Summary: Research studies on vibration energy harvesting have shown from time to time that bistable harvesters offer a lucrative solution for harnessing substantial magnitude of power across a broad range of frequencies. This exciting potential of bistable harvesters has bred interest towards investigating the possibility of enhancement in power by coupling multiple of them. In this regard, the present work analyzes the behavior of a 1-D array of bistable piezoelectric harvesters mechanically coupled in the nearest-neighbor configuration under a noise perturbed periodic base excitation. The numerical study reports a resonant-like behavior of the total power with system size for certain noise levels of excitation. The parametric regimes to which the system size resonance effect is confined have been identified. The present work attempts to provide an intuitive understanding into the role of system size on the total harvested power under a noisy environment. Inferences drawn from the results of this work shall help in designing a harvesting system to realize broadband power generation.

MSC:
70Kxx Nonlinear dynamics in mechanics
34Fxx Ordinary differential equations and systems with randomness
34Cxx Qualitative theory for ordinary differential equations

Keywords:
energy harvesting; nonlinear dynamics; stochastic resonance; harmonic excitation with noise; synchronization

Full Text: DOI

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