The Chair of Astrodynamics is offering a

Ph.D. Position in Dynamics, GN&C of Advanced Autonomous Spacecraft: Analysis, Simulations, Experiments (m/f/d)

About us and the position

At the Chair of Astrodynamics, we advance spaceflight science and engineering through pioneering research, from theory to experimentation and flight. Our research foci include spaceflight mechanics, orbital robotics and systems engineering for advanced space missions.

This university-funded Ph.D. research will investigate both fundamental and applied engineering aspects related to dynamic modeling and the Guidance, Navigation, and Control (GN&C) of advanced autonomous spacecraft. Emphasis will be placed on real-time attitude control and proximity maneuvering. Examples of applications include autonomous rendezvous and docking, in-orbit servicing, space debris removal, and formation flying.

Your main Responsibilities

- Perform original and excellence-driven research: This will include
    - Develop and analyze dynamic models and guidance and control algorithms
    - Conceptualize and develop sample scenarios, roadmaps and trade-off analyses
    - Code software libraries and perform computational simulations
    - Lead the development of a real-time capable software architecture for simulations, as well as processor and hardware-in-the-loop experiments
    - Lead the design and development of an advanced test facility for experimentally testing key aspects of the dynamics, GN&C of proximity spacecraft maneuvering
    - Design and perform experimental campaigns
- Publish research findings in high-impact international journals, and present at leading conferences
- Mentor undergraduate and master's students
- Develop expertise and stay current with the latest advancements in the area of research
- Contribute to teaching and examinations for TUM students at the Chair of Astrodynamics
- Participate in administrative tasks at the Chair of Astrodynamics
- Contribute to inventions and patent applications
- Support grant writing and collaborative proposal development to secure research funding

Required Skills & Experience

- A Master of Science/Engineering degree (or equivalent) with excellent academic results in Aerospace Engineering, Mechanical Engineering, Electrical/Computer Engineering, Physics, or a related field at the time of appointment

- Required knowledge
    - Excellent knowledge of aeronautical or spaceflight mechanics
    - Excellent knowledge of control theory, including linear, nonlinear, and optimal control
    - Excellent mathematical, analytical and problem-solving skills
    - Basic knowledge of robotic manipulator mechanics and control
    - Proficiency in English (written and spoken)
    - Proficiency in MATLAB; good knowledge of Python, or C/C++, with strong willingness to improve

- o Previous experience or strong interest in experimental aerospace simulators (e.g., multicopters)
- o Good knowledge of 3D engineering software, with strong willingness to expand this knowledge

- Required skills

  - o High motivation, and persistence in overcoming research challenges
  - o Ability to formulate research questions and investigate them systematically
  - o Strong interest in, ability to, and basic experience with writing high-quality technical papers
  - o Capacity to work independently as well as collaboratively within a team environment
  - o Commitment to research excellence
  - o Prior experience in experimental research or a strong interest in developing the needed skills

- Advantageous knowledge/skills

  - o Previous research experience and publications in related fields
  - o Knowledge of the German language is an advantage but not mandatory

- The successful candidate must fulfill the requirements for admission to a Ph.D. program at TUM. More information on a doctorate at TUM can be found on the websites of the TUM Graduate School and of the Graduate Center of Engineering and Design

What we offer
- Full-time position (100% / 40h, pay grade E13, TV-L) with a 3 year contract and the goal to obtain a Ph.D.
- Engaging research in a welcoming international team, highly motivated to shape the future of Space
- Stimulating working environment at one of the top technical universities in Europe
- An academic ecosystem fostering entrepreneurial initiatives and the possible creation of spin-off startups
- A large network of peers in the international space business and academia
- The position is based at the TUM Ottobrunn Campus in the vicinity of Munich, Bavaria, Germany
- We value diversity, equity, and inclusion and encourage candidates from underrepresented groups to apply. We are dedicated to offering an inclusive research environment and encourage applicants of all backgrounds to apply, including individuals with disabilities. The position is suitable for persons with disabilities.

Application
Interested candidates should send their application (including motivation letter (maximum 1 page), CV in Europass format, also listing your nationality/nationalities, list of publications, full bachelor and master transcripts including grades, at least two letters of reference, as well as any supporting documents) via email:
positions.coa@ed.tum.de (Important: Please attach a single PDF and use the subject: "[your name] for PHD-COA-2"). The application deadline is: 17 March 2025 (the position will remain open until filled). The aim is for the position to start in Spring 2025.
We look forward to your application!

Technische Universität München

TUM School of Engineering and Design

Chair of Astrodynamics

Prof. Dr. Marcello Romano

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