

Additively Manufactured Piezoelectric Pickup for Acoustic Guitar and Other Sound Sources

Conformable, frequency-tuned piezo pickup customizable to instrument geometry for improved sound capture.

Researchers at Purdue University have additively manufactured a piezoelectric sensor for detecting acoustic instrument vibration. Standard acoustic sensors primarily rely on planar sensors, which are significantly limited in size and shape. This newly developed piezoelectric sensor is conformable to non-planar surfaces and can tune the pickup to individual frequencies. As such, this innovation will be of great value to acoustic instrument producers and structural modeling companies who frequently work with instruments varying in size and sound frequency.

Unlike existing acoustic sensors, the piezoelectric sensor developed by researchers at Purdue University can fabricate any 3D shape, which promotes different frequency ranges. The sensor can be disposed on an instrument in nearly any position, and this placement can be further optimized to enhance system sensitivity.

Technology Validation:

The researchers completed a frequency response analysis (FRA) on the 3D printed sensor to determine that the sensor yielded a response under oscillatory excitation. A mechanical transfer function test was performed with the 3D printed sensor for visualizing modes of a guitar body. String tests were then completed for each string (low E, A, D, G, B, and high E) to test for their harmonics.

Advantages:

- Customizable in size and shape
- Can be fabricated to any 3D shape

Technology ID

2024-NAWR-70665

Category

Materials Science &
Nanotechnology/Advanced
Functional Materials
Digital Health & Medtech/AI in
Medical Imaging

Further information

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-Versatility of sensor enables enhanced system sensitivity via placement optimization

-Tunes pickup to individual frequencies

Applications:

-Acoustic instruments, such as guitars, violins, and other structures with embedded sensing

TRL: 3

Intellectual Property:

Provisional-Patent, 2024-04-25, United States

Provisional-Patent, 2025-05-02, United States

Keywords: Additive Manufacturing, Materials and Manufacturing, Piezoelectric sensors, sensor systems, sound frequency pickup