Deutsches Zentrum
DLR für Luft- und Raumfahrt

SE²A

Topic:

Mathematical Modelling of 2D and 3D Morphing Blades Geometries

The need for sustainable and environmentally friendly mobility concepts in aviation poses new challenges for aircraft design and especially for engine design. In order to improve aircraft efficiency, adaptability towards the different flight regimes an aircraft encounters is necessary. Within the frame of the SE2A project a novel concept for the development of shape-adaptive compressor blades for aeronautical applications is being investigated. In this project, the aerodynamic design and optimization of a compressor blade will be coupled with a detailed structural design process, which will then be validated both through simulation and experimentally. The goal is to develop morphing blades capable of achieving an optimal shape for increasing the engine's efficiency depending on the operating and flying conditions.

Within the frame of this master thesis a concept for the automatization of the geometric modelling of morphing blades with integrated actuators will be developed. The work encompasses the following tasks:

1. Literature research about parametrization of blades geometries and blade modelling
2. Development of a mathematical geometric model for a 2D blade geometry with integrated actuators in Matlab and CAD modelling based on the developed blade model.
3. Development of a mathematical geometric model for a 3D blade geometry with integrated actuators in Matlab and CAD modelling based on the developed blade model.
4. Structural analysis of the developed 3D blade.
5. Concept validation based on existing SE2A modelled blade geometries for two goal deformations.
6. Conclusions and Outlook of the work.
7. Preparation of a report about the performed work.

For further information or to apply please contact
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