

## Nonlinear waves in beams on tensionless substrates

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## ABSTRACT

In many engineering applications, remarkably railway tracks and railway overhead power lines, but also in coatings and laid pipelines, it is needed to study the wave propagation of infinitely long beams resting on tensionless (or compressionless) foundations. Even considering a linear behavior for the structural element, because of the piecewise linear behavior of the substrate the problem becomes nonlinear. Contrarily to what commonly happens in nonlinear problems, where an exact solution cannot be found, in this case I was able to obtain an exact analytical solution, that allows a deep understanding of the problem. The effects of the stiffness of the soil on the wave velocity are investigated, and the outcomes are compared with the (reference) case of the same beam on the bilateral soil, for which the solution is well-known.

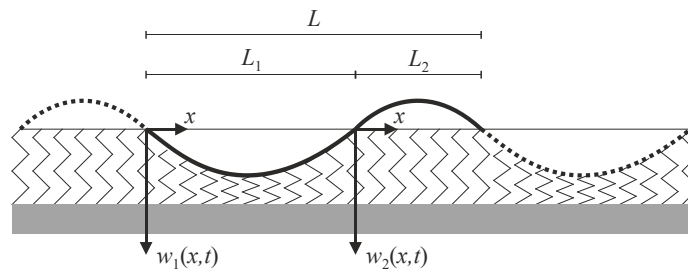


Figure 1: Wave in beams on unilateral soil

Keywords: Wave propagation, tensionless soil

- [1] Lenci, S. and Clementi, F. 2020 Flexural wave propagation in infinite beams on a unilateral elastic foundation. *Nonlinear Dynamics* 99, 721-735. DOI: 10.1007/s11071-019-04944-4