

Behaviour of a Kirchhoff rod loaded by a pure moment

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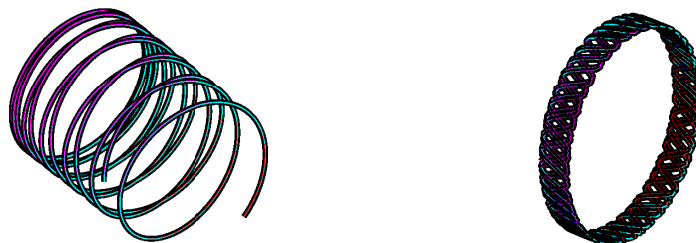
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Bending of a Kirchhoff rod loaded by pure moment is derived using Cosserat formulation by the mean of a material curve and a moving director frame. Equilibrium relations are derived in a dimensionless form. Linear stress-strain relation is adopted with large strain and large displacement. Two invariants dictate the existence of the solutions : the moment M and the energy per unit length μ . Bending is controlled by these two invariants along with the material g and the cross section geometry e .

Explicit solutions for different regimes are presented in terms of Jacobian elliptic functions and different rod patterns are observed depending on the geometry of the cross section and the ratio $\eta := \frac{M}{\mu}$ without any dependence on rod length.

This approach may lead to a better understanding of helical shapes such as DNA structures and may be applied to study the geometry of knots and ribbons.



Mots clefs : Kirchhoff rod, Ribbons, Helical shapes.

Références

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