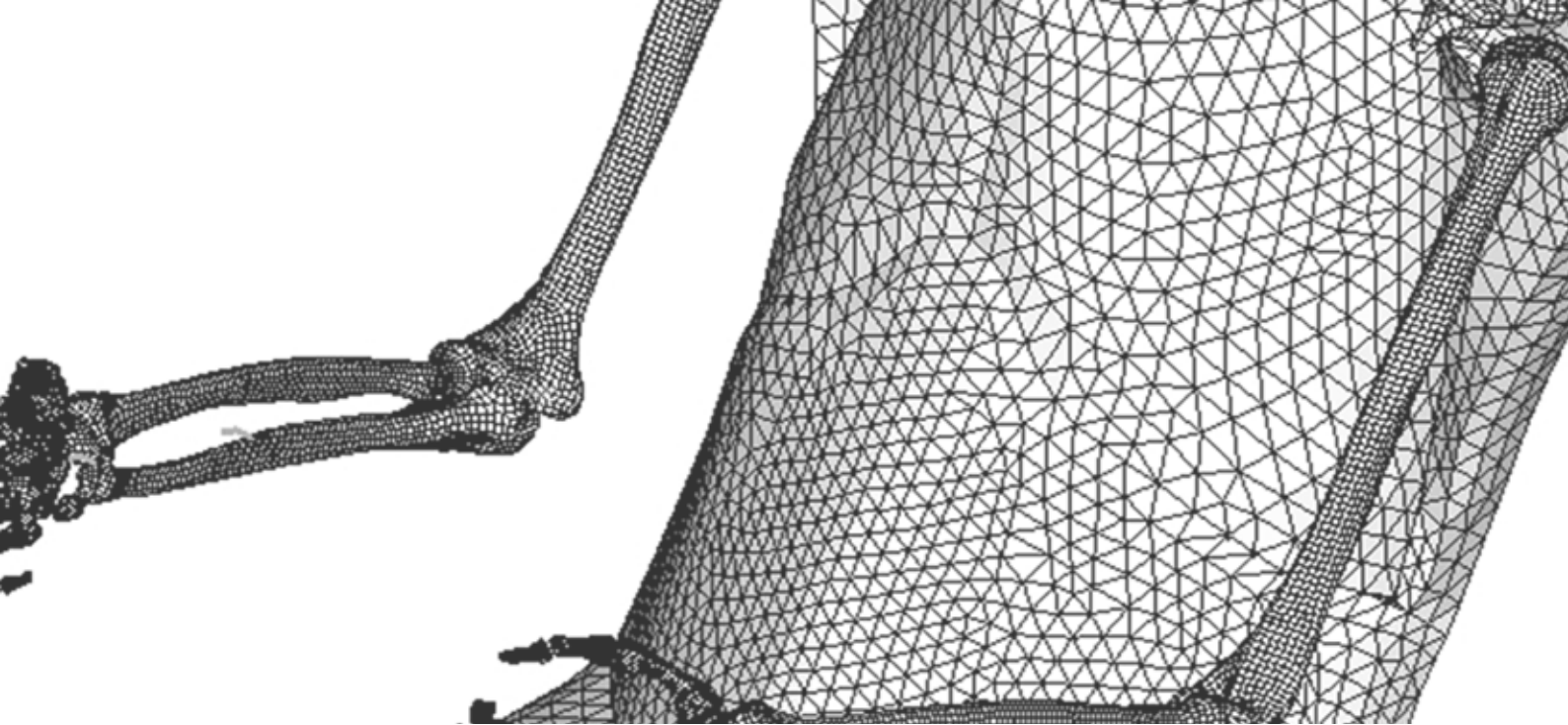




Can you sit out progress?

CASIMIR – Software tool for virtual analysis of seating comfort





Seating comfort

... in passenger cars begins with the first impression in the show room and therefore is an important selling point. Due to the strong competition within the automotive industry and due to increased customer requirements its impact within the seat- or car-development is getting more and more significant. Currently, the OEM and Tier-1 are mainly using experimental setups with test drivers for evaluation of seating comfort. An enhanced seat development is possible by a virtual analysis using software tools.

