Elastic pendulum

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Elastic pendulum is a simple mechanical system consisting of a point mass suspended on an elastic spring. Besides being an interesting physical system of its own it serves as a model for certain triatomic molecules (e.g. CO_2). The conservative model of elastic pendulum has two equilibrium points. The upper equilibrium points is unstable, while the lower e.p. is stable. The vertical line going through the lower e.p. is invariant, for a given total energy there exists a periodic solution in this vertical line (for appropriate initial conditions). For certain parameter values and for certain amplitude this periodic solution is unstable. We investigate the border of stability in the parameter–amplitude space. We formulate the condition of stability, and we use the continuation technique to find the border numerically. Finally we find an analytic formula to approximate the border of stability in a wide range of parameter and amplitude values.

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