
Bending and Torsion of Composite Cable Structures

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Abstract

Electric cables and cable bundles are highly flexible slender objects consisting of multiple components. The high variety of cable and bundle structures from single conductors and twisted cable pairs to wiring harnesses consisting of up to 100 different cable types leads to various deformation characteristics. However, these structures can be modelled efficiently using geometrically exact rod models formulating the constitutive behaviour in terms of the sectional quantities (i.e. forces and moments) and objective deformation measures (strains and curvatures) of the rod. In accordance with this modelling approach, classical experiments for clamped rods can be utilized in adapted setups to investigate the deformation behaviour of cable structures, derive fitting constitutive models and the corresponding model parameters. Typically, bending, torsion and their combination define the three-dimensional shape of a cable-like structure in applications. In this contribution, we will show real and virtual experiments to investigate cable behaviour under bending-torsion coupling and the derivation of suitable constitutive laws.

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