Virtual analysing

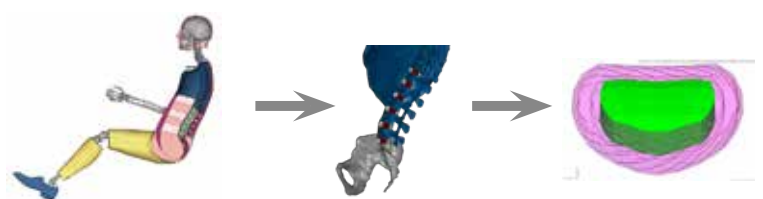
The virtual analysis shows the advantages that

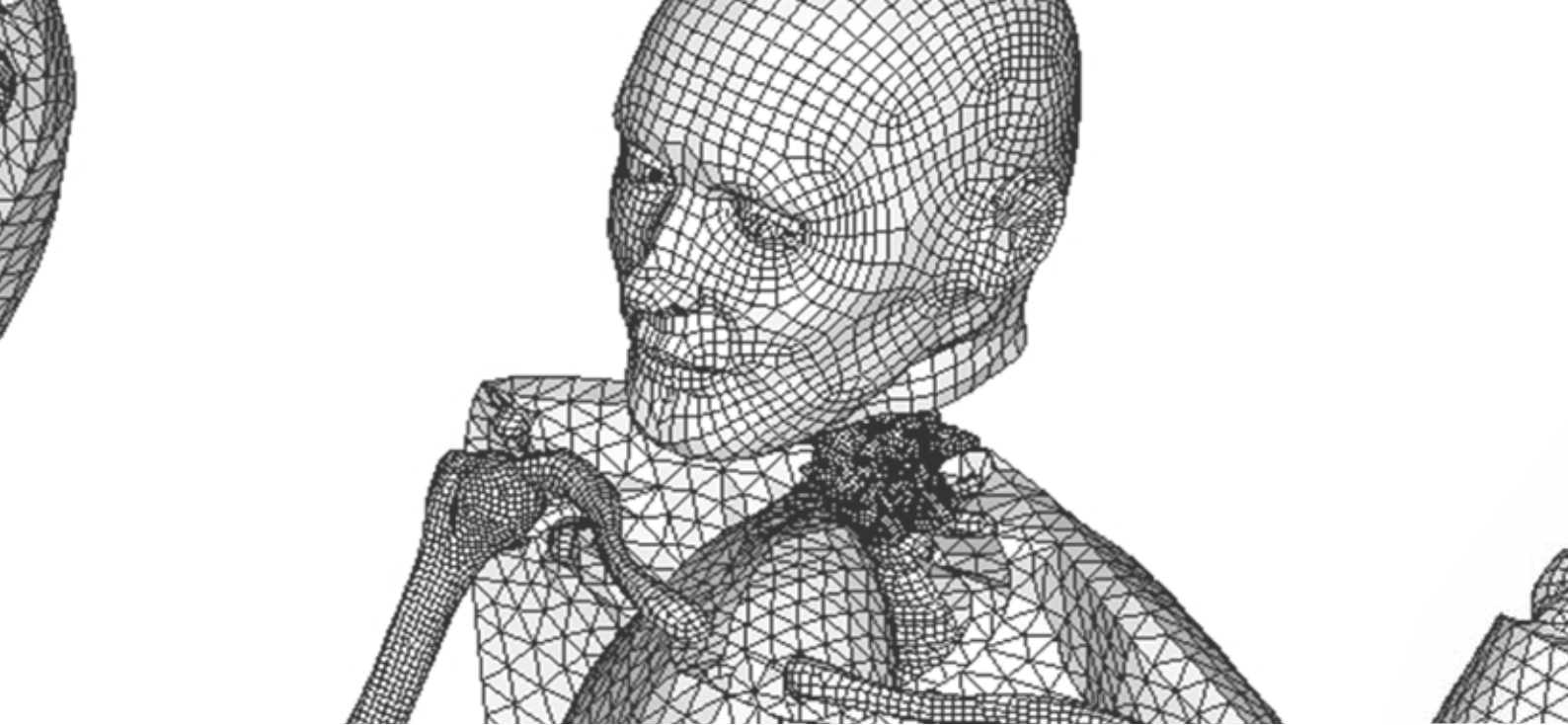
- the results are reproducible
- non-measurable quantities can be evaluated
- the assessment is objective
- the application is feasible within the early development phase

