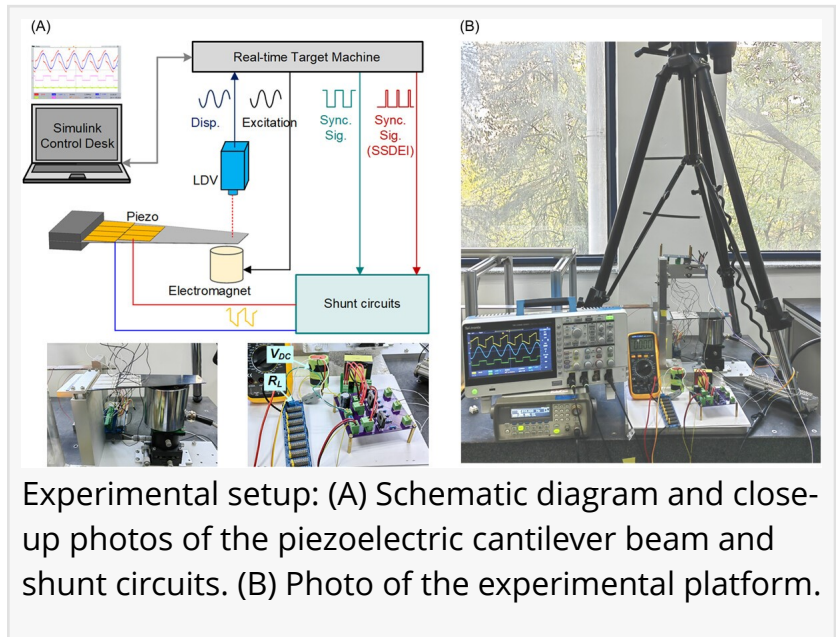


Vibration to power: bidirectional piezoelectric systems for future aerospace structures

USA, June 11, 2024 /EINPresswire.com/

-- In a significant leap for aerospace and mechanical engineering, researchers have developed a cutting-edge bidirectional energy-controlled piezoelectric shunt damping technology. This breakthrough not only significantly enhances the suppression of [vibration](#) amplitudes in mechanical systems without external power but also harnesses electrical energy, heralding a new era of self-powered solutions.



Mechanical structures often suffer from vibrations that can compromise safety, comfort, and operational longevity. Traditional control methods, while effective, demand substantial energy and complex systems. The quest for efficient and sustainable alternatives has led to the exploration of piezoelectric materials. However, the limitations of current damping techniques necessitate an in-depth examination of novel approaches to achieve superior vibration suppression.

A collaborative effort from Nanjing University of Aeronautics and Astronautics, along with international partners, has yielded a study (DOI: 10.1002/msd2.12101) published in the International Journal of Mechanical System Dynamics on March 11, 2024. The research introduces a pioneering bidirectional energy-controlled piezoelectric shunt damping technology that promises to transform the field of vibration control.

The study's centerpiece is a flyback transformer-based switching circuit that dynamically interacts with piezoelectric elements, either extracting or injecting energy. This dual functionality allows for precise vibration attenuation, with experimental results corroborating theoretical models. The system demonstrated an adjustable attenuation range from -5 to -25 dB and a power consumption spectrum from -13 to 25 mW, underscoring its potential for self-sustaining operation and its suitability for applications with limited power availability.

Dr. Yipeng Wu, a lead researcher and Associate Professor at Nanjing University of Aeronautics and Astronautics, remarked, "This technology is a game-changer, offering superior vibration attenuation without the dependency on external power. It enhances system performance, introduces new possibilities for sustainability, and points the way to autonomous vibration control solutions."

The potential applications of this technology are expansive, with the aerospace, automotive, and industrial sectors set to benefit from lighter, more efficient, and cost-effective systems. The capacity to harvest energy from vibrations could also be pivotal for powering remote sensors and electronics, thereby bolstering the advancement of smart structures and IoT. This innovation could mark a pivotal shift towards self-reliant and intelligent mechanical systems.

DOI

10.1002/msd2.12101

Original Source URL

<https://doi.org/10.1002/msd2.12101>

Funding information

Financial support from the National Key Research and Development Program of China through grant number 2021YFB3400100 and the National Natural Science Foundation of China through grant numbers 52241103 & U2241261 is highly appreciated. Moreover, this research work was also supported by the Fund of Prospective Layout of Scientific Research for Nanjing University of Aeronautics and Astronautics (NUAA).

Lucy Wang

BioDesign Research

[email us here](#)

This press release can be viewed online at: <https://www.einpresswire.com/article/719049981>

EIN Presswire's priority is source transparency. We do not allow opaque clients, and our editors try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.

© 1995-2024 Newsmatics Inc. All Right Reserved.