Chair of Computational Mechanics
Department of Vehicle Safety, BMW AG

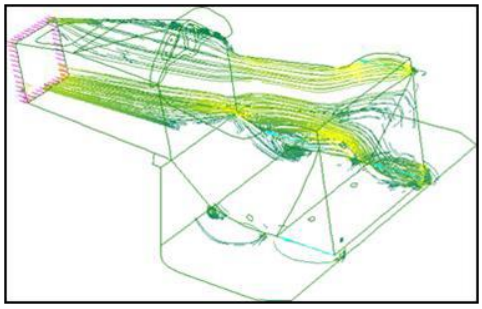
Modeling: ★★★★☆
Mathematics: ★★☆☆☆
Programming: ★★★★★

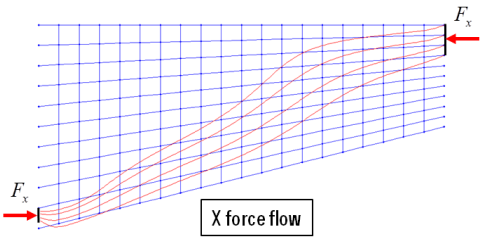
Software Lab:

A Load Path Analysis Tool for the Vehicle Structure in Crashworthiness Design

Setting

Current tools for analyzing the simulation results of crash include deformation and contour plots of stresses. In the early phase of crashworthiness design, it is necessary to study the load flow in the entire vehicle structure, so that a simplified model which describes the load paths can be established. Based on this model, the functional objectives of the load paths can be defined.
To extract the load paths, a research group in BMW AG and Chair of Computational Mechanics will create a tool to analyze the load flow within vehicle structure, which is mainly modeled using shell elements. The tool shall start with standard Abaqus output (*.odb), analyze the stress output and generate the load flow in the Lagrangian coordinate system. The load flow should be generated on different scales (vehicle level, component level etc.).





Task

- Refine the algorithms to calculate load flow field vector in specified direction (e.g. direction of crash velocity)
- Define the filter to adapt the element stress precision to different scales (e.g. vehicle level, component level etc.)
- Create a python tool based on *Abaqus python API* and *mayavi* to visualize the load flow, thus determine the load paths

Supervisors

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References

[1] D. Kelly, C. Reidsema, A. Bassandeh, G. Pearce, M. Lee, On interpreting load paths and identifying a load bearing topology from finite element analysis, Finite Elements in Analysis and Design 47 (2011) 867-876