leading to reduced time and cost expenditure. In addition, optimization potentials can be used more efficiently and the efforts required are reduced. Due to our more than 20 years of experience in human body modelling we have been able to develop realistic setups which enable detailed analysis of comfort relevant areas as the lumberspine, the back muscles and the buttock tissue.

CAE Tool CASIMIR/Automotive for Analysis of Seating Comfort

- With a coupled Finite-Element-Model (Seat & occupant model CASIMIR) the simulation tool CASIMIR/Automotive enables the user to assess the static and dynamic seating comfort.
- By using digital prototypes comfort relevant aspects can be investigated within the early development phase.
- Parametric studies with aspect to geometry and material can be carried out in short times leading to optimized and innovative concepts

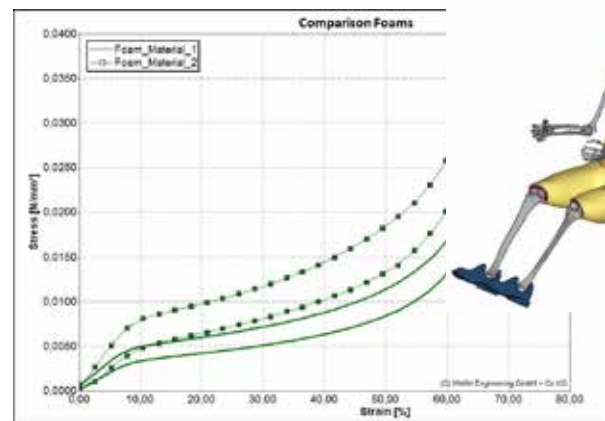




- Integrated within existing workflows, the tool uses HyperMesh as pre-processor and ABAQUS as Finite-Element-Solver.
- An implemented project management enables a constant overview about the seat variants designed.
- Main component is the occupant model CASIMIR, representing the bandwidth of customers by 13 different percentile configurations e.g. for Asians, North Americans or Europeans.
- Additionally, the application of the SAE-dummy J826 as occupant model provides information related to safety issues, which also can be used as input for packaging tools.

