2013 [13] C. Kessler, S. Gorlatch, J. Emmyren, U. Dastgeer, **M. Steuwer**, and P. Kegel, Skeleton Programming for Portable Many-Core Computing, *Skeleton Programming for Portable Many-Core Computing*, In *Programming Multi-core and Many-core Computing Systems* edited by S. Pllana and F. Xhafa, Wiley Interscience, (to appear).

[14] P. Kegel, **M. Steuwer**, and S. Gorlatch, Uniform High-Level Programming of Many-Core and Multi-GPU Systems, *Uniform High-Level Programming of Many-Core and Multi-GPU Systems*, In *Transition of HPC Towards Exascale Computing* edited by E. D'Hollander, J. Dongarra, I. Foster, Grandinetti L., and Joubert G., volume 24 of *Advances in Parallel Computing*, IOS Press, (to appear).

Teaching

Summer Term 2014 — Supervised a student project: *Design and implementation of a high-level API for programming heterogeneous clusters*.

Winter Term 2013/2014 — Supervised a student project: *High-level programming of online games in future generation networks*.

Summer Term 2013 — Lecturer for the course: *Introduction to programming with C and C++*.
Teaching assistant for the course: *Multi-core and GPU: Parallel Programming*.

Winter Term 2011/2012 — Teaching assistant for the course: *Operating Systems*.

Summer Term 2012 — Supervised a student project: *High-level programming of heterogeneous parallel systems*.
Teaching assistant for the course: *Multi-core and GPU: Parallel Programming*.

Winter Term 2011/2012 — Teaching assistant for the seminar: *Technical aspects of cloud computing*.
Teaching assistant for the course: *Operating Systems*.

Summer Term 2011 — Supervised a student project: *Internet- and GPU-based Cloud Computing*.
Teaching assistant for the course: *Multi-core and GPU: Parallel Programming*.

Winter Term 2010/2011 — Supervised a student project: *High-level GPU programming*.

Supervised Students

(All students are co-supervised with Prof. Sergei Gorlatch)

Currently active

since 04/2013 — Bachelor thesis of André Lüers: *Evaluation of the Skeleton Library FastFlow*

since 04/2014 Bachelor thesis of Lars Klein: *A Parallel Implementation of the T-CUP Software using the SkelCL Library*

since 05/2013 Bachelor thesis of Fabian Hall: *Design and implementation of an OpenCL compatibility API for the SkelCL Library*

Completed

01/2014 Master thesis of Michael Olejnik: *A GPU-based Classification Framework for HIV Resistance Prediction* (co-supervised with Dr. habil. Dominik Heider)

01/2014 Master thesis of Stefan Breuer: *Extending the SkelCL Library for Stencil Computations*

11/2013 Diploma thesis of Wadim Hamm: *Development of a Divide & Conquer Skeleton for SkelCL*

07/2013 Bachelor thesis of Matthias Droste: *Evaluation of the Skeleton Library SkePU*

06/2013 Bachelor thesis of Kai Kientopf: *Implementation of the Needleman-Wunsch Algorithm and the Breath-First-Search with the SkelCL Library*

06/2013 Master thesis of Florian Quinkert: *A Model for Predicting Work Distribution in Heterogeneous Systems and its Implementation in the SkelCL Library*

03/2013 Master thesis of Malte Friese: *Extending the Skeleton Library SkelCL with a Skeleton for Allpairs Computations*

03/2013 Bachelor thesis of Sebastian Mißbach: *Implementing the LU-Decomposition and the Mersenne-Twister with the SkelCL Library*

03/2013 Bachelor thesis of Patrick Schiffler: *Performance Analysis of SkelCL using B+ Tree Traversal and 3D Jacobi Stencil Computation*

01/2013 Diploma thesis of Markus Blank-Burian: *Simulation and Analysis of Two-Dimensional Turbulences on Parallel Computer Architectures* (co-supervised with Prof. Gernot Münster)

06/2012 Diploma thesis of Matthias Buß: *Adding Multidimensional Data Types to the Multi-GPU Skeleton Library SkelCL*

09/2011 Bachelor thesis of Michael Olejnik: *Investigating the Use of GPUs for Radix Sort*

09/2011 Bachelor thesis of Jan Gerd Tenberge: *Extending the SkelCL Library with Iterators*

08/2011 Bachelor thesis of Stefan Breuer: *Enhancing SkelCL's MapOverlap Skeleton*

08/2011 Bachelor thesis of Tobias Günnewig: *Developing a Library for Manipulating Source Code of C-based Languages* (co-supervised with Philipp Kegel)