סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ד'

26.01.22 (כ"ד בשבט, תשפ"ב), בשעה 13:30 באמצעות הזום :

https://technion.zoom.us/j/7498253049

מרצה: יאיר לוקסנבורג

מנחה: פרופ' ספי גבלי

על הנושא:

An improved analytical description of the response of axisymmetric conical shells exhibiting bistable behavior

The seminar will be given in English

תקציר ההרצאה :

Nonlinear mechanisms are gaining popularity in the last decades, achieving greater design control while incorporating fewer components. Under certain conditions, nonlinear springs include a bistable behavior, namely under the same load more than one displacement may be stable. In this study, we focus on these types of springs and in particular on Belleville springs, a widely used conical axisymmetric shaped washers. It has been shown that bistable structures may be exploited as vibration isolators. The peak response can be bounded in the transient phase, where the spring exhibits a snap-through behavior between its stable displacements. Yet, we show that designing a system that ensures such a response form requires a highly accurate model. Therefore, the commonly used Belleville springs models were examined by comparing their results to a finite-element simulation. It was found that these models lack the necessary accuracy due to the assumption of rigid rotation. According to this assumption, adopted by all analytical models of Belleville springs, the cross-section of the spring rotates without bending, i.e. maintains zero curvature as the spring deforms. Motivated by this insight, we relax the rigid-rotation assumption and approximate the radial displacement field by a linear relation in terms of the distance from the spring axis. We find, based on extensive finite-element simulations, that the functional dependence of the radial displacement on the geometry of the springs is indifferent to the stage of deformation and can be expressed in terms of only two non-dimensional geometrical parameters. These findings enable us to derive closed-form expressions that are simple and straight-forward to use yet are significantly more accurate than existing analytical models.

בברכה,

פרופ"ח מתי סאס

מרכז הסמינרים