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INTRODUCTION

The application of the electromagnetoelastic actuator based on the electromagnetoelasticity is promising in the nanotechnology, the nanobiology, the microelectronics, the adaptive optics, the power engineering. Piezoactuator is the piezomechanical device intended for the actuation of the mechanisms, the systems or the management based on the piezoeffect, converts the electrical signals into the mechanical displacement and force.

AIM

This study focuses the attention to construct the absolute stability conditions by using the Yakubovich absolute stability criterion for the control system for the nanodisplacement with the electromagnetoelastic actuator for the nanotechnology applications.

MATERIAL AND METHOD

In the present work the absolute stability conditions for the control system with the electromagnetoelastic actuator are constructed by using the Yakubovich absolute stability criterion. The characteristics of the electromagnetoelastic actuators are the alternating-sign hysteresis type for the piezoactuators and the constant-sign butterfly type for the electrostriction actuators. The values of the tangents of the inclination angles of the tangent line to the hysteresis nonlinearity on the butterfly wing for the electromagnetoelastic actuator are determined similar to the hysteresis characteristic.

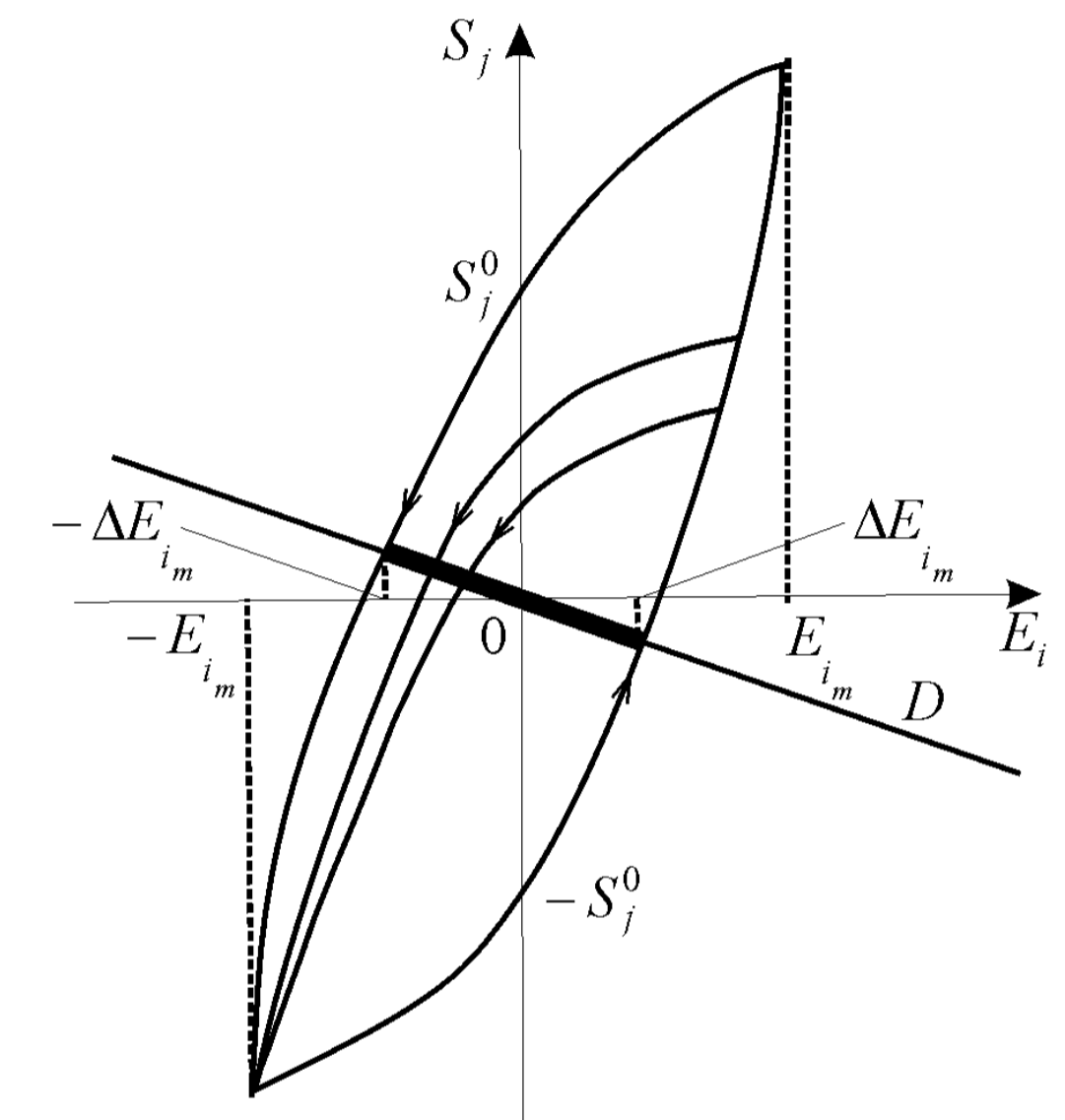
RESULT AND DISCUSSION

The analytical expressions for the sufficient absolute stability conditions of the system with the hysteresis nonlinearity of the electromagnetoelastic actuators are written using the Yakubovich absolute stability criterion, which is the development of the Popov absolute stability criterion. For the Lyapunov-stable control system, the Yakubovich absolute stability criterion for the systems with the single hysteresis nonlinearity provides the simplest and pictorial representation of results of the investigation of the stability and the possibility of the synthesis of the correcting devices of the system ensuring the stability of the strain control systems with the electromagnetoelastic actuators. The stationary set of the control systems of the electromagnetoelastic actuator are shown in Graph. 1. The correcting devices are chosen for providing the high quality of the control systems for the deformation of the piezoactuator.

CONCLUSION

The stationary set of the control systems is the segment of the straight line. The absolute stability conditions of control systems with piezoactuator deformation in the case of longitudinal, transverse and shift piezoeffect for the hysteresis characteristic of deformation of the piezoactuator are obtained for the nanotechnology applications. The obtained absolute stability conditions for the control system with the electromagnetoelastic actuator allow one to estimate and calculate the characteristics of the control system of the deformation of the electromagnetoelastic actuator with the characteristics for the actuator of the alternating-sign hysteresis type or the constant-sign butterfly type.

GRAPHS



Graph. 1. The alternating-sign hysteresis-type characteristic of the deformation of the piezoactuator.