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Bifurcation Approach to the Travelling Waves in Asymmetrically Supported Bending Beam

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Abstract

We study the boundary value problem for fourth-order partial differential equation with jumping nonlinearity in the form

$$u_{tt} + u_{xxxx} + au^+ - bu^- = 1, \qquad x \in \mathbb{R}, t > 0, \tag{1}$$

with parameters $a > 0$ and $b \geq 0$. We focus on its travelling wave solutions $u = u(x - ct)$ and their number. Problem (1) can be used as a generalized model of a suspension bridge or as a model of asymmetrically supported infinite bending beam.
Previously in [1] (for $b = 0$) and in [2] (for $b > 0$), the existence of at least two different travelling waves with particular fixed wave speed c was proved. The aim of our work is to show the multiplicity of the travelling waves with speeds in the admissible range using bifurcation theory. Next, we will present the results concerning related eigenvalue problem and several open questions.

References

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