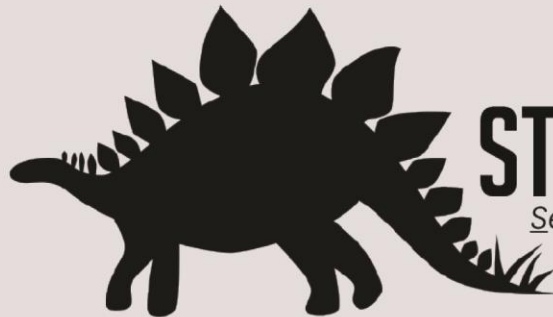


3D Printed MEMS Actuators



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3D Printed MEMS Actuators

What are 3D Printed MEMS Actuators?

Researchers at MIT have created a new way of making a 3D printed mechanism to determine how force is being put on an object. These objects are printed on a single print bed, allowing for rapid prototyping. Objects like joysticks, switches or handheld controllers, “interactive input devices,” are being designed. The inner cells stretch or compress changing the capacitance of the opposite electrodes. Using capacitive sensing, these variations can be quantified and used to analyze the extent and direction of the utilized forces.

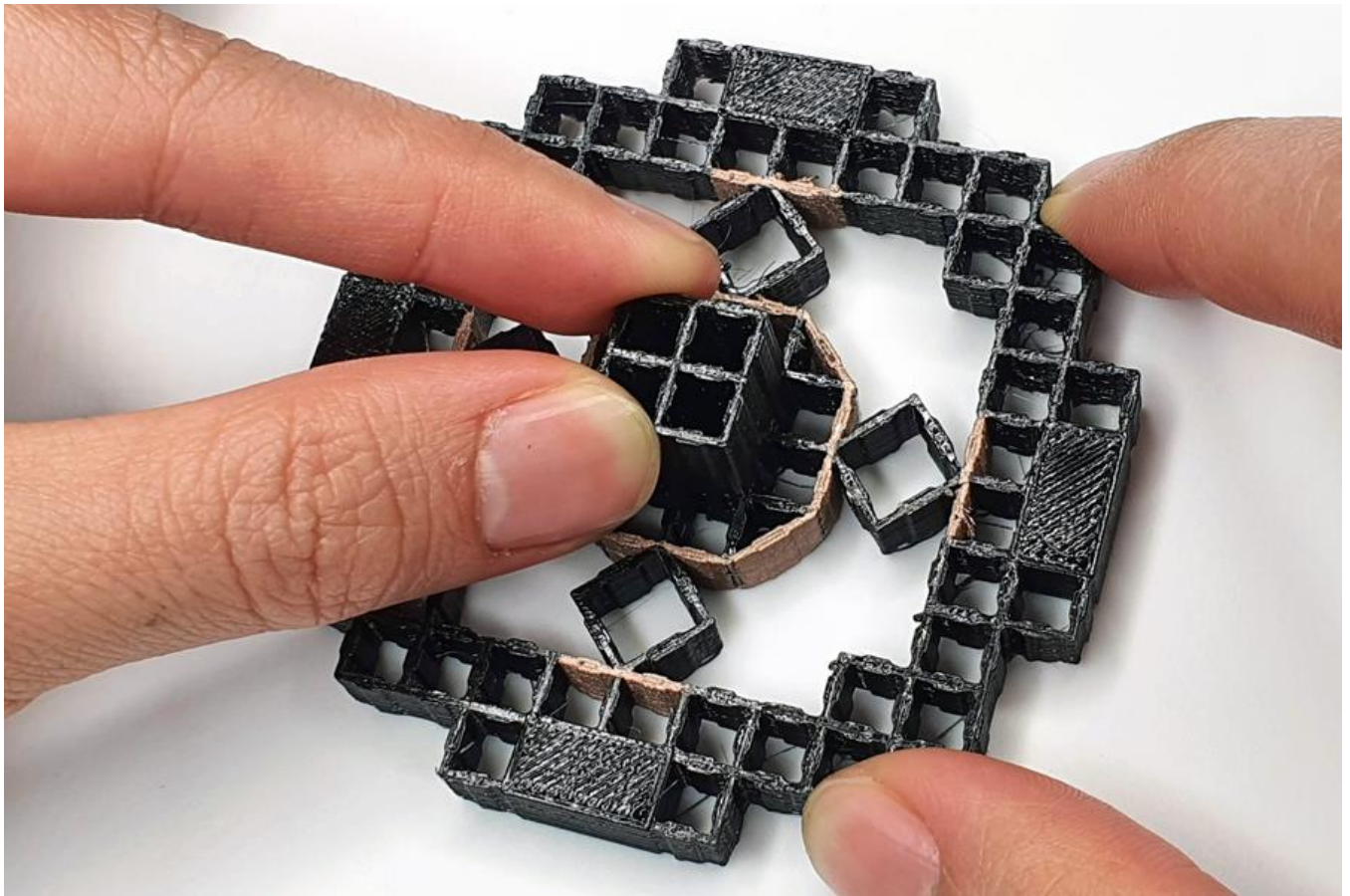


Figure 1: Researchers from MIT have developed a method to integrate sensing capabilities into 3D printable structures comprised of repetitive cells, which enables designers to rapidly prototype interactive input devices, MIT News Office, <https://news.mit.edu/2021/3d-printed-objects-sense-interaction-0914>, Licensed under [CC BY-NC-ND 3.0](https://creativecommons.org/licenses/by-nc-nd/3.0/)

What are the possibilities?

