

Aleksandr Mikov

Curriculum vitæ

About Me

PhD, Researcher and algorithm developer in the indoor and outdoor navigation field with an emphasis on automotive and pedestrian applications.

Employment

2022 – now

Bosch, XC/AS, Stuttgart

Senior Researcher

- Developed localization algorithms for parking lots & underground garages based on odometry and perception data
- Prototyped mapping algorithm for parking lots & underground garages

2020 – 2022

Huawei, St. Petersburg

Lead Researcher

- Worked on Intelligent Transport Systems problems: radar-camera calibration, pose estimation, multi-target tracking
- Developed unsupervised alignment algorithm for radar-camera pairs deployed at the intersection

2018 – 2020

Navagine Inc. & Yandex, Skolkovo & Moscow

Researcher & Senior Software Developer

- Developed Sensor Fusion of GNSS, Inertial and Visual Odometry data. The position error after 5 minutes of autonomous positioning didn't exceed 1% of total travelled distance (See [Example](#))
- Worked on Tightly Coupled GNSS/INS Sensor Fusion toolbox
- Developed sensor fusion algorithms for automotive positioning using GPS, odometer and Analog Devices inertial sensors. Enabled fast and efficient cold start without GPS (See [Results](#))
- Developed algorithms for automotive positioning in GPS-denied environment using CAN-data (steering wheel angle, odometer) and road information. With the proposed algorithms car is able to robustly estimate its position hours after GPS signal loss (See [Demo](#))
- Accelerated the development of localization library which fuses Bluetooth, WiFi, GPS and inertial measurements, strengthened it to provide even more robust navigation solution



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- Implemented and integrated indoor Particle Filter based positioning algorithms for Yandex Maps
- Developed Sensor Fusion solution of GNSS, Inertial and Odometer data for Yandex Drive car positioning using low-cost sensors. The solution able to work robustly in GNSSs-denied and GNSS-spoofed environments (See [Video](#))

2012 – 2018

000 NANOSSETI, Petrozavodsk

Researcher & Software Developer

Developed sensor fusion algorithms, motion classifiers and event-detectors, applied various optimization techniques. Worked in an excellent team of professionals.

- Constructed the models and algorithms for an accurate IMU calibration. The algorithms cure sensors imperfections: scale, non-orthogonality, bias and triads' misalignment
- Developed high-accurate sensor fusion algorithms for automotive positioning using only inertial sensors (See [Demo](#))
- Developed the dead-reckoning algorithms for pedestrians (See [Demo 1](#), [Demo 2](#))
- Designed motion activity classifier using Machine Learning techniques. It is able to detect walking, running, walking upstairs, walking downstairs and zero motion
- Intensively worked with Kalman filters, Bayesian methods and probability, statistical signal processing, multiple hypothesis tests
- Designed an embedded firmware for mobile handheld devices connected in wireless sensor network based on UWB/BLE with a focus on their self-localization, voice transmission and sensor fusion
- Tutored students on inertial navigation topics and prepared lab materials

2011 – 2012

Budget Monitoring Center, Petrozavodsk

Software developer

- Composed and proposed the statistical metrics to estimate the efficiency of local government services
- Deployed database mining algorithms and analytical services

Academic Career

- Dec. 2021 **PhD** in Mathematical Modeling, Numerical Methods and Software Engineering
Thesis title: Automotive dead reckoning algorithms for vehicles using low-cost MEMS IMUs
Advisor: [Roman Voronov](#)
Petrozavodsk State University
- June 2013 **M.S. in Computer Science**
M.S. in Computer Engineering
With honors
GPA: 5.0
Advisor: [Alexey Moschevikin](#)
Co-advisor: [Axel Sikora](#)
Petrozavodsk State University
- June 2011 **B.S. in Computer Science**
B.S. in Computer Engineering
With honors
GPA: 4.77
Advisor: [Ilya Pennie](#)
Petrozavodsk State University

