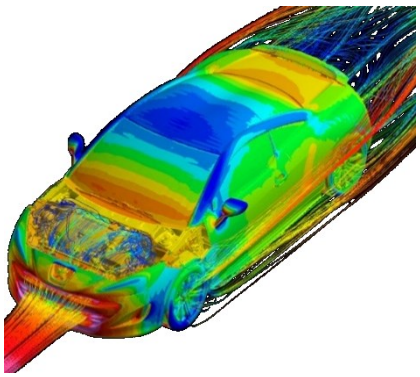
MAGNA STEYR

Engineering AG & Co KG

Institut für Strömungslehre und Wärmeübertragung

Master Thesis

Investigation of transient CFD simulation methods for commercial application in the aerodynamic development process of the automotive industry



Computational Fluid Dynamics (CFD) is used in the aerodynamic automotive development process to predict the flow field around and through vehicles. Most commercial CFD codes until recently used a simplified approach to describe the generally very complex unsteady vortical motion evolving in the various regions of separated flow downstream from the backward facing parts of the vehicle's surface. Using this simplifying method yields steady-state solutions missing a lot of the finer details of the flow. Recently, transient simulation techniques have become more common, since they capture the unsteady turbulent structures of the flow around vehicles. Subject of this Master Thesis is the investigation of commercially available transient simulation methods and software packages to model the air flow around vehicles.

Tasks

1. Literature review (papers, books and articles) concerning transient CFD simulation
   - Advantages/disadvantages and benefits of transient simulation compared to steady methods.
   - Current CFD development status and future CFD trends.
2. Specify representative test cases assuming symmetric inflow conditions (zero yawing angle)
   - Focus is preliminarily put on flow around the Ahmed body (generic geometry with extensive experimental data available)
   - Possibly identify an alternative, geometrically more complex body to investigate relevant unsteady flow structures not featured by the flow around the Ahmed body.
   - Determine parameters from the available experimental data to be used for validation
3. CFD Simulations using one selected commercial CFD Software
   - Simulate test cases specified in item 2 using alternatively steady and transient models
   - Validation against experimental data
   - Analyze the scope and the limits of the applied models in capturing the effect of the unsteady vortical structures shed from the rear part of the body
   - Recommended model
4. Documentation

Duration: 6 Months
Start: any time from October 2017, at the earliest convenience
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