

Czech Technical University In Prague
Department of Cybernetics
Multi-Robot Systems group
✉ petrpa6@fel.cvut.cz
☎ +420 739 757 519
📄 mrs.felk.cvut.cz/pavel-petracek
🐙 [GitHub](#) [Google Scholar](#)
CV updated on June 6, 2023



Pavel Petráček

Personal information

Nationality Czech
Date of birth November 26, 1994
Languages Czech (mothertongue), great conversational English

Education

2019–present **Doctoral candidate in Informatics**, Department of Cybernetics, Faculty of Electrical Engineering, Czech Technical University in Prague (FEE CTU)
— **Ph.D. topic**: Robust UAV localization in perception-degraded environments
— **supervisor**: doc. Ing. Martin Saska, Dr. rer. nat.
— **publication count** (since 2019): 12 impacted journals, 3 conference proceedings
— **h-index**: 5 in WoS, 8 in Google Scholar, **citations count**: 90 in WoS, 250 in Google Scholar

2017–2019 **Master degree in Cybernetics and robotics**, FEE CTU

2014–2017 **Bachelor degree in Cybernetics and robotics**, FEE CTU

Experience

2019–present **Doctoral candidate and research fellow at Multi-Robot Systems research group**, FEE CTU
— **research**: lightweight yet robust localization and mapping of mobile robots in perceptually degraded environments, decentralized swarming systems, robustness maximization in aerial robotics
— **responsibilities**: research; co-development of [MRS UAV system](#); transferring research ideas into the real world (design and realization of robotic experiments, participation in robotic competitions); robotic demos for investors, industrial partners, students and media; supervision of students; popularization of the university and the field; academic courses, workshops, and summer school preparations and organization

Research projects & competitions

2020–2022 **DARPA Subterranean Challenge**: Exploration of unknown subterranean environments with a cooperative team of ground and aerial autonomous robots
— **contributions & responsibilities**: development of novel methods of lightweight perception, localization, and mapping of UAVs in perception-degraded environments, UAV system design, real-time systems integration, system evaluation and testing, key member for in situ deployment of aerial robots

2018–2022 **Dronument**: Documentation of interiors of historical structures with autonomous aerial robots
— **contributions & responsibilities**: development of a robust HW & SW system capable of deploying a fully autonomous UAV team within interiors of historical structures; focus on on-board UAV localization and prevention of its degeneracy in geometrically featureless environments; deployment of the system for documenting 17 historical objects (including 2 UNESCO sites) with direct use in heritage preservation

2017–present **Swarming**: Decentralized communication-less control of UAVs among obstacles
— **contributions**: novel bio-inspired algorithms for communication-less perception-aware coordination of UAV teams in environments with obstacles. Research published in several academic publications.

2020–present **DOFEC**: Extinguishment of fires in aboveground floors using an autonomous UAV
— **contributions**: detection and localization of fires from on-board sensors, mission planning

International stays

2023 **Autonomous Robots Lab at NTNU**, Two months research stay, cooperation on doctoral topic with prof. Kostas Alexis

Industry

2023–present **Fly4Future s.r.o.**, Technical consulting, grant writing, employee training.

2016–2017 **CertiCon a.s.**, Learned how to properly think about and write automated software tests. Gained experience in corporate project management and scheduling

2012–2014 **KD planeta s.r.o.**, First-hand experience with robotic automation — interaction between human operators, robotic manipulators, and CNC machinery

Honors & awards

2021 **DARPA Subterranean Challenge**: team CTU-CRAS-NORLAB competing with international universities and companies (e.g., Caltech, MIT, ETH Zürich, NTNU) in multi-robot search & rescue operations in underground environments

- 1st place among non-funded teams in the Urban Circuit, real-world deployment (\$500k)
- 2nd place among all teams in the Final Round, virtual deployment (\$500k)

2019 **Dean's price for astounding Master thesis**: FEE CTU. Related to the Dronument project
— topic: Design, localization and position control of a specialized UAV platform for documentation of historical monuments

2017 **Dean's price for astounding Bachelor thesis**: FEE CTU
— topic: Decentralized model of a swarm behavior Boids in ROS

Academic activities

Teaching

- Algorithms and Programming: Python and basic programming algorithms for Bachelor students
- Multi-Robot Aerial Systems: for Master students, [link](#) to example task

Workshops

- Seminar tasks introduction, *In IEEE RAS Summer School on Multi-Robot Systems, 2022.*
- [Dronument workshop](#) (organizer and speaker), *hosted at FEE CTU, 2021.*
- Decentralized Aerial Swarms Using Vision-Based Mutual Localization, *In IEEE IROS (Second Workshop on Multi-robot Perception-Driven Control and Planning), 2018.*

Conference committee

- Co-chair of session *Micro and Mini UAS I* at ICUAS'22 (chair: prof. Subodh Bhandari).

