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Odd periodic oscillations in Comb-drive finger actuators. (English) Zbl 1478.34061
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Summary: In this work we consider the existence of solutions of a Dirichlet problem with a prescribed number of zeros for a large class of second order differential equations with singularities. Additionally, for the model of a well known kind of micro-electromechanical system, the transverse Comb-drive finger device, we provide sufficient conditions in terms of control parameters that lead to odd periodic oscillations with a certain number of zeros that ranges from zero to some positive integer. This work is motivated and follows the lines of *R. Ortega* [Arch. Math. 107, No. 4, 405–412 (2016; [Zbl 1354.34072](#))] where the existence of odd periodic oscillations was studied for second order differential equations without singularities, in particular, for the Sitnikov problem. The main results of this paper are obtained through a truncation process, the application of classical tools as the shooting method, and the Sturm comparison theory. A numerical approach based on a bisection method is employed to illustrate the main results with simulations by using literature reference parameters.

MSC:

- [34C60](#) Qualitative investigation and simulation of ordinary differential equation models
- [34C25](#) Periodic solutions to ordinary differential equations
- [34D20](#) Stability of solutions to ordinary differential equations
- [47N20](#) Applications of operator theory to differential and integral equations
- [74M15](#) Contact in solid mechanics

Keywords:

Comb-drive finger model; odd periodic solutions; second-order differential equations

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