ANTON MITROKHIN

M.S.: Moscow Institute of Physics and Technology, Department of Radio Engineering and Cybernetics
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Education

Moscow Institute of Physics and Technology 09/2012 – 07/2018
B.E., Electrical and Computer Engineering
Internship (co-op) at Intel, Advisor: Dmitry Babokin
M.S., Electrical and Computer Engineering
Institute of Microelectronics and Advanced Control Systems
Degree in progress, graduation 07/2018

University of Maryland, College Park 09/2016 – present
Ph.D, Computer Science
Perception and Robotics Group, Advisor: Prof. Yiannis Aloimonos
Degree in progress, graduation 05/2021

Research Interests

autonomous robotics, Internet of Things, AI, data mining, embedded systems, sensor networks

Relevant skills

Programming languages: C/C++ (STL, Boost, C++11, 14), Assembly, Python, Bash, Verilog
Tools: Git, SVN, OpenCL, OpenCV, PCL, ROS, TensorFlow, Theano
IDEs: Vim, Eclipse, Visual Studio, Xilinx ISE, Vivado
my Github page is available here

Employment

University of Maryland, College Park 09/2016 – present
Research Assistant: Perception and Robotics Group (website) 01/2017 – present
Teaching Assistant: CMSC 132:
Advanced object oriented programming 09/2016 – 01/2017
Teaching Assistant: CMSC 498F (website):
An introduction to the design and programming of robotics systems 01/2017 – 05/2017
Teaching Assistant: ENPM 673:
Perception for autonomous robots 01/2018 – 05/2018

Intel Corporation 07/2014 – 07/2016
Research Intern (co-op): Technology Pathfinding and Innovation (Dmitry Babokin)

Moscow Institute of Physics and Technology 09/2013 – 07/2016
Teaching Assistant: MIPT Program for High School Students (Anna Tykova)

Intel Corporation 09/2014 – 07/2016
Teaching Assistant: Intel iLab Computer Science (Ilya Dedinsky)

MIPT Robotics Laboratory 11/2014 – 07/2016
Teaching Assistant: ROS Framework (Alexey Tsyganov, Taras Pustovoy)

Parallels, Inc 08/2013 – 06/2014
Research Intern (co-op): Device Virtualization Division (Anna Melekhova)

Projects

ISPC [*Anton Mitrokhin, Vsevolod Livinsky, Dmitry Babokin*] (website)
ISPC stands for Intel SPMD (Single Program, Multiple Data) Program Compiler – an open source compiler for a variant of C programming language with extensions for SPMD model. ISPC utilizes SIMD units of CPUs to run several instances of a regular serial code with different data inputs, thus delivering up to 4x performance gain on

4-wide SSE units, 8x on AVX units and 16x on AVX-512 units. ISPCs primary purpose is to facilitate the process of creating parallel code for CPU. ISPCs programming model is especially effective with image processing algorithms and renderers. I was one of the major contributors to the project, implementing support for AVX-512, KNC and KNL.

YARPgen [*Anton Mitrokhin, Vsevolod Livinsky, Dmitry Babokin*] (website)
YARPgen is an open source random C/C++ program generator which produces correct runnable C/C++ programs for the purpose of automated compiler testing. I have started this project as a part of my Bachelor's thesis at MIPT in collaboration with Intel. YARPgen utilizes a sophisticated grammar for program generation and is able to outperform modern state of the art test generators such as CSmith and Orange in terms of number of errors found. I am currently preparing a paper on YARPgen for publishing in IEEE.

VIP [*Anton Mitrokhin, Dmitry Babokin, Areg Adamyan*]
VIP is an experimental CPU architecture which utilizes a *Vector of Instruction Pointers* (i.e. several instruction pointers (IPs) per core) to execute programs. This architecture can severely mitigate the cost of context switching for applications exhibiting fine-grained parallelism (the majority of modern applications) as independent strands of instructions can be processed by several IPs within a single CPU core. As a part of my Bachelor's thesis I was involved in the development of a new type of compiler for VIP to supply the CPU with high-level information about available parallelism. We implemented the front end in Go Language and the middle end was based on the modified version of INSPIRE IR used in a well known Insieme compiler.

