

## Bachelor-, Studienarbeit

# Exploring the 3<sup>rd</sup> Generation Vortex Identification Methods

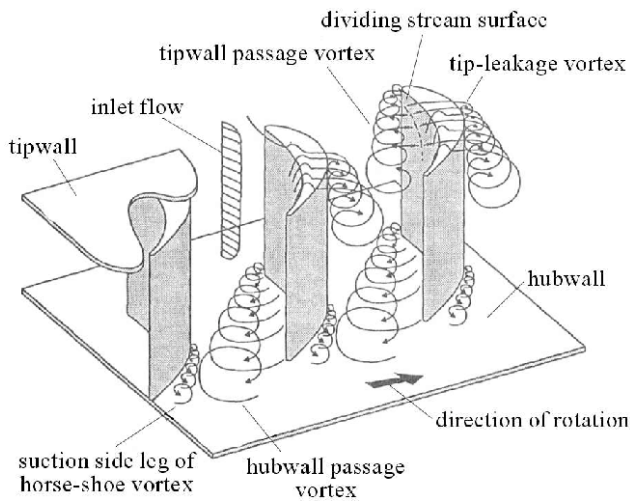


Figure 1: Tip leakage and passage vortices at the tip endwall with a clearance

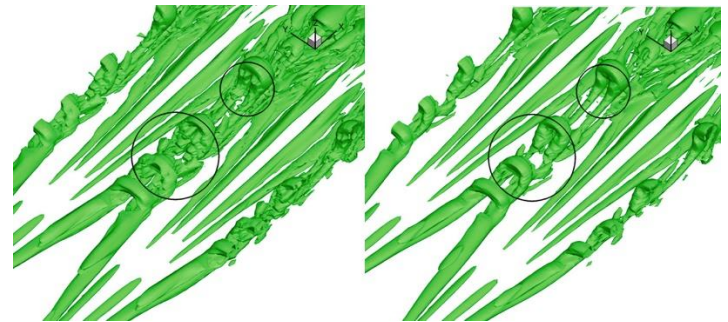


Figure 2: Isosurfaces of hairpin vortex structures by different normalized Rortex/vortex identification methods

### Background

The definition of a vortex is often ambiguous. In fact, there is no rigorous and universally-accepted definition. Nevertheless, the vortices may come in handy when one is to understand the behaviour of fluid flows in engineering applications. To begin with, the vorticity vector itself, denoted as the 1<sup>st</sup> generation method, cannot deliver a proper visualization of vortices because of being mostly contaminated by shear. Furthermore, the most common 2<sup>nd</sup> generation vortex identification methods (i.e., Q-criterion,  $\lambda_2$ ) have their shortcomings when a wide range of vortices are to be visualized at the same time.

A 3<sup>rd</sup> generation of vortex identification methods have been developed in the recent years, which aspire to overcome the shortcomings of the 2<sup>nd</sup> generation methods. The aim of this project is to explore these methods.

### Responsibilities

- Literature research on vortex identification methods,
- Implementing the selected methods using python,
- Applying them on given flow fields

### Your profile

You are expected to have,

- Preferably, a good command of the python language
- Some understanding of fluid flows and tensor algebra
- Willingness to work with git/gitlab.

### Contact

If the topic catches your interest, please get in touch with

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