The Chair of Astrodynamics is offering a

Ph.D. Position in Astrodynamics of Rotational and Orbital Flight Modeling & Advanced Visualization Techniques (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 opportunity focuses on both the fundamental and applied engineering aspects of spaceflight systems modeling and motion analysis, with an emphasis on advanced visualization techniques for both rotational and orbital dynamics. The research will address particularly Distributed Space Systems for space exploration, Earth observation, and commercial applications. Key areas of potential applications include orbit determination and space situational awareness, proliferated space systems, space sustainability challenges, solar sail fleets, constellation design and management, as well as space logistics architectures.

Your main Responsibilities

- Perform original and excellence-driven research: This will include
    - Develop and analyze high-fidelity dynamic models
    - Conceptualize & develop advanced visualization strategies for selected spaceflight scenarios involving a system-of-systems architecture
    - Design software architectures, and develop software libraries and perform computational simulations
    - Lead the development of a state-of-the-art immersive visualization facility
    - Lead the development of a software architecture bridging standard and custom-developed spaceflight mechanics simulation tools with Virtual-Reality visualization tools, ideally based on open-source software
    - 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 Engineering, Computer Science, Physics, or a related field at the time of appointment

- Required knowledge
    - Excellent knowledge of spaceflight mechanics
    - Excellent mathematical, analytical and problem-solving skills
    - Proficiency in English (written and spoken)
    - Proficiency and experience in MATLAB, Python, C/C++, GMAT or similar

- o Ability, previous experience or strong interest in developing and utilizing Virtual Reality, Augmented Reality and other advanced visualization systems

- 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

- Advantageous knowledge/skills

  - o Prior experience in computational and VR visualization research
  - 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-3"). The application deadline is: 17 March 2025 (the position will stay open until filled). The aim is for the position to start in Spring 2025.
We look forward to your application!

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TUM School of Engineering and Design
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