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# Investigation of influence of various parameters on nonlinear dynamics of contact interaction of Bernoulli-Euler nanobeams

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*Abstract*: Micro-and nanoscale beams in contact with each other are widely used in various micro-and nano-electromechanical systems (vibration sensors, micro-drives, micro-switches). At the same time, as a rule, they work in a wide range of dynamic loads. In this paper, the mathematical model of contact interaction of Bernoulli-Euler beams on the basis of gradient deformation theory is constructed. With the help of Hamilton's variational principle the resolving system of differential equations and the corresponding boundary conditions are obtained. The resulting system of nonlinear partial differential equations is reduced to a system of ordinary differential equations by the method of finite differences of the second order. The Cauchy problem is solved by the fourth order Runge-Kutta method. Fourier and wavelet analysis, phase portraits, Poincaré maps and dynamic analysis of the largest Lyapunov exponents are used to analyze the nonlinear dynamics of the contact interaction. Phase chaotic synchronization is also investigated. With the help of the developed algorithms and programs, the influence of three scale parameters of the length of the material on the deflection of the beam, the natural frequency and oscillation modes of the beam are studied. The problems with different values of clearances between beams and different dissipation factors are considered. Studies have shown a significant effect of the scale parameters of the length of the material, the clearance and the dissipation factor on the dynamic modes of contact interaction of nanobeams.

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