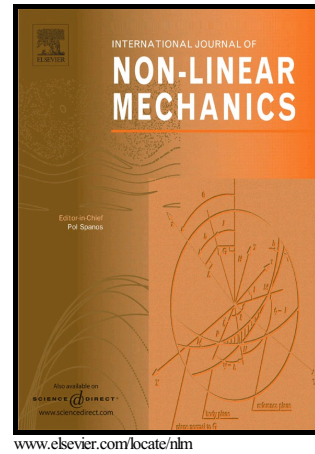


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Atsushi Yao, Takashi Hikiara



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# Reprogrammable logic-memory device of a mechanical resonator

Atsushi Yao<sup>a</sup>, Takashi Hikihara<sup>b</sup>

<sup>a</sup>*Department of Electronic Science and Engineering, Kyoto University, Katsura, Nishikyo,  
Kyoto, 615-8510 Japan*

<sup>b</sup>*Department of Electrical Engineering, Kyoto University, Katsura, Nishikyo, Kyoto,  
615-8510 Japan*

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## Abstract

From the viewpoint of application of nonlinear dynamics, we report multifunctional operation in a single microelectromechanical system (MEMS) resonator. This paper addresses a reprogrammable logic-memory device that uses a nonlinear MEMS resonator with multi-states. In order to develop the reprogrammable logic-memory device, we discuss the nonlinear dynamics of the MEMS resonator with and without control input as logic and memory operations. Through the experiments and numerical simulations, we realize the reprogrammable logic function that consists of OR/AND gate by adjusting the excitation amplitude and the memory function by storing logic information in the single nonlinear MEMS resonator.

*Keywords:* micro-electro-mechanical resonator, nonlinear dynamics, logic-memory device, logic operation, memory operation, nonlinear vibrations

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## 1. Introduction

A mechanical computer consists of mechanical components such as gears, beams and so on. The history of mechanical computation began when the mechanical calculator was invented by Wilhelm Schickard in the 17th century. In 1644, Blaise Pascal designed and built a small and simple mechanical calculator

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*Email addresses:* yao@piezo.kuee.kyoto-u.ac.jp (Atsushi Yao),  
hikihara.takashi.2n@kyoto-u.ac.jp (Takashi Hikihara)

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