

Colloquium Thermo- and Fluid Dynamics

3D Lagrangian Particle Tracking and Data Assimilation in Fluid Mechanics

Resolving a wide range of flow scales by STB and FlowFit

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Dense 3D Particle Tracking allows characterizing unsteady and turbulent flows within the Lagrangian and Eulerian frame of reference at high spatial and temporal resolution. The 3D Lagrangian Particle Tracking (LPT) method "Shake-The-Box" (STB) has been continuously developed during the past couple of years and is able to reliably and efficiently extract particle trajectories from volumetric flow measurements at unprecedented numbers. STB delivers accurate data on particles position, velocity and acceleration (material derivative) along densely distributed tracks. The STB method can be applied as well to short recording sequences, acquired with a multi- or two-pulse technique, allowing investigating high-speed flows at Reynolds numbers relevant for research in aerospace engineering.

Subsequently, the FlowFit (FF) data assimilation or PINN methods can be applied, which use Navier-Stokes-constraints for a linear or non linear optimization process resulting in a continuous interpolation of the flow field including pressure with minimized deviation to the measurement data.



Prof. Dr. Andreas Schröder is senior scientist and group leader for PIV and STB at the German Aerospace Center (DLR), Institute of Aerodynamics and Flow Technology in Göttingen and Professor for Image Based Measurement Techniques at the Brandenburg University of Technology in Cottbus, Germany. His research interests are the development and application of optical field measurement techniques for aerodynamic, -elastic and -acoustic research and turbulent flow diagnostics using Stereo- and 3D PIV, BOS and 3D Lagrangian Particle Tracking (Shake-The-Box) with subsequent Data Assimilation (DA) using Navier-Stokes constraints.

Date: Tuesday, 1 October 2024

Time: 10:15 - 11:15h

Place: ETH Zurich, ML H 41.1

Host: Prof. Filippo Coletti