

Research Studentships for PhD students

Applications are open for 3 Research Studentships, within the framework of project Aero.Next (1801P.01227.1.01 Aero next – 00000066 contrato N.º 31 – IST-ID) funded by national funds through PRR (Plano de Recuperação e Resiliência), through IAPMEI – Agência para a Competitividade e Inovação, under the following conditions:

Scientific Area: Automation, Control, and Robotics

Admission Requirements: *To be enrolled at a PhD (at contracting time).*

Workplan: The three research positions aim to address the objectives of the Aero.Next project to enable Swarm Technologies for an unmanned aircraft system being developed for surveillance and search and rescue missions. It focuses on developing three specific research topics: Multi-agent control and motion coordination, Collaborative sensing and localization, and Human-swarm interaction.

1) Multi-agent control and motion coordination:

Objective: Develop algorithms and techniques for coordinating the motion of multiple micro aerial robots inside a swarm.

Expected activities:

- Conduct a comprehensive literature review of existing control and coordination methods in multi-robot systems.
- Design and implement novel algorithms for motion coordination and control of the micro aerial robots within the team.
- Evaluate the performance and scalability of the developed algorithms through simulation and real-world experiments.
- Optimize the algorithms for efficiency, robustness, and adaptability in different swarm scenarios required for the project.
- Document the research findings in technical reports and academic publications.
- Collaborate with other team members to integrate the developed control algorithms into the overall system.

2) Collaborative sensing and localization:

Objective: Develop algorithms and systems for cooperatively perceiving the environment/targets and improving the localization of robots within the swarm.

Expected activities:

- Review the state-of-the-art techniques in cooperative sensing and localization in multi-drone systems.
- Design and implement algorithms for collaborative perception and target detection within the swarm.
- Investigate methods for integrating sensor data from multiple micro aerial robots to improve localization accuracy.
- Conduct experiments to evaluate the performance of the developed algorithms in different environmental conditions.
- Analyze the impact of environmental factors and communication constraints on sensing and localization capabilities.
- Publish research findings in scientific conferences and journals.
- Collaborate with other researchers to integrate perception and localization systems into the larger swarm framework.

3) Human-swarm interaction:

Objective: Develop methods for human operators to effectively interact with and control a swarm of micro aerial robots.

Expected activities:

- Review existing human-swarm interaction techniques and interfaces in robotics and drone systems.
- Design and implement intuitive and user-friendly interfaces for swarm control and mission planning.
- Conduct user studies and experiments to evaluate the usability and effectiveness of the developed human-swarm interaction methods.

- Iterate and refine the interfaces based on user feedback and system requirements.
- Investigate strategies for incorporating user preferences, situational awareness, and mission objectives into swarm control algorithms.
- Document the research outcomes in technical reports and present findings at relevant conferences.
- Collaborate with other research team members to integrate human-swarm interaction methods into the overall unmanned aircraft system.

Legislation and Regulations: Statute of Scientific Research Fellow, approved by Law nr. 40/2004, of August 18, as worded by Decree-Law nr. 123/2019, of August 28; FCT Regulation for Research Studentships and Fellowships, available on <https://www.fct.pt/apoios/bolsas/docs/RegulamentoBolsasFCT2019.pdf> and <https://dre.pt/application/file/a/127230968> .

Workplace: The work will be developed at the Institute for Systems and Robotics of Instituto Superior Técnico, under the scientific supervision of Professor Rodrigo Ventura e do Doctor Meysam Basiri.

Duration: The research fellowships will have an initial duration of 12 months, renewable. It's expected to begin in October 2023.

Monthly maintenance allowance: According to the values for Research Fellowships awarded by FCT in Portugal (<http://www.fct.pt/apoios/bolsas/valores>), the amount of the monthly maintenance allowance is € 1199.64, being the payment method an option of the Fellow by Wire Transfer/Check.

Selection methods: The selection methods will be the following: *Curriculum evaluation, and individual interview to a short list of candidates*, with the respective weight of 100% to the curriculum evaluation, adjusted in the case of an interview.

Composition of the selection Jury: Prof. Rodrigo Ventura, Dr. Meysam Basiri, and Prof. Pedro U. Lima.

Announcement/ notification of the results: The final evaluation results will be communicated to all applicants by email.

Deadlines and procedures of complaint and appeal. A complaint may be lodged from the final decision within 15 working days, or an appeal to the Executive Board of IST-ID within 30 working days, both counted from the respective notification

Application deadline and formalization: The call is open from September 11 until September 22, 2023.

It is mandatory to formalize applications with the submission of the following documents: i) B1 Form – Fellowship application (<https://ist-id.pt/concursos/bolsas/>); ii) *Curriculum Vitae*; iii) academic degree certificate, where applicable; iv) motivation letter.

Applications must be submitted to the email: rodrigo.ventura@isr.tecnico.ulisboa.pt