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Investigation of Powerfull and High Precision Piezoelectric Actuator for Two-Dimensional Positioning

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The investigation of novel design high precision piezoelectric actuator for the object positioning in two-dimensional space is presented in the paper. Introduced piezostack-based actuator can achieve elliptical moving trajectories of the contact core in two perpendicular planes. Actuator operating principle is based on exciting the ends of the beam with two external harmonical forces that have the same frequency but different phases. The movement of such beam looks like a beam shaking. Investigated actuator consists of two perpendicular concatenated shaking beams. Depending on control of the power supply the linear, curvilinear and rotational motion of the positioning object can be achieved. Piezoelectric actuator has main advantages of large driving force, high dynamic resolution and small response time. Optimization analysis of piezoelectric actuator is carried out on purpose to find out optimal geometrical parameters of the actuator. A simulation, including a finite element analysis of the system, is used to analyze the actuator response to various input sets. Experimental model of piezoelectric actuator is built and its characteristics were compared to the results of theoretical analysis.

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