Researchers are incorporating integrated electrodes into the objects made from metamaterials, which are “materials divided into a grid of repeating cells.” These metamaterials can utilize various mechanical functionalities. These researchers are combining sensing capabilities with the material form of the devices.

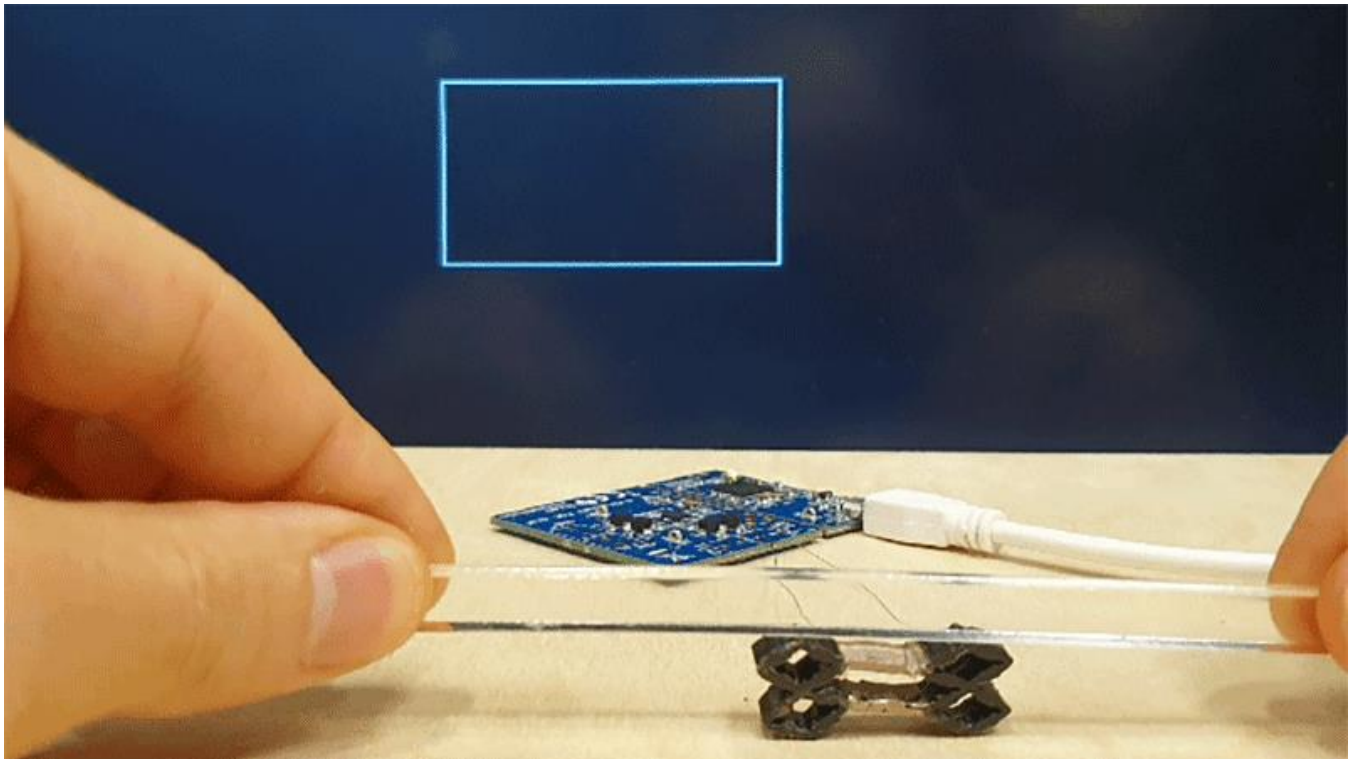


Figure 2: The copper-colored capacitive sensing electrodes integrated into this 3D printed metamaterial mechanism are used to sense compression, MIT News Office, <https://news.mit.edu/2021/3d-printed-objects-sense-interaction-0914>, Licensed under [CC BY-NC-ND 3.0](https://creativecommons.org/licenses/by-nc-nd/3.0/)

Applications in Additive Manufacturing/3D Printing

These are 3D printed sensors using copper metamaterials for sensing. The 3D printer they are using has more than one nozzle and they either extrude conductive or non-conductive filament.



Current Challenges & Weaknesses

The multimaterial printing requires tuning because of the different subtleties of the non-conductive and conductive filaments. The speed, temperature of the print must be controlled.

Market Overview & Technology Game Changers

Utilizing software and these sensors, wearables have the capacity to change how they respond to the user and their movements. Furniture in your house could have these sensors embedded in them and respond to your movements or habits.

Time to Technical Confirmation & Time to Market Introduction

This research was presented in October of this year to the Association for Computing Machinery Symposium on User Interface Software and Technology. More research needs to be done, to fine tune the operating parameters and programming to utilize the signals from these sensors.

References

Engineers create 3D-printed objects that sense how a user is interacting with them. (2021, September 14). MIT News | Massachusetts Institute of Technology.
<https://news.mit.edu/2021/3d-printed-objects-sense-interaction-0914>