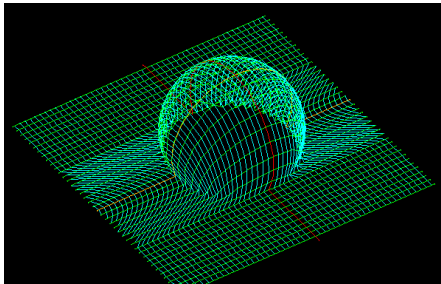


CAD-Simulation  
of 3D woven shapes



Funded by North-Rhine/Westphalia  
(Innovationsfonds 2001)

Objective of this project is a software extension development for a 3D-competent standard CAD system. This module is to describe and to simulate three-dimensional fabrics in respect of geometry and fabric design completely.

The project is based on Shape Weaving, a new method for the production of 3D-woven shapes on the weaving loom.

**State of the Art:**

- ⇒ Compilation of a data record by manual measuring of the prototypes regarding warp and weft thread lengths.
- ⇒ Test series for the determination of fabric statements and for the tuning of geometry, weave as well as thread densities.

Disadvantage:

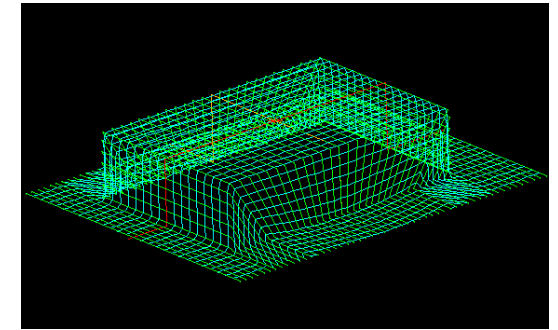
- ⇒ Feasibility and qualities are difficult to predict
- ⇒ Changes of geometry, the material or the weight per unit areas require new test series

**Objectives:**

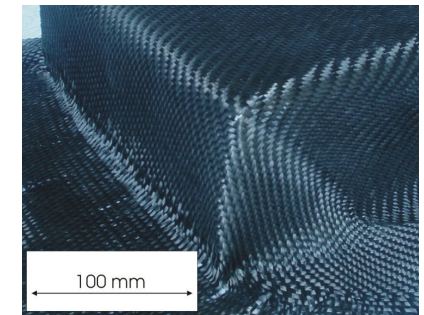
Simulation of 3D-woven fabrics with consideration of weaving technological boundary conditions:

- ⇒ quick checkup of the feasibility of geometry from 3D-woven fabrics
- ⇒ Forecast of woven structure and quality for each position of geometry
- ⇒ Optimization of parameters of the 3D-woven fabric (thread sizes, weave, thread distances) by simulation
- ⇒ economical prototype development

**Example: 3D- woven suitcase shell**

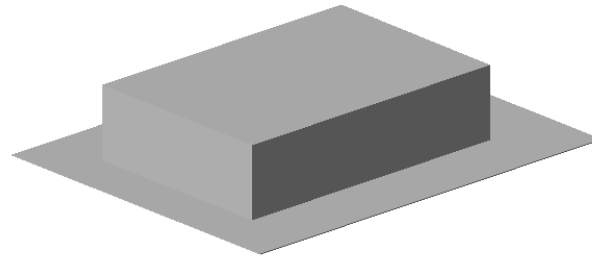


Simulation of woven geometry and the resulting orientation and density of warp and weft threads. In the boundary region warp thread density increases significantly.

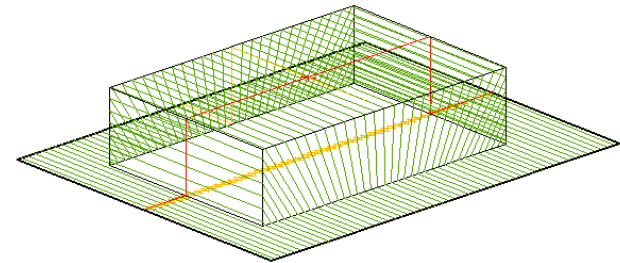


Checkup of the simulation by weaving trials: Formation of crinkles caused by too high thread densities at the predicted position.

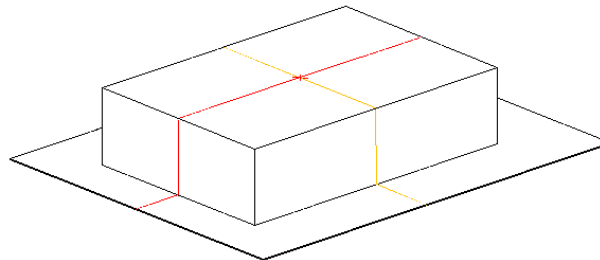
**Simulation procedure**  
**proportionally spread weft- and parallel warp threads**



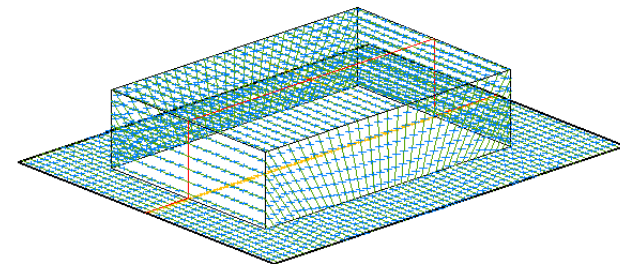
Construction unit geometry



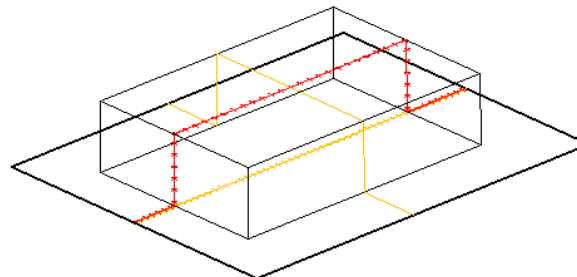
proportionally spread weft threads



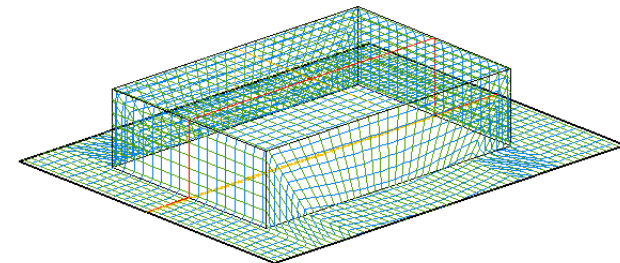
central warp thread and perpendicularly inserted weft



bases for warp-ends



bases for weft threads



proportionally spread weft- and parallel warp threads



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