3D Nonwoven Simulation

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The aim of this program is to provide fiber structures for use in the Fluent simulation package. These structures have been, so far, mostly used in investigating the influence of various parameters in filtration.
The simulation can generate multiple layers of different fiber types, each layer having its own input parameters (Fig. 1):

- Fiber type (staple or continuous)
- Fiber diameter distribution
- Fiber length distribution (for staple fibers only)
- Fiber density or count
- Basis weight or thickness
- ODF
- Maximum allowed bending angle.

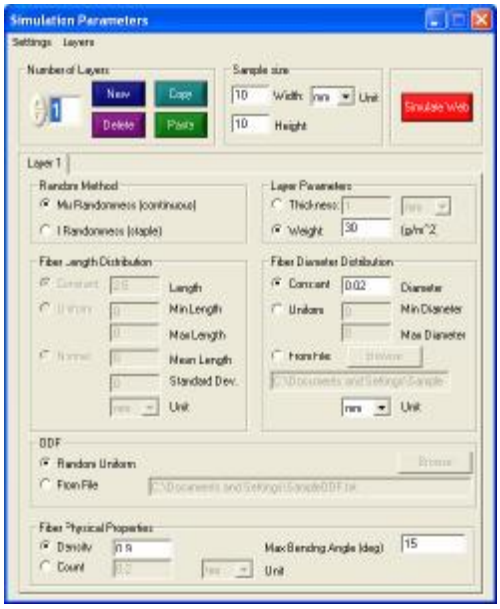

Figure 1: Interface for generating multi-layered structures.

Fibers are represented by straight cylinders. They are generated with an orientation in accordance with the input ODF then dropped on top of the fiber mat created so far. The extremities are then allowed to bend, up to the maximum allowed bending angle (Fig. 2).

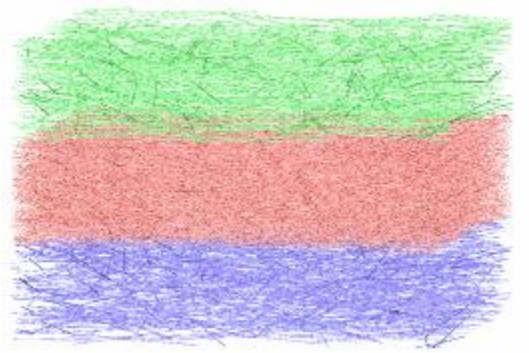

Figure 2: An SMS-like structure: top and bottom layers are coarse fibers, middle layer is made from fine fibers.

Once the structure has been created, a number of properties are available for inspection, like ODF compliancy, solid volume fraction or the number of fiber to fiber contacts.

The structure can then be exported to GAMBIT as a journal file. There are several options available for this, ranging from the complete structure to cross sections (Fig 3).

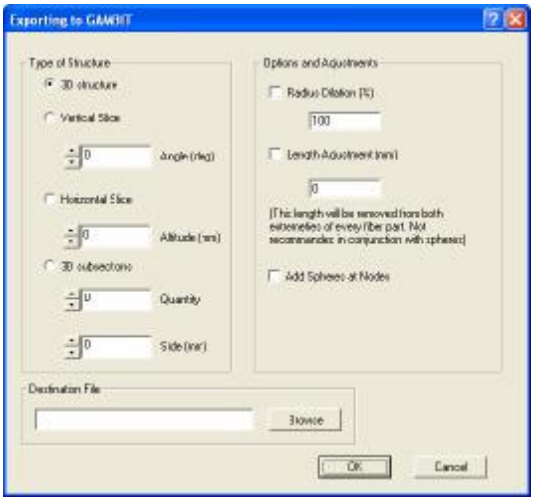

Figure 3: Interface for exporting structures to GAMBIT.

This software will be made available to full member companies or NCRC through the office of technological transfer of NC State University.

To learn more about this research contact us at nonwoven@ncsu.edu.