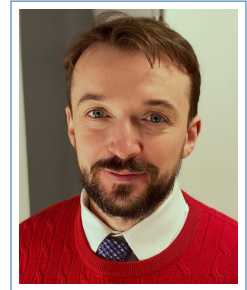


Ilya Korogodin

Curriculum Vitae

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Engineer, researcher, and professor solving problems and enjoying the solutions.

Previous Employment

2013–
nowadays **Head Researcher, Associate Professor, Moscow Power Engineering Institute.**

- As researcher and engineer, I conduct R&D in the field of navigation systems: GNSS receivers and simulators, CRPA, GLONASS satellites equipment, GLONASS CORS, assisted navigation, pseudolites. I am a principal developer of a FPGA-based receivers/simulators/transceivers firmware, a head developer of logic modules for two ASICs. I'm an author of bit-accurate simulation utility for the GNSS firmware. I am responsible for interactions with customers, technical documentation, and reports. I recruit the team, teach and manage them. I evolve project management and continuous integration practices, including hardware autotests.

As professor, I teach professional and postgraduate courses (Navigation Receivers, Systems Simulation) and supervise postgraduate students, write books and manuals

2010–2013 **Researcher, Teaching Assistant, Moscow Power Engineering Institute.**

- I conducted R&D: navigation receiver for satellite vehicles, multipath suppression techniques, antijam properties and algorithms. I developed a firmware for an ASIC-based attitude determination GNSS receiver: calibration technique, tracking systems, measurements. Also, I developed a firmware for a navigation receiver: protocols, interfaces, signal tracking, host software.

As assistant, I taught a professional Basics of GNSS course, was participated in a Navigation Receivers course. I supervised graduate students and held the post of Scientific Secretary of the State Attestation Commission.

2006–2010 **Engineer, Moscow Power Engineering Institute.**

- I participated in GNSS and navigation receivers R&D: receiver properties, new GLONASS CDMA signals, integrated inertial-GNSS navigation systems. I investigated signal processing algorithms: attitude determination receivers, tracking loops, multipath, antijam capability. Matlab, estimation theory, laboratory equipment and navigation receivers were my main instruments at the time.

Education

- 2010–2013 **PhD, Navigation and location systems, Moscow Power Engineering Institute, PhD thesis "Development of signal processing algorithms for attitude determining GNSS receivers".**

- 2008–2010 **Master's Degree, Electrical and Electronic Engineering, MPEI, All A, with honors.**
- 2004–2008 **Bachelor's Degree, Radiophysic, MPEI, Moscow, All A, with honors.**
- 1993–2004 **High School, Zlatoust, with honors.**

Additional: Management in Education, Research Connect

Notable Projects

○ **Naviware: FPGA-based GNSS receiver/simulator/transceiver software**

I am the head of a team developing FPGA-based GNSS solutions: receivers, simulators and transceivers. Naviware includes software for the Xilinx Zynq processor system and programmable logic, bit-accurate simulation and testing utilities, user-side software. It implements GPS, GLONASS, Galileo and Beidou signal processing and other functions:

- Space-Time Adaptive Processing
- Fast signal acquisition
- Multi-input correlation channels
- Precise time synchronization
- GNSS vector signal generator channels

The Naviware is an engine for several successful GNSS-related projects:

- **Clonicus** is an all-band all-systems GNSS receiver in the popular Novatel OEM719 form factor. The board is an analogue of Swift Navigation PiksiMulti and Tersus BX306 boards.
- **Adicus** is a Xilinx Zynq-based GNSS transceiver board. It receives and generates GNSS and pseudolite signals.
- **Nomadicus** is a GNSS receiver for 4-element CRPAs. It implements space-time adaptive processing algorithms.
- **LocSys** is a long-range local navigation system. It's a functional analogue of Locata pseudolite navigation system.
- **Real-time controlled Simulator** is a precise GNSS synchronized simulator of GNSS navigation signals. The main feature of the project is a real-time aiming for integrated INS-GNSS testing purposes.
- **GLONASS laser continuously operating reference station (CORS)**
The main feature of the project is precise picosecond-level time synchronization. Naviware-based GNSS receiver operates in conjunction with a laser range-meter and a hydrogen clock. GNSS signals of all bands are processed.
- **Multi-element antenna CORS**
The main feature of the project is a CRPA beamforming and RTK with the CRPA. GNSS signals of all bands are processed.

