Student Assistant Research

Student Assistant – Establishing Software Maintenance Activities in UNICADO

Technical University of Munich

TUM School of Engineering and Design
Institute of Aircraft Design

Field of Activity:

Support software maintenance and engineering activities for the UNICADO framework, including requirements analysis, documentation, testing, and the establishment of a clean and well-documented core software baseline for a multidisciplinary aircraft design environment.

Task description:

The **UNICADO (UNIversity Conceptual Aircraft Design and Optimization)** project aims to establish a common, long-term, university-based aircraft conceptual design environment by bundling the expertise of German aviation universities. Read more about UNICADO here.

As a long-running research software, UNICADO faces challenges typical of evolving academic tools, including a growing codebase, incomplete documentation, inconsistent test coverage, and complex debugging workflows. To ensure long-term maintainability and alignment with modern software engineering practices, a systematic review and refinement of the core software is required.

We are therefore seeking a student assistant (HiWi) to support software engineering and maintenance activities in UNICADO. The role focuses on code analysis and documentation, improving testing and debugging, and establishing a solid foundation for future development, with the goal of enhancing maintainability, traceability, and usability.

Required Skills:

- Programming skills in C++ and/or Python
- Ability to understand and work with an existing, complex codebase
- Willingness to learn and apply best practices in modern software engineering

Scope of Work:

- Become familiar with the current UNICADO codebase, including frontend, backend, and core modules
- Identify and systematically document inconsistencies, ambiguities, and undocumented behavior within the codebase, using the **propulsion design** module of UNICADO as a starting point and focusing on key aspects such as,
  - Testing framework:
    - Review existing test levels and measure current test coverage. Identify testing gaps
    - Design and implement meaningful tests at unit, component (black box), and integration levels, with a focus on the propulsion system module
  - Debugging and traceability:
    - Review existing debugging capabilities
    - Implement improvements to debugging, logging, and traceability mechanisms
  - Robustness and error handling:
    - Improve exception handling and ensure clear, meaningful error messages throughout the system
- Support the derivation of a clean, well-documented baseline version of the UNICADO core software through Reverse Requirement Engineering

Our Offer

We offer a HiWi contract of up to 10 hours per week. The position provides exposure to modern software engineering best practices and the opportunity to work with a codebase implemented in modern C++.

Basic literature:

- Schültke, F., and Stumpf, E., “UNICADO - Devel- opment and Establishment of a University Con- ceptual Aircraft Design Environment: Presenta- tion,”, 2020.

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