

Résumé

Personal Information

Surname, Name, Degrees Polok Lukáš, Ing. Ph.D.
E-mail ipolok@fit.vutbr.cz Alternative E-mail lukas@lukas-polok.cz
Phone +420 54114-1404 Mobile Phone +420 73668-4124
Fax +420 54114-1270
Nationality Czech Republic
Birth Date 1985-05-15

Education

Period 2007/2008–2008/2009
Qualification Achieved Ing. (equivalent of an MSc.)
Main Specialization Information Technology
Name of the University Brno University of Technology, Faculty of Information Technology
Period 2009/2010–2015/2016
Qualification Achieved Ph.D.
Thesis Title Accelerated Sparse Matrix Operations in Nonlinear Least Squares Solvers
Name of the University Brno University of Technology, Faculty of Information Technology

Work Experience

Period 2009–present
Job Title Researcher, Technical assistant, Tutor
Job Description Teaching in areas of image processing, computer vision and user interfaces. Teaching and research in areas of algorithm acceleration, parallel computing and acceleration on the GPU platform. Research in the areas of sparse numerical methods and their applications in robotics and computer vision. Supervised more than 80 bachelor and master projects (two in 2009, 17 in 2010, 12 in 2011, 14 in 2012, ten in 2013, 13 in 2014 and 14 in 2015).
Classes Taught 2D Graphics lecture in *Multimedia* (2009–2013, since 2010 also in English), Parallelization lecture in *Practical Aspects of Software Design* (2011–2015), Accelerated 3D Graphics lecture in *Advanced Computer Graphics* (2011–2015), 3D Reconstruction lecture in *Computer Vision* (2013–2015) and Affine and Epipolar Geometry lecture in *Computational Geometry* (2017).
Supervised Project Mohelník Petr, *Procedural Animation of Human Walk*, 2015, published at a student conference, faculty candidate for the national ACM SPY competition
Highlights Koukolíček Ondřej, *Weather and Aeronautical Data on Map for Airplane EFB*, 2014, cooperation with industry (Honeywell)
Vaverka Filip, *Digital Filter Design on GPU*, 2012, published at a student conference
Klement Martin, *Procedural Animation of Human Walk*, 2010, winner of the Media Contest competition
Bartoš Peter, *Automatic Selection of Representative Pictures*, 2010, winner of the jury prize at the Media Contest competition
Name and Address of the Employer Brno University of Technology, Faculty of Information Technology, Antonínská 548/1, 601 90 Brno, Czech Republic
Period July 2015–September 2015
Job Title Visiting Fellow
Job Description A short visit at the Australian National University, with a quick stop at the Monash University. Cooperated with Robert Mahony, Tom Drummond, Viorela Ila and Vincent Lui. Wrote a conference paper (accepted to ACRA).

Name and Address of the Employer Australian National University, College of Engineering & Computer Science, 115 North Road, Canberra, ACT 0200

Research Projects in the Last Five Years

- 2012–2015 Intelligent Management Platform for Advanced Real-Time media processes, 7th FP, IMPART 316564, local coordinator and a member of the research team.
- 2010–2013 Embedded Service Oriented Monitoring, Diagnostics and Control: Towards the Asset-aware and Self-Recovery Factory, Artemis JU, eSonia, member of the research team.
- 2011–2012 Image processing and 3D graphics synthesis on mobile devices, Czech Ministry of Education, Youth and Sports, 1255/2011/G1, principal investigator.
- 2011–2013 Smart autopilot, Technology Agency of the Czech Republic, TA01010678, member of the research team.
- 2012–2013 Efficient tools for mobile application development, Czech Ministry of Education, Youth and Sports, 2158/2012/G1, principal investigator.

Expertise

Algorithm acceleration, parallel computing and acceleration on the GPU platform. Extended precision arithmetics. Sparse numerical methods with applications in robotics and computer vision. Highly proficient in C++, OpenMP, CUDA, OpenCL, OpenGL and LaTeX. Experienced Windows & Linux user. Skilled in multiplatform development using CMake. Supercomputing with PBS (portable batch system).

Research Interest

High performance computing (in particular software or algorithm development), parallel computing (in particular on SMP and NUMA machines, GPGPU), numerical methods (in particular direct methods on sparse matrices, extended precision methods), computer vision, robotics (in particular 3D reconstruction, robot navigation and mapping).

Selected Publications from the Last Five Years

- 2017 Klemen Istenič, Viorela Ila, Lukáš Polok, Nuno Gracias, Rafael García: Mission-time 3D Reconstruction with Quality Estimation. In: Proceedings of Oceans 2017. Aberdeen, Scotland: MTS/IEEE, 2017.
- 2017 Polok Lukáš, Pavel Smrž: Pivoting Strategy for Fast LU decomposition of Sparse Block Matrices. In: Proceedings of the 25th High Performance Computing Symposium (HPC'17). Virginia Beach, USA: ACM, 2017.
- 2017 Ila Viorela, Polok Lukáš, Šolony Marek and Pavel Svoboda: SLAM++. A Highly Efficient and Temporally Scalable Incremental SLAM Framework, The International Journal of Robotics Research (IJRR). SAGE Publications, 2017, ISSN: 1741-3176.
- 2016 Polok Lukáš and Smrž Pavel: Increasing Double Precision Throughput on NVIDIA Maxwell GPUs. In: Proceedings of the 24th High Performance Computing Symposium (HPC'16). Los Angeles, USA: ACM, 2016.

