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Current position

Senior researcher, Keldysh Institute of Applied Mathematics, Moscow
Associate professor, Moscow Institute of Physics and Technology, Moscow

Areas of specialization

- Preliminary mission analysis
- Trajectory optimization, optimal control design
- Restricted three-body problem, station-keeping analysis
- Small spacecraft mission analysis
- Numerical methods in astrodynamics
- High performance computing
- Machine learning and neural networks

Education

2017 Ph.D. in Theoretical Mechanics, Keldysh Institute of Applied Mathematics
2013 M.Sc. in Applied Mathematics and Physics, MIPT
2011 B.Sc. in Applied Mathematics and Physics, MIPT

Teaching

“Numerical Methods in Astrodynamics”, “Dynamical systems”, MIPT
“Probability Theory”, “Stochastic Processes”, and “Mathematical Statistics”, MIPT

Featured publications

- 2021 Shirobokov, M., Trofimov, S., Ovchinnikov, M. “Survey of Machine Learning Techniques in Spacecraft Control Design,” *Acta Astronautica*, 2021, Vol. 186, pp. 87–97. doi.org/10.1016/j.actaastro.2021.05.018
- 2020 Trofimov, S., Shirobokov, M., Tselousova, A., Ovchinnikov, M. “Transfers from Near-Rectilinear Halo Orbits to Low-Perilune Orbits and the Moon’s Surface,” *Acta Astronautica*, Vol. 167, pp. 260–271. URL: <https://doi.org/10.1016/j.actaastro.2019.10.049>
- 2018 Shirobokov, M. G., Trofimov, S. P., Ovchinnikov, M. Yu. “Design of Interplanetary Transfers with Passive Gravity Assists and Deep Space Maneuvers,” *Cosmic Research*, Vol. 56, No. 4, pp. 317–330. URL: <http://dx.doi.org/10.1134/S0010952518040044>
- 2017 Shirobokov, M., Trofimov, S., Ovchinnikov, M. “Survey of Station-Keeping Techniques for Libration Point Orbits,” *Journal of Guidance, Control, and Dynamics*, 2017, Vol. 40, No. 5, pp. 1085–1105. URL: <http://dx.doi.org/10.2514/1.G001850>
- 2016 Shirobokov, M., Trofimov, S., Ovchinnikov, M. “Recovery of Halo Orbit Missions in Case of Contingent Station-Keeping Maneuver Delay,” *Advances in Space Research*, 2016, Vol. 58, No. 9, pp. 1807–1818. URL: <http://dx.doi.org/10.1016/j.asr.2016.07.003>

Textbooks

- 2019 Gasnikov, A., Gorbunov, E., Guz, S., Chernousova, E., Shirobokov, M., Shulgin, E. “Lecture Notes on Stochastic Processes,” Moscow Institute of Physics and Technology, Moscow, 2019, ISBN: 978-5-7417-0710-4. URL: <https://arxiv.org/abs/1907.01060> (in Russian)
- 2016 Ivanov, D., Trofimov, S., Shirobokov, M. “Numerical Modeling of Spacecraft Orbital and Attitude Motion,” Keldysh Institute of Applied Mathematics, Moscow, 2016, ISBN 978-5-98354-023-1. URL: <https://keldysh.ru/e-biblio/trofimov/> (in Russian)

Ph.D. Thesis

- 2017 Shirobokov, M. “Trajectory design and navigation aspects of small spacecraft missions to the Moon and libration points,” Ph.D. Thesis, Keldysh Institute of Applied Mathematics, Moscow, 181 p. URL: <https://www.keldysh.ru/council/1/2017-shirobokov/diss.pdf> (in Russian)