

Maximilian H. Bremer

CONTACT INFORMATION

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EDUCATION

University of Texas at Austin, Institute for Computational Engineering and Sciences

Ph.D. Candidate, Computational Science, Engineering, and Mathematics.
M.Sc., Computational Science, Engineering, and Mathematics, May 2018.
Thesis: Task-Based Parallelism for Hurricane Storm Surge
Advisor: Clint Dawson
Expected Graduation Date: Summer 2020

University of Cambridge,

M.A.St., Part III Pure Mathematics, June 2015.
Emphasis: Partial Differential Equations / Analysis

The University of Texas at Austin

B.Sc., Aerospace Engineering, May 2014, GPA: 3.98/4.00.
B.Sc., Applied Mathematics, May 2014, GPA: 3.98/4.00.

RESEARCH EXPERIENCE

Keywords

Task-based parallelism • High performance computing • Discontinuous Galerkin finite elements
• Shallow water equations • Hurricane storm surge

The University of Texas at Austin

Computational Hydraulics Group

Fall 2015–present
Supervised by: Clint Dawson

- ‡ Developing dynamic load balancing strategies using HPX's Active Global Address Space (AGAS) to offset load imbalances generated by the simulation of inundation caused by hurricane storm surge.
- ‡ Compared and analyzed performance of flat (non-blocking) MPI versus an HPX-based parallelization on Knights Landing and Skylake architectures on Stampede2.
- ‡ Refactored in-house discontinuous Galerkin storm surge code to improve productivity. Introduced software engineering best practices, e.g. continuous integration and unit testing.

Lawrence Berkeley National Lab

Computer Architecture Group

Summer 2016
Supervised by: Cy Chan

- ‡ Examined load balancing strategies for asynchronous execution models of hurricane storm surge simulations.
- ‡ Developed and validated a discrete event simulator of the application code for rapid prototyping of load balancing strategies.

PUBLICATIONS

Journal Articles

1. **M.B.**, Kazbek Kazhyken, Hartmut Kaiser, Craig Michoski, Clint Dawson, "Performance Comparison of HPX Versus Traditional Parallelization Strategies for the Discontinuous Galerkin Method", *Submitted to J. Sci. Comput.*, 2018.

Conference Papers

1. **M.B.**, John Bachan, Cy Chan, "Semi-Static and Dynamic Load Balancing for Asynchronous Hurricane Storm Surge Simulations", *2018 IEEE/ACM Parallel Applications Workshop, Alternatives To MPI (PAW-ATM)*, Dallas, Texas, IEEE, November 16, 2018, 13 pages.

Presentations/Talks

8. **M.B.**, John Bachan, Cy Chan, “Semi-Static and Dynamic Load Balancing for Asynchronous Hurricane Storm Surge Simulations”, *2018 IEEE/ACM Parallel Applications Workshop, Alternatives To MPI (PAW-ATM)*, November 16, 2018.
7. **M.B.**, Kazbek Kazhyken, Hartmut Kaiser, Craig Michoski, Clint Dawson, “Task-based Parallelism for Finite-Element Models of Shallow Water Flows”, *World Congress in Computational Mechanics*, July 24, 2018.
6. **M.B.**, “Computational Modeling of Hurricane Storm Surge”, *Harrington Annual Research Symposium*, April 10, 2018.
5. **M.B.**, Zach Byerly, Hartmut Kaiser, Craig Michoski, Clint Dawson, “Performance Comparison of HPX versus Traditional Parallelization Models for Finite-Element Models of Environmental Flows”, *American Meteorological Society Annual Meeting*, January 10, 2018.
4. **M.B.**, “Wrangling Concurrency with HPX”, *ICES Seminar–Student Forum*, December 8, 2017.
3. **M.B.**, Craig Michoski, Zach Byerly, Hartmut Kaiser, Clint Dawson, “Optimizing Discontinuous Galerkin Finite Element Kernels on Knights Landing Chips”, *Texas Applied Mathematics and Engineering Symposium*, September 22, 2017.
2. **M.B.**, John Bachan, Cy Chan, “Asynchronous Load Balancing for Hurricane Storm Surge Simulations”, *LBL Computing Sciences Seminar*, February 16, 2017.
1. **M.B.**, Clint Dawson, Zach Byerly, Hartmut Kaiser, Craig Michoski, Andreas Schäfer, “Application of High Performance ParallelX (HPX) for High Performance Computing of Hurricane Storm Surge”, *American Meteorological Society Annual Meeting*, January 25, 2017.

HONORS AND AWARDS

Honors and Awards

Department of Energy Computational Science Graduate Fellowship (2015)
Donald D. Harrington Fellowship (2015)
Cockrell School of Engineering Outstanding Scholar/Leader Award (2014)
Graham F. Carey Scholarship in Computational Science (2013)

COMPUTER SKILLS

Languages

‡ C++, Python, Bash Scripting, FORTRAN, MatLab, L^AT_EX

Software Development

DGSWEM-v2

<https://github.com/UT-CHG/dgswemv2>

‡ Discontinuous Galerkin (DG) finite element code for the simulation of coastal flows.
‡ Provides MPI+OpenMP and HPX parallelization back-ends.
‡ License: MIT

Areas of Exposure

‡ *Packages*: MPI, OpenMP
‡ *Libraries*: HPX, Eigen, Blaze, UPC++
‡ *Software Engineering*: git, make, cmake, CircleCI, Docker

ACADEMIC SERVICE

Conferences/Seminars Organized

‡ Co-organizer, *ICES Seminar–Babuška Forum* Fall 2018–present
‡ Co-organizer, *Texas Applied Mathematics and Engineering Symposium* September 2017

Societal Membership

‡ CSEM Student Representative Fall 2018–present
‡ Society for Industrial and Applied Mathematics (SIAM)