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Autoren	R. Becker, F. Wolters, M. Nauroz, T. Otten
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Abstract

The present paper describes the design and application of the new DLR gas turbine simulation environment GTlab which is an object-oriented performance synthesis program written in C++ and Python. Its modular layout is designed to be extensible and flexible in use and can seamlessly be integrated into other simulation and optimization environments. The new performance code provides means for steady state and transient performance simulation of arbitrary engine concepts and is used in DLRs design and assessment of future aero engines.
The purpose of this paper is twofold: The first part describes the object-oriented framework and software design in general as well as more detailed aspects of the modelling libraries representing the physical behaviour of engine components. In part two GTlab is applied to a preliminary design process. Subject of the exemplary investigation is a two shaft military aero engine designed to operate in a high subsonic unmanned combat aerial vehicle (UCAV). First the GTlab model setup for such an engine will be explained. Following is the presentation of a mission point based cycle optimization. Finally the outcomes of a single preliminary thermodynamic design are presented.