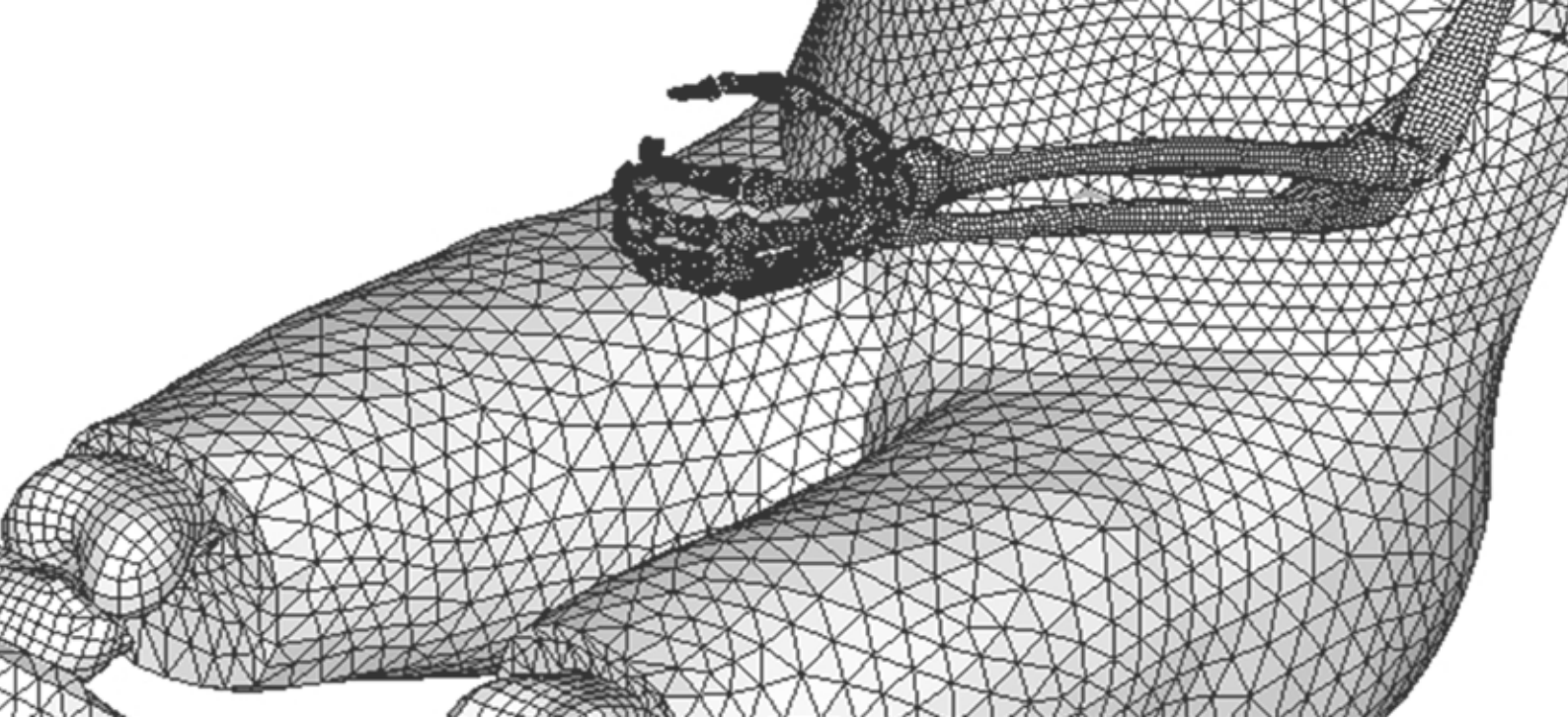
By applying CASIMIR/Automotive the following quantities can be computed for the investigated design:

- Static seat pressure distribution of cushion & backrest
- Meat-to-Metal for defining minimal distance between human tissue and seat structure
- Hip joint position as input data for packaging tools. Seated position defined via joints e.g.
- H-Point following SAE-J826 standard



Nonlinear Stress-Strain-Curve of typical seat foams

- Backset-Value following FMVSS 208 standard and other regulatory requirements
- Seat-transmissibility-function due to horizontal and vertical dynamic excitation
- Loading of lumbar spine due to vibrations
- Includes simulation for global hardness and hardness profiles to assess the differences between seats
- Study of muscle activity and its influence on seat performance
- In addition to the analysis of the occupied seat an enhanced procedure integrating the setup in a complete vehicle is possible.



Main Components of CASIMIR/Automotive

The nonlinear properties of the upholstery and the human body with its posture dependence are crucial for a realistic simulation of seating comfort. Accordingly, CASIMIR/Automotive supports the user here by its main components.

