

Bachelorarbeit

Development of a comprehensive data manipulation tool for the sector cascade rig

Effective and streamlined visualization techniques are fundamental to obtaining key insights from experimental and numerical data. The sector cascade rig at the institute for thermal turbomachinery and machine dynamics generates large amounts of experimental data used in the research and development of Turbine Vane Frames. A Turbine Vane Frame (TVF) is a component placed between high and low pressure turbines of dual spool turbofan aero engines. Its purpose is to provide a smooth transition for the flow leaving the small radius HPT and entering the high radius LPT; furthermore, the TVF integrates the turning function performed by nozzle guide vanes, eliminating the need for a vane row between TVF and LPT.

Due to its shape and design, strong secondary flow development is an inherent characteristic of the TVF. Experimental investigations and numerical simulations are able to deliver good understanding of the secondary flow and vortical patterns; obtaining these insights requires the development of adequate visualization methods. Focus of the thesis should be the development of a data manipulation tool able to integrate both experimental and numerical results. The tool shall take the form of an extension for the TecPlot software and is to be written in the Python programming language. It should be able to import both the pre-processed experimental data and the numerical results and offer comparison options; it should furthermore provide the user with the option to apply different vortex visualization methods to the data.

A vortex visualization method of particular interest is Rortex (also known as Liutex). This method promises an accurate identification of vortical structures achievable with an algorithm of moderate complexity; its application to the experimental and numerical data is expected to deliver further understanding of the vortical structures within the TVF.

Work Packages:

- Literature study
- Tool development
- Implementation of a vortex identification algorithm
- Thesis writing including comprehensive tool documentation

Further information available upon interest

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Beginn: ab sofort möglich

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