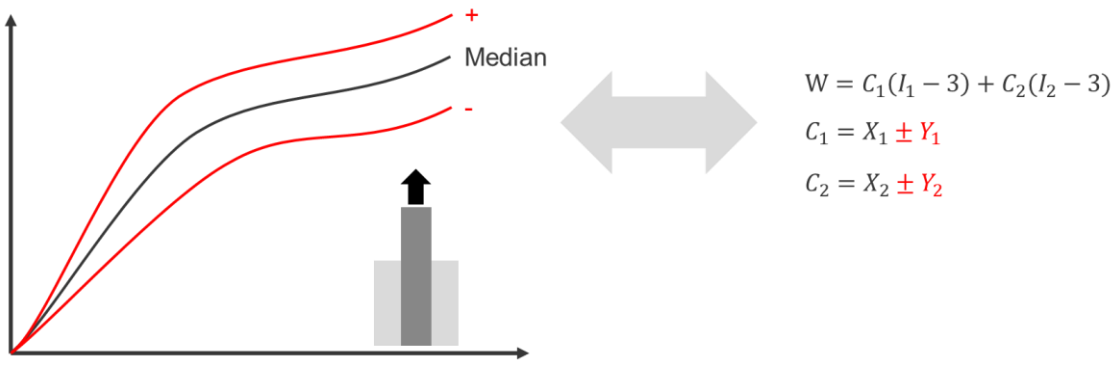
MiMM Day 2024 – Propagation of statistical effects to mechanical material models

Adhesive tapes are used in everyday life as well as in many technical applications. Often, and especially in industrial applications, the virtual design of components and complex systems has become a routine task for product developers. Virtual development is supported by simulations of the structural mechanical behaviour. The mathematical foundation for this is the finite element method and its analysis, accompanied by continuum mechanical concepts.

Within modern designs, adhesives play an important role. Linked to continuum mechanics, material models of these adhesives, describing their behavior, need to be found and subsequently calibrated by parameters. The basis for this calibration is a set of experimental tests. Unfortunately, even with great care in material production and the handling of specimens and tests, a natural scattering of mechanical material properties often appears.



Approaches to tackle this topic could involve developing a methodology that allows the transfer of the scattering of experimental data to the parameters of material models with varying levels of complexity. In doing so, the focus should always be on the application at the customer, with particular attention given to the impact of these natural variations in mechanical behaviour on a component's function.

Mathematical modelling approaches to describe those effects could include:

- Evaluating the natural scattering in experimental data,
- introducing known artificial scattering to artificial data (experimental data or parameterized material models),
- evaluating statistical distribution functions after (re-)identification of materials model parameters.

The tesa SE team will be happy to discuss this challenging modelling task with you!

Contact at tesa:

Dr. Oliver Gehrmann, Oliver.Gehrmann@tesa.com

Dr. Nils Hendrik Kröger, Nils-Hendrik.Kroeger@tesa.com

August 27, 2024