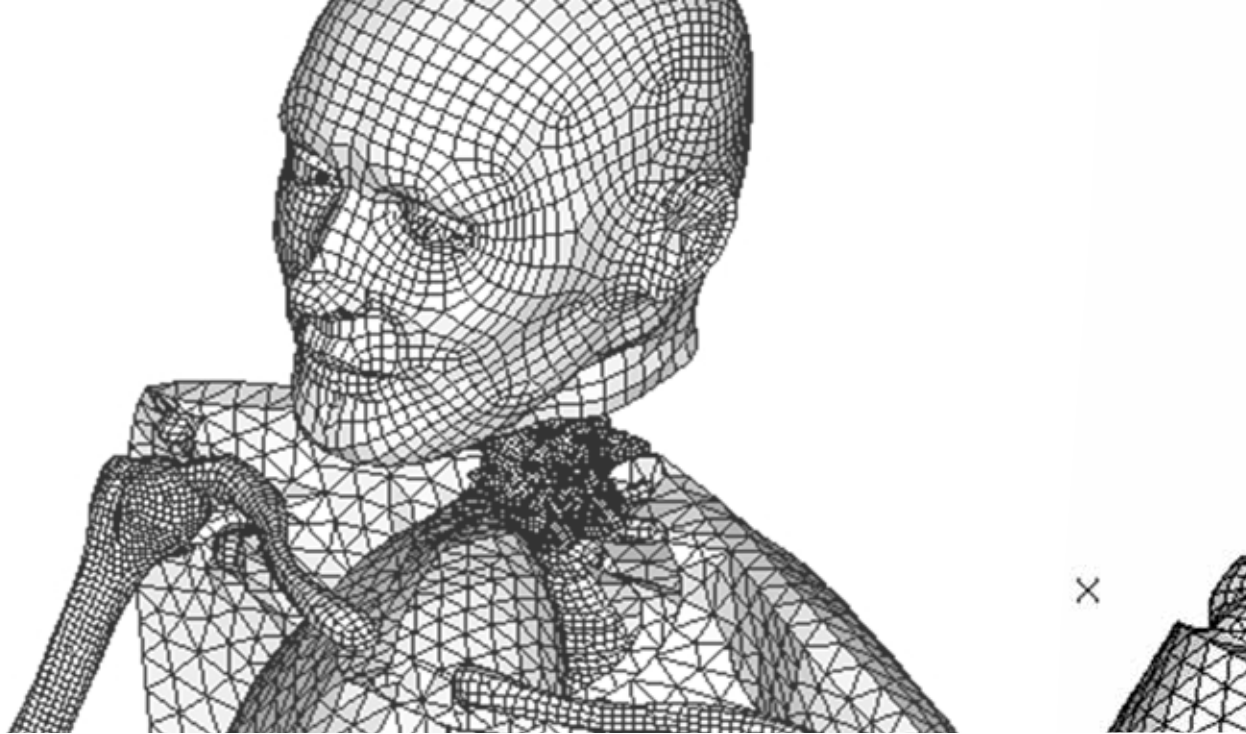
Identify and implement nonlinear Upholstery Properties

- The Material Manager (e.g. for foam, fabric and leather) includes all functionalities, starting with material test data up to the integration into an existing Finite-Element-Model.
- The identified properties can be stored and classified in a material database and thus form a steadily increasing info-pool for new variants.

Configure Occupied Seat Model

- Selection of appropriate percentile configuration from the 13 variants available (e.g. f05, m50, m95)
- Generation of realistic postures. Within the Posture Processor the user can vary the base setup of the human body model by adapting joint angles. A new interface enables also the exchange of posture information with packaging tools
- Optional: Definition of internal body properties such as the muscle activity or the curvature of the lumbar spine
- Positioning and interaction definition between seat and occupant model is supported by specific tools.





Simulation & Evaluation

- In general, the simulation uses default load cases as e.g. gravity, but can also be individualized by the Step-Manager.
- Besides the standard viewer tools CASIMIR/Post can be used for the evaluation. Objective assessment methods such as the Bodymap procedure for statics or Dimensions of Perception for dynamics are implemented.
- Thereby multi-axial result values are reduced to scalar quantities enabling a straight forward seat development by comparing design variants.
- Additionally, CASIMIR/Post can be applied for measurement data to link the virtual with the experimental process.
- Integration into the analysis of the entire vehicle.



Sitz: Daimler



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