Reviewer for journals

- Transactions on Cybernetics
- Transactions on Robotics (T-RO)
- Robotics and Automation Letters (RA-L)

Reviewer for conferences

- International Conference on Robotics and Automation (ICRA)
- International Conference on Intelligent Robots and Systems (IROS)

Supervised students

Ing. **Vojtěch Nydrle**, Cybernetics and robotics, FEE CTU
— thesis: Extinguishing of Indoor Fires by an Autonomous UAV

Bc. **Vojtěch Nydrle**, Cybernetics and robotics, FEE CTU

— thesis: Design of a specialized UAV platform for the discharge of a fire extinguishing capsule (Dean's price for astounding Bachelor thesis)

Martin Fischer, Cybernetics and robotics, FEE CTU

— thesis: Lidar and multi-camera calibration and fusion (Dean's price for astounding Bachelor thesis)

Peer-reviewed publications

Journal articles

- **P. Petracek**, V. Walter, T. Baca, and M. Saska, "Bio-Inspired Compact Swarms of Unmanned Aerial Vehicles without Communication and External Localization," *Bioinspiration & Biomimetics*, vol. 16, no. 2, p. 026 009, Dec. 2020.
- **P. Petracek**, V. Kratky, and M. Saska, "Dronument: System for Reliable Deployment of Micro Aerial Vehicles in Dark Areas of Large Historical Monuments," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 2078–2085, Apr. 2020.
- **P. Petracek**, V. Kratky, M. Petrlik, T. Baca, R. Kratochvil, and M. Saska, "Large-Scale Exploration of Cave Environments by Unmanned Aerial Vehicles," *IEEE Robotics and Automation Letters*, vol. 6, no. 4, pp. 7596–7603, Oct. 2021.
- **P. Petracek**, V. Kratky, T. Baca, M. Petrlik, and M. Saska, "New Era in Cultural Heritage Preservation: Cooperative Aerial Autonomy: Supervised Autonomy for Fast Digitalization of Difficult-to-Access Interiors of Historical Monuments," *IEEE Robotics & Automation Magazine*, pp. 2–19, 2023.
- V. Kratky, **P. Petracek**, V. Spurny, and M. Saska, "Autonomous Reflectance Transformation Imaging by a Team of Unmanned Aerial Vehicles," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 2302–2309, Apr. 2020.
- V. Kratky, **P. Petracek**, T. Baca, and M. Saska, "An Autonomous Unmanned Aerial Vehicle System for Fast Exploration of Large Complex Indoor Environments," *Journal of Field Robotics*, vol. 38, no. 8, pp. 1036–1058, 2021.
- F. Novak, V. Walter, **P. Petracek**, T. Baca, and M. Saska, "Fast Collective Evasion in Self-Localized Swarms of Unmanned Aerial Vehicles," *Bioinspiration & Biomimetics*, vol. 16, no. 6, p. 066 025, Nov. 2021.
- V. Kratky, **P. Petracek**, T. Nascimento, M. Cadilova, M. Skobrtal, P. Stoudek, and M. Saska, "Safe Documentation of Historical Monuments by an Autonomous Unmanned Aerial Vehicle," *ISPRS International Journal of Geo-Information*, vol. 10, no. 11, p. 738, Nov. 2021.
- T. Manoni, D. Albani, J. Horyna, **P. Petracek**, M. Saska, and E. Ferrante, "Adaptive Arbitration of Aerial Swarm Interactions through a Gaussian Kernel for Coherent Group Motion," *Frontiers in Robotics and AI*, vol. 9, 2022.
- M. Petrlik, **P. Petracek**, V. Kratky, T. Musil, Y. Stasinchuk, M. Vrba, T. Baca, D. Hert, M. Pecka, T. Svoboda, and M. Saska, *UAVs Beneath the Surface: Cooperative Autonomy for Subterranean Search and Rescue in DARPA SubT*, Jun. 2022.
- T. Prihodova, G. Silano, A. Ahmad, V. Kratky, T. Baca, **P. Petracek**, V. Saskova, J. Bednar, and M. Saska, "2022 IEEE Robotics and Automation Society Summer School on Multi-Robot Systems in Prague [Education]," *IEEE Robotics & Automation Magazine*, vol. 30, no. 1, pp. 104–106, Mar. 2023.
- T. Roucek, M. Pecka, P. Cizek, T. Petricek, J. Bayer, V. Salansky, T. Azayev, D. Hert, M. Petrlik, T. Baca, V. Spurny, V. Kratky, **P. Petracek**, D. Baril, M. Vaidis, V. Kubelka, F. c. Pomerleau, J. Faigl, K. Zimmermann, M. Saska, T. Svoboda, and T. Krajnik, "System for Multi-Robotic Exploration of Underground Environments CTU-CRAS-NORLAB in the DARPA Subterranean Challenge," *Field Robotics*, vol. 2, no. 1, pp. 1779–1818, Mar. 2022.

Conference articles

- A. Ahmad, V. Walter, **P. Petracek**, M. Petrlik, T. Baca, D. Zaitlik, and M. Saska, "Autonomous Aerial Swarming in GNSS-denied Environments with High Obstacle Density," in *IEEE ICRA*, May 2021, pp. 570–576.
- T. Amorim, T. Nascimento, **P. Petracek**, G. de Masi, E. Ferrante, and M. Saska, "Self-Organized UAV Flocking Based on Proximal Control," in *ICUAS*, Jun. 2021, pp. 1374–1382.
- D. Hert, T. Baca, **P. Petracek**, V. Kratky, V. Spurny, M. Petrlik, M. Vrba, D. Zaitlik, P. Stoudek, V. Walter, P. Stepan, J. Horyna, V. Pritzl, G. Silano, D. Bonilla Licea, P. Stibinger, R. Penicka, T. Nascimento,

and M. Saska, "MRS Modular UAV Hardware Platforms for Supporting Research in Real-World Outdoor and Indoor Environments," in *ICUAS*, Jun. 2022, pp. 1264–1273.