STEV: Stretchable Triboelectric E-skin enabled Proprioceptive Vibrational Sensing for Soft Robot

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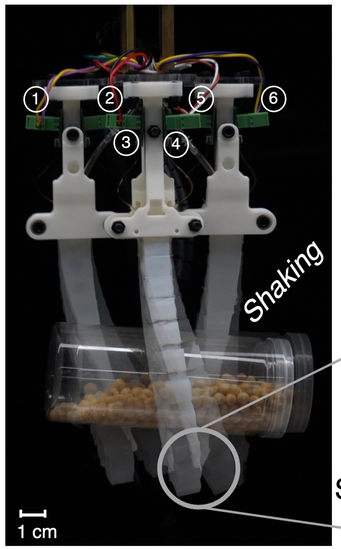
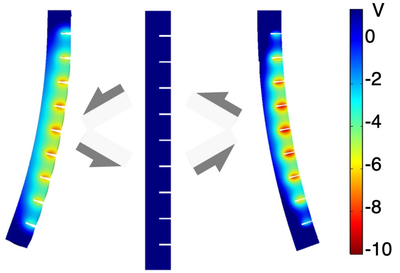
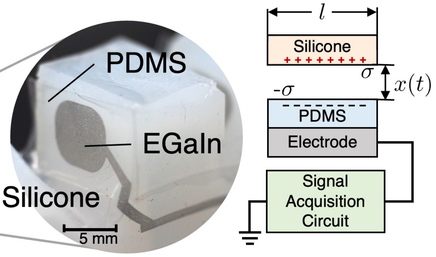
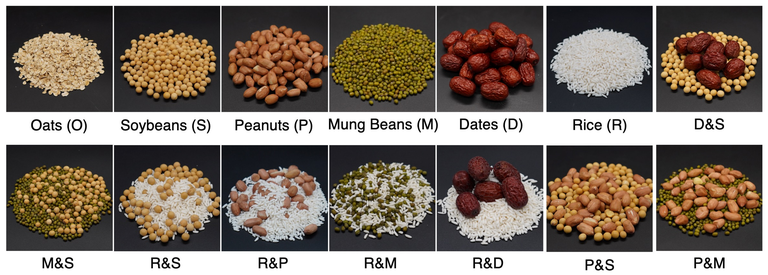
Abstract





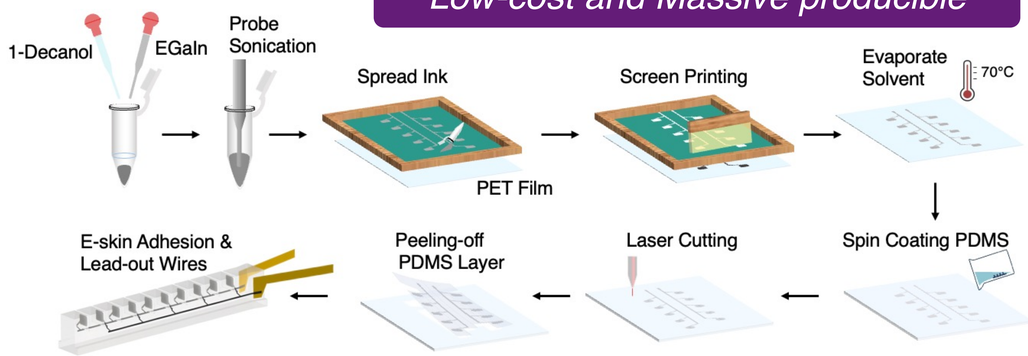




Vibration perception is essential for robotic sensing and dynamic control. We proposed a liquid metal-based stretchable e-skin that enables soft robot proprioceptive vibration sensing. The e-skin is in 0.1mm ultrathin thickness, ensuring its negligible influence on the overall stiffness of the soft robot. The vibration sensing the e-skin is enabled by the principle of self-powered triboelectric nanogenerator. We demonstrate 97.3% accuracy on classify 15 grains in a bottle by shaking them.

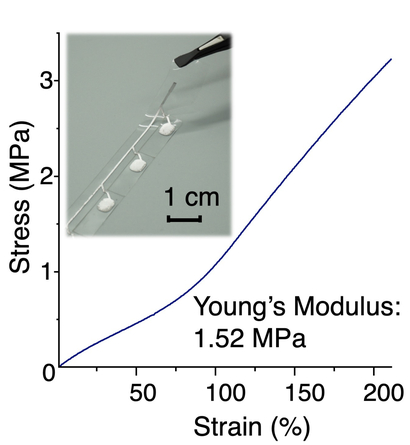
Fabrication

Low-cost and Massive producible

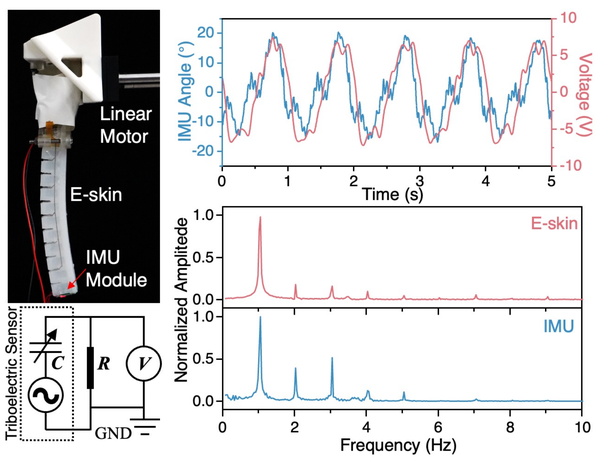


Characterization

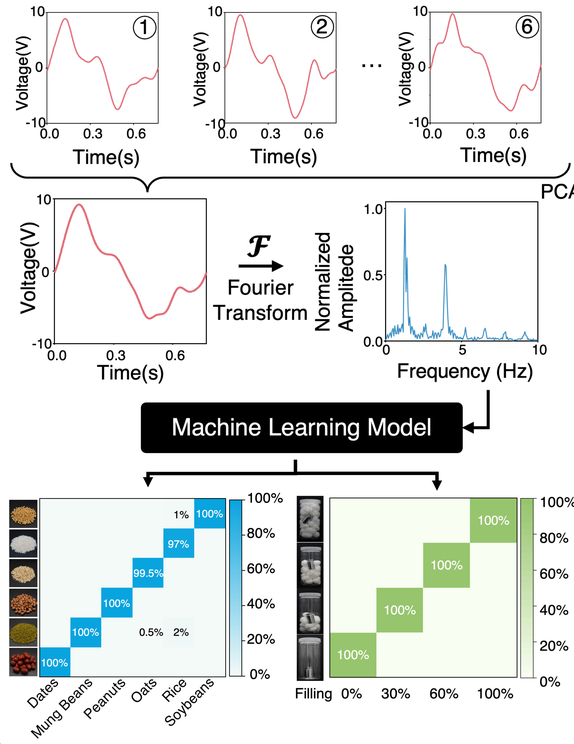
200% stretchable



Scan for Video Demo



Sensing by shaking



Conclusion

Our experiment shows that a soft gripper with the e-skin can accurately distinguish the grain category and the packaging quality by shaking the gripped bottle. The proposed soft robotic proprioceptive vibration sensing approach may help soft robots to have a more comprehensive awareness of their self-state and may inspire further research on soft robots.

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