

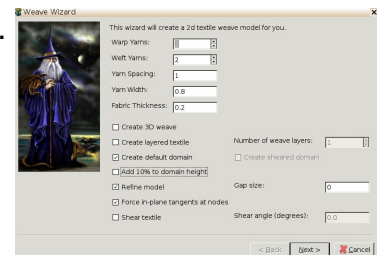
Predict initial failure strength constants of plain woven composites

Problem Description

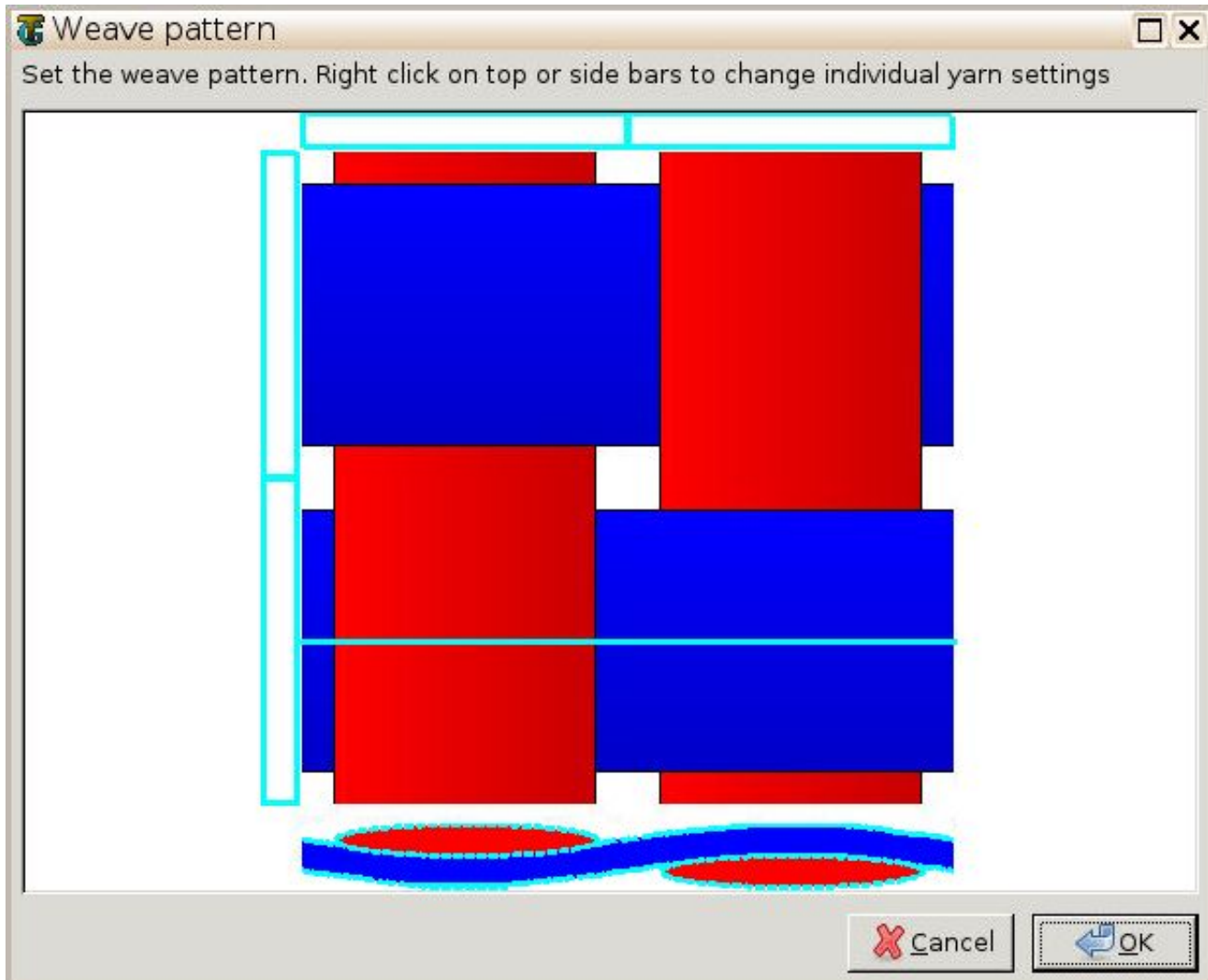
Predicting the failure initiation is the first step for many failure analyses of composites. A popular approach is the multiscale failure analysis, which computes the homogenized failure strength constants from the fine scale and use these strength constants along with the predefined failure criterion at the coarse scale. For example, in order to predict the failure initiation of a 2D woven laminate, we need the strength constants in each lamina to define the failure criterion and these constants are computed from the mesoscale model. In this example, we will show how to compute the strength constants using a plain woven SG at the mesoscale.

Solution Procedure

* step 1 Create a plain woven SG as in the previous examples. Here, we just want to show how to use this initial failure strength constants. To simplify the problem, we use the default parameters for this woven SG (un-select the add %10 domain height).

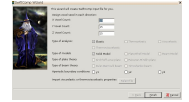


PREDICT INITIAL FAILURE STRENGTH CONSTANTS OF PLAIN WOVEN COMPOSITES



* step 2 Save the sc model and run mesoscale analysis as in the previous example.

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* step 3 Click Initial failure as shown in the following figure.

SwiftComp Wizard

Initial failure analysis

Choose failure criterion for matrix:

Max principal stress Max principal strain Max shear stress Max shear strain Mises

Xt: Xc: S:

Choose failure criterion for yarns:

Max stress Max strain Tsai-Hill Tsai-Wu Hashin

Xt: Yt: Zt:

Xc: Yc: Zc:

R: T: S:

Type of analysis: Strength constants Index and strength ratio Envelope

Type of load: stress-based strain-based

Load:

Envelope:

< Back Finish X Cancel

Different failure criterion for the matrix and yarns can be selected. The analysis type is “Strength constants” and we are using stress-based criterion. If the strength constants are defined in terms of strain, we can also use the strain-based load. The default strength constants are provided, which are usually measured from experiments or from subscale modeling.

Click Finish and the strength constants are automatically pop up.

Initial Failure Strengths: Positive Negative

1.8448394E+002	1.8813592E+002
1.8447659E+002	1.8812972E+002
2.2031740E+001	7.9821967E+001
1.8319621E+001	1.8319621E+001
1.8318452E+001	1.8318452E+001
1.7449173E+001	1.7449173E+001

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Note that the meaning of the strength constants provided and computed can be found in the [SwiftComp](#) user manual.