Numerical simulation and experimental set-up of an axially excited spatial double physical pendulum

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Abstract: A periodically excited spatial double physical pendulum being coupled by two universal joints is studied. Damping forces and torques inside joints as well as an influence of the gravitational field are taken into account while deriving the governing ODEs of the pendulum dynamics. The work consists of modelling, simulation and experimental measurements to validate the numerical simulation of the earlier introduced mathematical model. In the experiment, kinetic excitation is realised by an non-constant periodic torque yielded by the computer-controlled servomotor. Angles of rotation of the pendulum links are measured by four encoders mounted on each of the universal joints and analysed by an originally developed acquisition software. Plans for future extensions of the mathematical model simulation and the experimental setup are discussed. Exemplary simulation as well as simulation of built pendulum behaviour showed several types of non-linear effects, including chaos, quasi-periodic and periodic dynamics.

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