

Research highlights

Piezoelectric actuators: Why cubic?

The possibility of designing a cubic stator in a rotary-linear piezoelectric actuator is intriguing and technically challenging. Theoretically, the vibrational behaviour of cubic stators remains unclear when modeled using the finite element method (FEM).

Here, Tomoaki Mashimo and Shigeki Toyama analyzed the vibrational behavior of cubic stators based on an energy method, which distinguishes components of mechanical energy.

By changing the design of stators—especially the length in the direction of the through-hole axis—the researchers clarified how the vibrational modes are in accordance at one equal frequency in cubic shape.

The energy method described in this paper showed that the mechanical energy of two specific vibrational modes is in equilibrium. The shape for which the stator achieves equilibrium energy was found to be a cube.

This approach should be useful for not only studies on vibration, but also for design the stators with an easy-to-use modal analysis method.

Reference:

Tomoaki Mashimo and Shigeki Toyama.

Vibration Analysis of Cubic Rotary-Linear Piezoelectric Actuator.

IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control **58**, 844–848, (2011).

Digital Object Identifier (DOI): 10.1109/TUFFC.2011.1877

Tomoaki Mashimo is now at the Electronics-Inspired Interdisciplinary Research Institute, Toyohashi University of Technology.

Department website: Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) <http://www.eiiris.tut.ac.jp/>



Tomoaki Mashimo



An actual cubic actuator