Nonlinear Sciences > Chaotic Dynamics

Swinging Atwood's Machine: Experimental and Theoretical Studies

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A Swinging Atwood Machine (SAM) is built and some experimental results concerning its dynamic behaviour are presented. Experiments clearly show that pulleys play a role in the motion of the pendulum, since they can rotate and have non-negligible radii and masses. Equations of motion must therefore take into account the inertial momentum of the pulleys, as well as the winding of the rope around them. Their influence is compared to previous studies. A preliminary discussion of the role of dissipation is included. The theoretical behaviour of the system with pulleys is illustrated numerically, and the relevance of different parameters is highlighted. Finally, the integrability of the dynamic system is studied, the main result being that the Machine with pulleys is non-integrable. The status of the results on integrability of the pulley-less Machine is also recalled.

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