Research Experiences for Teachers and Young Scholars in Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

Fabricating and Assembling Piezoelectric Compliant Mechanisms

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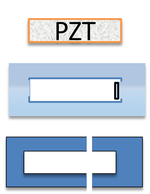
Overview

Energy Harvesting From Piezoelectric material (PZT) is an important part of the ASSIST initiative. It's a possible way to power the entire device. The energy is created when the PZT is bent or strained. One way to create that strain is to add PZT to the compliant mechanism. The compliant mechanism would need to resonate at a low frequency so as to work with human motion. The compliant mechanism is designed to be a wearable device that would be located on the body in a place where movement occurs more often such as a wrist or finger joint.

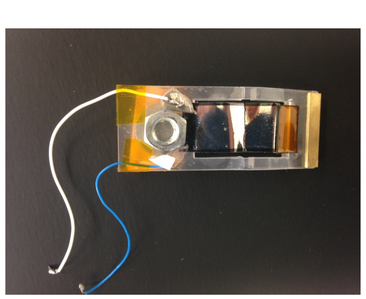
Compliant Mechanism Design 1 Starting Point

Compliant Mechanism Design 1

This is the design that we started the research experience with. The initial design is layered with 2 acrylic pieces, a flexure piece and piezoelectric material. The flexure piece is on top of the two rigid parts acting as a hinge.



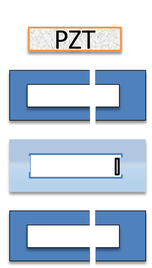
The PCM is tested with repeated movement to generate and harvest energy.
This design did produce energy but needs improvement to make it more durable.

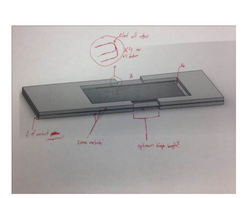


SolidWorks

The initial design showed results in harvesting energy through movement but the durability of the compliant mechanism design could be improved. The flexure hinge was separating from the rigid pieces.

Engineering department meetings took place weekly while a new design was created. To make the flexure hinge more durable, it was place between two sets of rigid pieces.

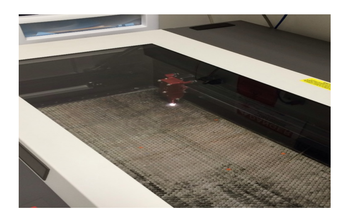




Compliant Mechanism Design 2

3-D Laser Printer

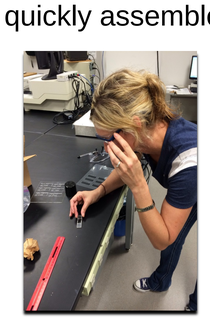
Once the new design is tested in SolidWorks, the file is saved and taken to the3-D laser printer.

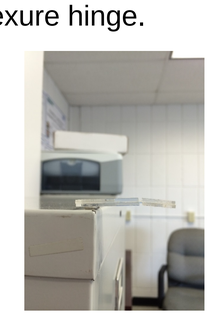


The printer cuts out the rigid pieces from acrylic material and the flexure hinge piece from a lightweight material.

Compliant Mechanism Design 2 Assembly

Spray glue and quickly assemble rigid pieces to flexure hinge.





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