UAV Tournaments [*Anton Mitrokhin, Vsevolod Livinsky, Alexey Gusarov, Alexey Tsyganov*] (website)
I lead the MIPT team for aerial robotics competitions since 2013. We have developed our own frame based on ArduPilot 2.6 with custom firmware and Intel NUC as a central processing node. The robot is running ROS (Robot Operating System) and uses IMU (Inertial Measurement Unit), sonar and MS Kinect (later, Intel RealSense and Intel R200 cameras) to navigate. The robot is capable of operating in outdoor environment, mapping and navigating a previously unknown maze, and automatically landing on a landing pad. In 2014, I published a paper describing some of the techniques implemented in robot navigation system (*pdf, available in Russian*).

KVM [*Anton Mitrokhin, Anna Melekhova*]
KVM is a virtualization framework for Linux, which allows users to run multiple operating systems on a single host. Virtualization technologies play a key role in Cloud Computing, where power consumption may become a tangible problem for big data centers. The Green KVM project, conducted during my work in Parallels, aimed at finding and eliminating inefficiencies in KVM virtualization algorithms. The biggest problem found was due to conflicting system calls, where several virtual machines ordered opposite tasks with highest execution priority. As a result of the project, I implemented a KVM module to control and properly schedule or merge conflicting calls. The addition allowed to improve performance 40 to 50 percent in certain cases.

Publications

Mitrokhin, Anton, et al. *"Event-based Moving Object Detection and Tracking."* arXiv preprint arXiv:1803.04523 (2018). (https://arxiv.org/abs/1803.04523) - submitted for iROS 2018. *Project page, video*

Preparing for publication: Mitrokhin, Anton, et al. "*Yet Another Random Program Generator: Compiler verification using random test generation*" (https://github.com/01org/yarpgen)

Mitrokhin, Anton, et al. *"Micro Air Vehicle Stabilization in Closed Environments Using RGB-D Sensor and IMU."* Potential of Modern Science, 2, 20 Apr. 2014: 6-10. Print.
(http://nf-innovate.com/index_sub2_sub4_sub2.html; *pdf, available in Russian*)

Invited Talks

Data processing and Motion analysis with Dynamic Vision Sensors
2018 Northrop Grumman Mission Systems University Research Symposium Apr 17, 2018

BetterFlow: High speed Optical Flow estimation with Neuromorphic Sensors Jul 25, 2017
2017 Telluride Neuromorphic Cognition Engineering Workshop

YARP-gen: Random test generator for optimization verification in C/C++ compilers
59th Moscow Institute of Physics and Technology Scientific Conference (honors section) Nov 24, 2016

LLVM: Advanced Vectorization Support and Drawbacks in Presence of Explicitly Parallel Code
58th Moscow Institute of Physics and Technology Scientific Conference Nov 28, 2015

A Survey of Random Program Generation Methods for C/C++ Compiler Testing
58th Moscow Institute of Physics and Technology Scientific Conference Nov 28, 2015

Relevant Coursework

University of Maryland, College Park (*GPA: 3.95*)
Image Processing (*CMSC 828G, CMSC 733*), Natural Language Processing (*CMSC 723*), Computer Graphics (*CMSC 740*), Network Security (*CMSC 818O, ENEE 759F*).

Moscow Institute of Physics and Technology
Distributed Systems, Operating Systems, Computer Security, Parallel Computing, Computer Networks (Cisco Network Course at MIPT), Object Oriented Programming.

Intel
VLSI design, FPGA development, Graph Theory, Compiler Theory, Computer Architecture, Programming Languages.

Teaching

University of Maryland, College Park Teaching Assistant
- CMSC 132: Advanced object oriented programming 09/2016 – 01/2017
- CMSC 498F: An introduction to the design and programming of robotics systems 01/2017 – 05/2017
- ENPM 673: Perception for autonomous robots 01/2018 – 05/2018

Intel iLab: Introduction to Programming Languages Fall 2014, Fall 2015
Teaching Assistant for Ilya Dedinsky, Intel

Intel iLab: C/C++ and Object Oriented Programming Spring 2015, Spring 2016
Teaching Assistant for Ilya Dedinsky, Intel

MIPT Program for High School Students Fall 2013 – Summer 2016
Teaching Assistant for Anna Tykova, MIPT

MIPT Robotics Laboratory Fall 2014 – Summer 2016
Teaching Assistant: ROS Framework for Alexey Tsyganov

MIPT Robotics Laboratory Fall 2014 – Summer 2016
Student Volunteer: Fast Prototyping and Robotics master classes

Awards

University of Maryland Flagship Fellowship 2016 – 2020

59th MIPT Scientific Conference Best Poster Award 2016

Intel Recognition Award 2015

Pearson Presentation Contest, winner 2015

Intel Recognition Award 2014

Abramov-Frolov merit-based Scholarship 2012 – 2015 (each academic term)