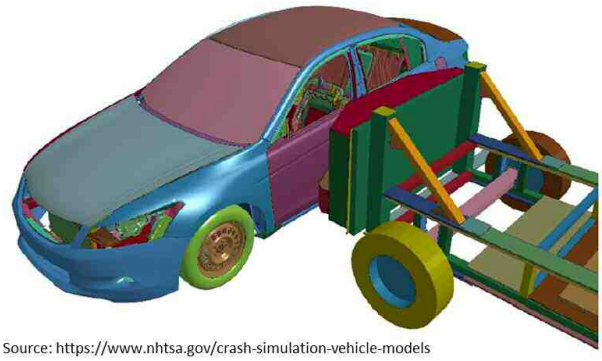
Vehicle Safety Insitute

Predicting boundary conditions for occupant simulation models under lateral loading using Real-World Accident data

Background

Usually restraint systems are designed to perform well in a **limited number of load cases**, e.g. to meet legal requirements (UN R95, FMVSS 214) or to perform well in consumer tests (Euro/US NCAP, IIHS). These tests usually **do not cover all loading conditions** that appear in Real-World Accidents. Therefore, the **real-world performance** of a new restraint system can usually be evaluated **after many years** when there is sufficient accident numbers in accident databases.



Source: https://www.nhtsa.gov/crash-simulation-vehicle-models

Your goal is to **develop a method** to predict **input data** for FE **occupant simulation models.** Therefore, you will use an explicit **full vehicle FE model** in order to derive the **structural response** of a vehicle under **lateral loading** based on given **Real-World Accident data.** You will then develop an approach to **predict the structural response** in different loading conditions without the need of a full vehicle FE simulation.

Tasks

- **Get familiar** with structural measures for occupant protection in side crash scenarios
- **Understand** the connection between Real-World accident data and the structural response of vehicles under lateral loading
- **Develop** a method predict the structural response based on surrogate measures of crash severity (vehicle mass, impact velocity, …)
- **Implement your ideas** to simplify the method for deriving boundary conditions for occupant simulation models
- **Build Skills** in the fields of explicit finite element analysis and DOE (design of experiments)

Literature

- Arbelaez et al., 2004: Delta Vs for IIHS Side Impact Crash Tests and Their Relationship to Real-World Crash Severity
- Rattenbury et al., 2001: Vehicle Deformation in Real-World Side Impact Crashes and Regulatory Crash Tests, SAE Technical Paper No. 2001-06-0248

Recommended as

- Master thesis for Mechanical Engineers

Organizational

- Start: anytime
- Scholarship: min. € 2.500,- for successful completion of the thesis
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