AI, ROBOTICS, PATH PLANNING

Moscow Institute of Physics and Technology (National Research University)

Degree or qualification is awarded: **PhD (Candidate of Science)**

Language of study: **English**
Mode of study: **full-time**
Duration: **4 years**
Availability of free education: **yes**
Price: **375 000 RUB**

Programme curator: **Denis Ustyuzhaninov**
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Entry requirements:

- Master's degree / equivalent in a related field
- B2 level of English
- Good track record of publications related to the topic of the intended research
- Strong research proposal 1,500 - 3,500 words

Research supervisor:
Konstantin Yakovlev
PhD

Supervisor's research interests:

- Artificial Intelligence.
- Intelligent Robotics.
- AI planning, path planning.
- Motion planning.
- Multi-agent path finding.
- Heuristic search.
- Multi-agent systems.

Research highlights:
My general research interests lie in Artificial Intelligence and Robotics and more specifically in Path and motion planning. I'm a part of a group that extensively studies Multi-agent Path Finding (MAPF) and develops state-or-the-art planners which use heuristic search techniques as their basis. We are interested in two lines of research within MAPF: i) Developing provably complete and optimal algorithms that do not rely on numerous limiting assumptions, i.e. are able to handle continuous time and space, take kinematic constraints of agents into account etc., ii) Developing MAPF algorithms that work fast and scale well to large numbers of agents, making them suitable for real-world applications (e.g. automated warehouses). Besides Path Planning, I'm also involved in SLAM research, in particular - monocular vision based SLAM. My students develop fast vSLAM methods suitable for execution in real time under tough computational constraints (e.g. when running onboard a compact mobile robot). vSLAM, however, is not my primary research interest.

Supervisor's specific requirements:

- Solid background in Math/CS (specifically – discrete mathematics, graph theory).
- C++/Python (at least 2-3 years of experience).
- Robotic Operating System (ROS) is a plus.
- Published papers in the areas of AI, Robotics, Path/motion planning is a plus.

Main publications:

- Andreychuk A., Yakovlev K., Atzmon D., Stern R. Multi-Agent Pathfinding with Continuous Time // In Proceedings of the 28th International Joint Conference on Artificial Intelligence (IJCAI 2019). pp. 39-45.
- Yakovlev K., Andreychuk A., Vorobyev V. Prioritized Multi-Agent Path Finding for Differential Drive Robots // In Proceedings of the 2019 European Conference on Mobile Robots (ECMR 2019). pp. 1-6.
- Soboleva N., Yakovlev K. GAN Path Finder: Preliminary results // In Proceedings of the 42nd German Conference on Artificial Intelligence (KI 2019). pp. 316-324.
- Panov A.I., Suvorov R., Yakovlev K.S. (2018) Grid Path Planning with Deep Reinforcement Learning: Preliminary Results // In Proceedings of the 8th Annual International Conference on Biologically Inspired Cognitive Architectures (BICA 2017). pp. 347–353. Elsevier.
- Yakovlev, K., Andreychuk, A. (2017) Any-Angle Pathfinding for Multiple Agents Based on SIPP Algorithm. In Proceedings of the 27th International Conference on Automated Planning and Scheduling (ICAPS 2017). pp. 586-593.

Specializations within this programme