Numerical simulation of nonlinearities in elastic beam differential models

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We consider a hinged elastic beam subject to nonlinear restoring force. Our purpose is to model the roadway of a suspension bridge and the nonlinear action of the hangers by a convenient fourth order ordinary differential equation. We show that the equilibrium position of the beam under the action of a vertical load displays an oscillating profile. We compare the nonlinear model with the linear model and we study the dependence of the solution with respect to the physical parameters involved. More, in simulating nonlinear model some challenging numerical point appears, which we discuss.