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Oscillatory configurational forces

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Abstract: Eshelby introduced the concept of configurational forces to motivate the change in the defects position within a solid [3]. Over the last decade, this framework has been extended to the mechanics of structures by showing that frictionless sliding sleeves may provide at their exit an 'Eshelby-like' force parallel to the sliding direction [1, 2].

The effect of oscillatory configurational forces is analyzed during the fall of a rod constrained by a sliding sleeve subject to a periodic motion. Time evolution of the system is achieved through numerical integration by means of an in-house Finite Element solver. The dynamic response can be distinguished in three qualitatively different behaviours: (i.) a final complete injection; (ii.) a final complete transverse ejection; and, unexpectedly, (iii.) a steady small amplitude oscillation in the absence of a final injection or ejection of the rod.

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References

[1] Armanini C., Dal Corso F., Misseroni D., Bigoni D. (2019). Configurational forces and nonlinear structural dynamics. *J. Mech. Phys. Sol.*, 130, 82-100.

[2] Bigoni D., Dal Corso F., Bosi F., Misseroni D. (2015) Eshelby-like forces acting on elastic structures: theoretical and experimental proof. *Mech. Mater.*, 80, 368–374.

[3] Eshelby J.D. (1956). The continuum theory of lattice defects. *Solid State Phys.*, 3.C, 79–144.