Non-linear dynamics of flexibly suspended spring pendulum embedded in gravity and electric fields

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Abstract: In this paper we study non-linear behavior of vertically and flexibly suspended spring pendulum embedded in both gravity and electric fields. Due to strong non-linearity of the analyzed three-degree-of-freedom mechanical system, some interesting non-linear behaviors are observed and discussed. The motion of the system for different parameters is considered by employing standard numerical methods dedicated for non-linear systems, including both qualitative and quantitative methods as well as own original animations of the system dynamics, created in Mathematica software. The investigated energy transition between fixed points and other non-linear behaviors of the considered system can be potentially applied to other similar systems such as, for instance, real electro-mechanical systems.

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