Courses

- 2019 **Algorithms for integrated inertial satellite navigation systems**
[Certificate](#)
Lomonosov Moscow State University, MSU
- 2017 **Machine Learning: Statistics for data analysis**
[Coursera Certificate](#)
Moscow Institute of Physics and Technology & Yandex
- 2016 **Machine Learning: Unsupervised Learning**
[Coursera Certificate](#)
Moscow Institute of Physics and Technology & Yandex

- 2016 **Machine Learning: Supervised Learning**
[Coursera Certificate](#)
Moscow Institute of Physics and Technology & Yandex
- 2016 **Math and Python for data analysis**
[Coursera Certificate](#)
Moscow Institute of Physics and Technology & Yandex
- 2016 **Robotics: Aerial Robotics**
University of Pennsylvania on Coursera
- 2015 **Digital Signal Processing**
Faculty of Extension Courses, PetrSU
- 2014 **Fundamentals of business: information services**
Faculty of Extension Courses, PetrSU
- 2013 **Computer networks and communications**
Faculty of Extension Courses, PetrSU

Awards and acknowledgments

- 2015 **Intel Hackaton**
The member of the winning team of IoT 2015 hackaton. Presented a device which was able to measure the physical characteristics of the environment and to make the recommendations about work schedule
- 2014 **The winner of «Youth Scientific Innovation Competition» (UMNIK)**
My funding proposal for «The development of inertial navigation system for pedestrians in GPS-denied environment» got a \$10000 grant
- 2013 **First prize EvAAL-2013**
The RealTrac positioning system, which I contributed to, took the first place in International competition «Evaluating AAL Systems through Competitive Benchmarking, EvAAL-2013»
- 2013 **DAAD Scholarship, Germany**
Research work at Offenburg University of Applied Sciences
- 2013 **Personal Scholarship**
The winner of the scholarship from the head of the republic of Karelia
- 2012 **Personal Scholarship**
The winner of the special scholarship for young researchers from the Russian Parliament
- 2012 **Microsoft Student Partner**
Microsoft Student Partner in Petrozavodsk State University in 2011-2012

Skills

Software development

Platforms	Proficiency in Linux and its tools. Special exposure to real-time operating systems (FreeRTOS). Able to develop on Unix or Microsoft desktop systems. Solid background in embedded programming on low-powered micro-controllers (ARM Cortex based: STM32F4 and nRF51 families).
IDEs	Experience with Visual Studio Code, VIM.
Compilers	GNU Compiler Collection, GNU Arm Embedded Toolchain.
Hardware	CAN, I2C, I2S, SAI, SPI, DMA, inertial sensors, nanoLOC, BLE, UWB, Audio Codecs, SocketCAN
SCM	GIT, SVN.

Programming Technologies

C/C++	8 years of experience. Good understanding of program flow, memory management and real-time systems behaviour. Solid knowledge of standard (STL) and scientific (Eigen) libraries.
Python	6 years of experience. Used for research, algorithm development and verification. Gained the competence in Numpy, Scipy, Pandas and Scikit-Learn. A lot of experience with visualizations and data representation using Jupyter tools.
Matlab	Good proficiency. Used before Python for various research problems.
LaTeX	Used for paper publishing, scientific reports and professional documentation.

Scientific knowledge

Computer science	Functional and object-oriented programming, data structures, algorithm design and its complexity estimation, Montecarlo simulations, software engineering, debugging and code profiling, subversioning
Machine learning	Classification, clusterization, linear regression, statistics, Particle Filters, Bayesian methods, probability theory, learning methods.
Signal processing	Kalman filters, sensor calibration, smoothing, dimensionality reduction, sampling, numerical computing, linear algebra, least squares, minimization and maximization problems.
Navigation systems	GPS, GLONASS, GALILEO, Inertial Sensors, odometers, motion constraints, Ackermann model, Map matching, Factor Graphs.

Publications

Full list of publications is available [here](#)