

Bachelor/Master Thesis

Simulation of frictionless contacts in elastic rod assemblies

Background

The simulation of interacting rods or rod-like bodies has been investigated in many applications, for examples, biopolymer networks, wire strands, cables, woven fabrics, entangled fibrous materials, DNA supercoiling. In such examples, the large number of bodies and their contact interactions typically require significant computational costs, which demands the development of efficient and accurate beam and beam contact formulations. In this study, we employ *an isogeometric finite element formulation of Cosserat rods with unconstrained directors*, which allows an efficient description of cross-sectional deformations and a smooth parameterization of lateral surface, compared with conventional brick element formulations. In the thesis, we focus on **one of the following topics**:

- Development of *an efficient global and local contact search scheme*
 - *closest point projection* by a Newton-Raphson method with a *good initial guess*
- Enforcement of the impenetrability constraint using one of the following methods:
 - an augmented Lagrangian method,
 - a Nitsche's method.



Aim

- Contact simulation in textile structures like knot tightening, twisting wire strands
- Survey relevant literature
- Write your own computer code (reference FORTRAN code provided)
- Learn tools for a scientific visualization/writing

Contact