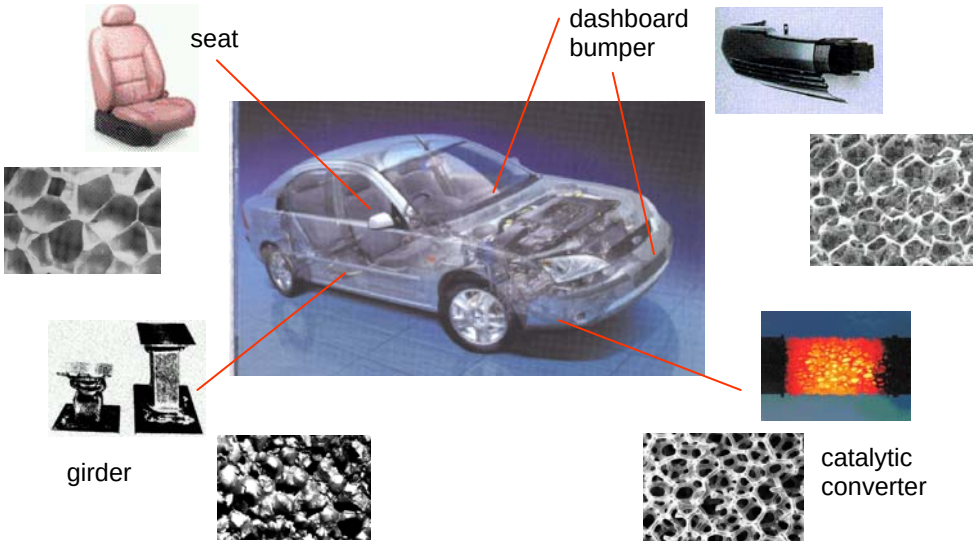
Microscopic computations of foam-like materials

There is an increasing interest in the application of foam-like materials (e.g. in the automotive industry).



However, the mechanical behavior of such materials is very complex, even for small deformations. There are three main numerical approaches to capture this behavior: the first is to fully resolve the entire structure on a microscopic level, the second is to apply higher order continuum theories on the macroscale, and the third is a combination of both and it is called FE^2 method; here the microstructure is embedded into a macroscopic framework.
In this software lab we will focus on the first approach. We will compare two different discretization strategies for foam-like materials on the microscopic level: beam-like solid elements of higher-order and beam elements (e.g. Timoshenko beam theory).
For the solid elements we will use the higher-order *p*-FEM code AdhoC [1]. For the beam elements we will use commercial codes, e.g. Ansys™.

To achieve this goal the following steps are necessary:

- Get acquainted with AdhoC (written in C) and a commercial FEM-solver.
- Create suitable meshes (note that several macro-mesh generators are available at our chair; these generators can be easily expanded to our needs).
- Perform case studies and compare the results.

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References

[1] AdhoC - Users Guide. Lehrstuhl für Computation in Engineering, Bauingenieur- und Vermessungswesen, Technische Universität München.