- 2016 Polok Lukáš, Ila Viorela and Smrž Pavel: 3D Reconstruction Quality Analysis and Its Acceleration on GPU Clusters. In: Proceedings of the European Signal Processing Conference (EUSIPCO). Budapest, Hungary: IEEE, 2016.
- 2015 Polok Lukáš, Lui Vincent, Ila Viorela, Drummond Tom, Mahony Robert: The Effect of Different Parameterisations in Incremental Structure from Motion. In: Proceedings of the Australian Conference on Robotics and Automation (ACRA). Canberra, Australia: ARAA, 2015.
- 2015 Ila Viorela, Polok Lukáš, Šolony Marek, Zemčík Pavel and Smrž Pavel: Fast Covariance Recovery in Incremental Nonlinear Least Square Solvers. In: Proceedings of IEEE International Conference on Robotics and Automation (ICRA). Seattle, USA: IEEE Computer Society, 2015.
- 2015 Polok Lukáš, Ila Viorela and Smrž Pavel: Fast Sparse Matrix Multiplication on GPU. In: Proceedings of the 23rd High Performance Computing Symposium (HPC'15). Alexandria, USA: ACM, 2015.
- 2015 Pabst Simon, Kim Hansung, Polok Lukáš, Ila Viorela, Wayne Ted, Hilton Adrian, Clifford Jeff and Smrž Pavel: Jigsaw - Multi-Modal Big Data Management in Digital Film Production. In: Proceedings of the 42nd SIGGRAPH Posters. Los Angeles, USA: ACM, 2015.
- 2014 Polok Lukáš, Ila Viorela and Smrž Pavel: Fast Radix Sort for Sparse Linear Algebra on GPU. In: Proceedings of the 22nd High Performance Computing Symposium (HPC'14). Tampa, USA: ACM, 2014.
- 2013 Polok Lukáš, Ila Viorela and Smrž Pavel: Cache Efficient Implementation for Block Matrix Operations, In: Proceedings of the 21st High Performance Computing Symposium (HPC'13). USA: ACM, 2013.
- 2013 Polok Lukáš, Ila Viorela, Šolony Marek, Zemčík Pavel and Smrž Pavel: Efficient Implementation for Block Matrix Operations Nonlinear Least Squares Problems for Robotic Applications, In: Proceedings of IEEE International Conference on Robotics and Automation (ICRA). Karlsruhe, Germany: IEEE CS, 2013.
- 2013 Polok Lukáš, Ila Viorela, Šolony Marek, Zemčík Pavel and Smrž Pavel: Incremental Block Cholesky Factorization for Nonlinear Least Squares in Robotics, In: Proceedings of The Robotics: Science and Systems (RSS 2013). Berlín, Germany: MIT Press, 2013.
- 2013 Polok Lukáš, Ila Viorela, Šolony Marek, Zemčík Pavel and Smrž Pavel: Incremental Cholesky Factorization for Least Squares Problems in Robotics, In: Proceedings of The 2013 IFAC Intelligent Autonomous Vehicles Symposium. Gold Coast, Australia: IEEE CS, 2013.
- 2012 Polok Lukáš and Smrž Pavel: Fast Linear Algebra on GPU, In: Proceedings of IEEE High Performance Computing and Communication Conference (HPCC). Liverpool, Great Britain: IEEE CS, 2012.
- 2012 Polok Lukáš, Bartoň Radek, Chudý Peter, Smrž Pavel and Kršek Přemysl, Terrain Rendering Algorithm Performance Analysis, In: Proceedings of The 31st IEEE/AIAA Digital Avionics Systems Conference (DASC). Williamsburg, USA: IEEE, 2012.

Personal Skills

Development of highly efficient algorithms, with focus on delivering high quality code that is fast, robust and easy to use. I like to work in a good team; I enjoy publishing my research and support open source.

Other Merits

Runner-up for the best student presentation and runner-up for the best student poster at the RSS 2013 conference.

Invited talks at the Australian National University (Australia, 2015), Monash University (Australia, 2015), GPU Technology Conference (USA, 2015), Max Planck Institute for Informatics (Germany, 2016), High Visual Computing (Czech Republic, 2016) and BrMO mobile developer meeting (Czech Republic, 2017).

Recipient of the 2016 ACRV Award for Collaborative Papers.

Program vice-chair of the HPC 2016 conference.

General chair of the HPC 2017 conference.

External reviewer for the journal of Signal Processing: Image Communications (Elsevier), for the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) and for the IEEE International Conference on Image Processing (ICIP).

Member of SCS (Society for Modeling and Simulation International).

Awarded 295,000 core-hours at the IT4I Czech National Supercomputing Center in grant competitions.

Received two GPUs (Tesla K40 and Tegra K1) in the NVIDIA Academic Hardware Grant Program.

References

prof. Dr. Ing. Zemčík Pavel, dean, FIT BUT

doc. Dr. Ing. Černocký Jan, head of the DCGM department, FIT BUT

doc. RNDr. Smrž Pavel, Ph.D., associate professor, FIT BUT

{[zemcik](mailto:zemcik@fit.vutbr.cz),[cernocky](mailto:cernocky@fit.vutbr.cz),[smrz](mailto:smrz@fit.vutbr.cz)}@fit.vutbr.cz