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Magnetically plucked piezoelectric energy harvester via hybrid kinetic motion (Article) (Open Access)

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Abstract

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Piezoelectric energy harvesting is a possible breakthrough to reduce the global issue of electronic waste as they can efficiently convert the ambient vibration to the electrical energy without any additional power. This work presents the design and development of a piezoelectric energy harvester that is capable of transforming vibration from ambient sources into electricity. It focuses on a magnetically plucked piezoelectric beam as an alternative to the mechanically induced harvesters, as the latter are subjected to wear and tear. A prototype comprising of a 40 mm PZT-5H piezoelectric beam with a permanent magnet mounted at one end of the beam, as well as a series of permanent magnets of same types attached on an eccentric rotor was developed along with a National Instruments® data acquisition device. Mean output voltages of 2.98 V, 1.76 V and 0.34 V were recorded when the eccentric rotors were slowly rotated at 8.4 rad/s with increasing distances of 5 mm, 7.5 mm and 10 mm respectively, between the magnets on the rotor and the beam. These results have proven that voltage could also be generated by magnetically plucking the piezoelectric beam, and by reducing the distance between magnets, the amount of voltage generated will be higher. The outcome of this work signifies the possibility for implementation of energy harvesters that are capable of powering electronic devices from hybrid kinetic motion, with a reduced risk of equipment fatigue. © 2019, International Islamic University Malaysia-IIUM.

SciVal Topic Prominence

Topic: Energy harvesting | Harvesters | Harvested power

Prominence percentile: 99.842

Author keywords

Energy harvester | Hybrid kinetic motion | Magnetically plucked | Piezoelectric

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