I acted as a principal software developer, tech/team leader and project manager for all the projects.

○ **GNSS receivers QA/CI pipeline**

It's an gitlab-based hardware testing system. It implements several testing stages: build, simulation, signal loops, testbed and open-sky. The system generates industry standart reports and requirements specifaion.

○ **STAP ASIC**

It was an ASIC for space-time adaptive signal processing for CRPAs and locators. The project was successful, the ASIC works fine. I participated in architecture developing process, wrote about 50% of final HDL code. It was a challenging to optimize the code by power consumption and chip area. Also, I developed a bit-accurate Matlab model to verify the HDL code.

○ **SV Navigation Receiver ASIC**

It was ASIC for navigation signal processing. The chip was intended for space vehicles. I participated in the architecture developing process and wrote some final HDL code and matlab models.

○ **CDMA signals for GLONASS**

It was part of a team developed new CDMA GLONASS signals (L1OC, L1SC, L2OC, L2SC). I carried out calculations and simulations for the considered variants: thermal noise errors, multipath mitigation,

intrasystem interference and so on.

- **GNSS receiver for attitude determination**

I participated in developing of a GLONASS multi-antenna receiver. It determines user attitude by means of navigation signals phases comparison. It was challenging to solve calibration problems for FDMA signals. I have developed special calibration technique and on-the-go algorithm based on the antennas swithing. Also I have developed a difference phase locking loops (DPLL). The algorithm dramatically increased accuracy and antijam capability of the attitude determinations.

- **Bayes estimator**

I implemented a strict Bayes estimator in Matlab and researched potential accuracy for frequency and difference phase estimations. This was a complete immersion in the theory of estimation.

- **Integrated GNSS-Inertial navigation system**

I participated in the system development process, wrote some code. The project introduced me to INS, huge Kalman filters and computational problems of inertial navigation.

Technical and Personal skills

- **Programming Languages:** Proficient in: C, C++, Matlab, Verilog, SystemVerilog, TeX.

Also basic ability with: Python, Java, R, TCL, PHP, bash.

- **Industry Software Skills:** gcc, gdb, Matlab, Vivado, ISE, SolidWorks, AutoCAD, TexMaker, git.

- **Laboratory Equipment Skills:** Rohde & Schwarz SMBV/SMJ, FSV/FSU, ZVA/ZVH and others; Spirent GNSS Simulators; Ettus USRP; Javad, Trimble, NVS, Geostar, u-blox and other GNSS receivers and chips.

- **General Business Skills:** Problem solving, presentation skills, customers requirements analytics, team leading, mentorship, organization of R&D.

- **Languages:** Russian (Native), English (B1/B2).

Awards and Honors

- PIERS-Rome Young Scientist Award, 2019

- Tsiolkovsky Award of Cosmonautics Federation of Russia, 2018

- PIERS-Toyama Young Scientist Award, 2018

- MPEI Board of Honor, 2018

- MPEI Young Teaching Fellow of the Year, 2014

- Scholarship of the Governement of the Russian Federation, 2011

- Scholarship of the President of the Russian Federation, 2009

Interests and extra-curricular activity

- I am interested in interior design and architecture. I have designed and built my own house in the Moscow suburbs. I have developed and realised a design-project of our university office.

- Mountain bike, snowboarding, snowkiting

- I am a member of the administrative reserve of our university. I graduated trainings and have the title of Manager In Education.

- I am a DevOps for our team: gitlab, wiki, Apache and so on.

Intellectual property

- The full list of publications contains about 30-35 items and is available on request

- I'm a co-author of a book (a thousand of terrific pages in Russian)) and an author of popular GNSS e-textbook

- I'm an author of 4 Russian patents, 6 registrated sotware products

Publications

A. I. Perov, R. V. Bakitko, V. V. Dvorkin, S. N. Karutin, I. V. Korogodin, I. A. Nagin, A. A. Povalyaev, R. F. Fatkylin, and A. U. Shatilov, *GLONASS. Modernization and development perspective*, A. I. Perov, Ed. Izdatel'stvo Radiotekhnika, 2020.

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I. V. Korogodin, A. I. Perov, V. V. Dneprov, and S. A. Savelyev, "Experimental study of the characteristics of the navigation receiver with antenna array and focusing on navigation satellites," *Radionavigation technology*, pp. 100–105, 2016.

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