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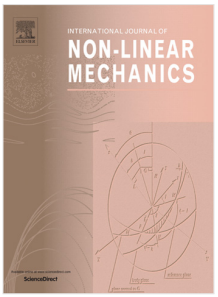

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Effects of clamping misalignments on the line-contact deformation of a constrained elastica

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Previous research shows that the lowest two natural frequencies of the line-contact deformation of a clamped-clamped elastic strip constrained by a pair of plane walls located symmetrically with respect to the clamping axis are degenerately zero. In experiments, some researchers reported the existence of line-contact deformation, while others reported that it did not exist. In this article, we study the effect of various clamping misalignments, which likely occur in experiments, on the stability of the line-contact deformation. If the tangents of the two end clamps point in the same side of the line connecting the two ends, the line-contact deformation is stable. On the other hand, if the clamp tangents point in opposite sides, the line-contact deformation does not exist at all. In the special case when either one of the clamp tangents is parallel to the wall, the line-contact deformation exists and remains neutrally stable. For this case, the chance of obtaining line-contact deformation in experiment is about the same as the chance of jumping away from point-contact deformation without going through line-contact. We suspect that this is due to the difficulty of aligning the clamp tangents parallel to the wall in practice. Therefore, it is almost impossible to predict whether the line-contact deformation exists in experiments.

Keywords: constrained elastica; line-contact deformation; stability