# Formulation of line-to-line contact conditions between flexible beams with circular cross-sections

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Flexible slender structures like cables have a variety of applications in high-performance engineering systems. The complex mechanical behaviour of such components, resulting from interactions between individual fibers, cannot be captured by means of global constitutive laws. Mesoscopic models see cables as a collection of fibers, modeled as 1D Cosserat beams, experiencing frictional contact. Beams are described through a space curve augmented by a frame attached to each cross section. The mechanical behaviour of a beam is the result of frame transformations belonging to the Lie group of rigid body motions SE(3). The use of suitable Lie group solvers combined with a discretization consistent with the Lie group framework results in numerical methods with interesting properties. In this contribution the modeling of cables made of elastic fibers with circular cross sections undergoing frictionless contact interactions is addressed. A continuous formulation as Cosserat beams with mortar contact conditions modeled as unilateral constraints is established in SE(3). Constraints are enforced by means of Lagrangian multipliers. Equilibrium equations written in the local frame emerge as a consequence of the left invariant representation of derivatives in the Lie group. They are solved using a semi-smooth Newton method. The spatial discretization is performed using helicoidal shape functions resulting from the geodesic interpolation of elements in SE(3). At the symposium an outline of the problem with its scientific challenges, first numerical results, as well as an outlook on future work will be presented.