Programming project

This programming project can be conducted as a part of the course Computational Models of Biomaterial Failure. Completing the project is not mandatory.

Project description

The code developed during the course provides a functioning implementation of a scalar-elastic medium, discretized as a network of load carrying edges.

The system is subject to a uniaxial load in the vertical direction, with uniform displacements $u = 1$ and $u = 0$ applied to the top and bottom boundary respectively. Periodic boundary conditions are applied in the horizontal direction. This configuration mimics the geometry of an elastic material, which is subject to tension in the vertical direction. For this project, a size of *at least* 20×20 is recommended.

Project tasks:

1. Generate a configuration with a horizontal crack, for instance by removing a small number a of contiguous vertical edges from a plane near the center of the system

2. As we showed during our last tutorial, the global force F (in simulation units) is the force carried by all vertical links in any horizontal cross-section of the network. Study the dependence of F on the length of the crack a.

3. Local forces f on horizontal edges are higher near the crack and decrease with the distance from the crack (for instance, in the direction normal to the crack line). Fix a crack size and study the dependence of these currents on the distance from the crack.

The final report can be submitted as a pdf file, including a concise description of the work conducted for each task and the necessary plots. No code should be included in the report and no additional files should be submitted.