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Structural-parametric model of electromagnetoelastic actuator for nanomechanics

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The application of the electromagnetoelastic actuator based on the electromagnetoelasticity (piezoelectric, piezomagnetic, electrostriction, magnetostriction effects) is promising in the nanomechanics, the nanotechnology, the adaptive optics, the large telescopes and the cosmic telescopes. The piezo actuator is the piezomechanical device intended for actuation of the mechanisms, the systems or the management based on the piezoelectric effect, converts the electrical signals into the mechanical movement or the force. The piezo actuator is used in the nanomanipulator for scanning tunneling microscope. Using the solutions of the equation of the electromagnetoelasticity, the wave equation and the matrix equation of the electromagnetoelastic actuator with the Laplace transform and taking into account the deformations along the coordinate axes, it is possible to construct the generalized structural-parametric model of the actuator and to describe its dynamic and static properties. Effects of geometric and physical parameters of an electromagnetoelastic actuator and external load on its dynamic characteristics are determined. Structural-parametric model, decision wave equation and matrix equations of the electromagnetoelastic actuator are obtained, its transfer functions are built. For calculation of control systems for the nanomechanics, the generalized parametric structural schematic diagram and the transfer functions of the electromagnetoelastic actuator are obtained. The generalized structural-parametric model of the electromagnetoelastic actuator provides the determination of its matrix transfer function and use methods of control theory in the calculation of its static and dynamic characteristics for the electromagnetoelastic actuator for the nanomechanics. The transfer functions and the parametric structural schematic diagram of the piezo actuator for the transverse, longitudinal, shift piezoelectric effects are obtained from the structural-parametric model of the piezo actuator. Static and dynamic characteristics of the piezo actuator for the nanomechanics are determined.

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