Institute of Aerodynamics and Chair of Fluid Mechanics

RWTH AACHEN UNIVERSITY

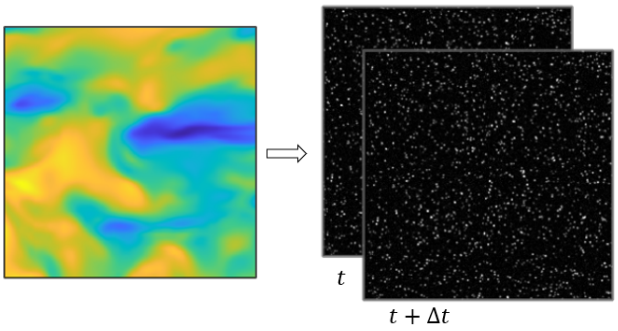
Project thesis/Projektarbeit

Synthetic data generator

Particle Image Velocimetry (PIV) is a reliable and widely used non-intrusive optical technique for measuring flow velocities in experimental setups. In this method, fluorescent tracer particles are introduced into the measurement section and illuminated by a light source. The particle movement within a short time is recorded in successive images and subsequently used to determine the flow field velocities.

Well-established methods for particle displacement estimation are based on a cross-correlation algorithm. Although reliable, this approaches estimate the displacement of ensemble of particles within an image window, resulting in a single displacement vector per window and consequently a reduction of image resolution and information loss. A deep learning based method for PIV processing proposed by the Institute of Aerodynamics overcomes this limitation by predicting per pixel particle displacement, thereby allowing the detection of small scale flow structures. To evaluate the performance and extend the application of neural networks for various PIV configurations, synthetic particle images including ground truth data of velocity fields are required.

The aim of this work is to implement a data generator for synthetic particle images derived from direct numerical simulations emulating typical image characteristics of PIV setups.



DNS flow field to synthetic particle images.

You ...

- are interested in experimental fluid dynamics, machine learning and image processing.
- have programming experience (Python, Matlab) and a quick grasp for new concepts.
- are eager to learn new skills and are able to work in an independent manner.

If you are interested, please contact:

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