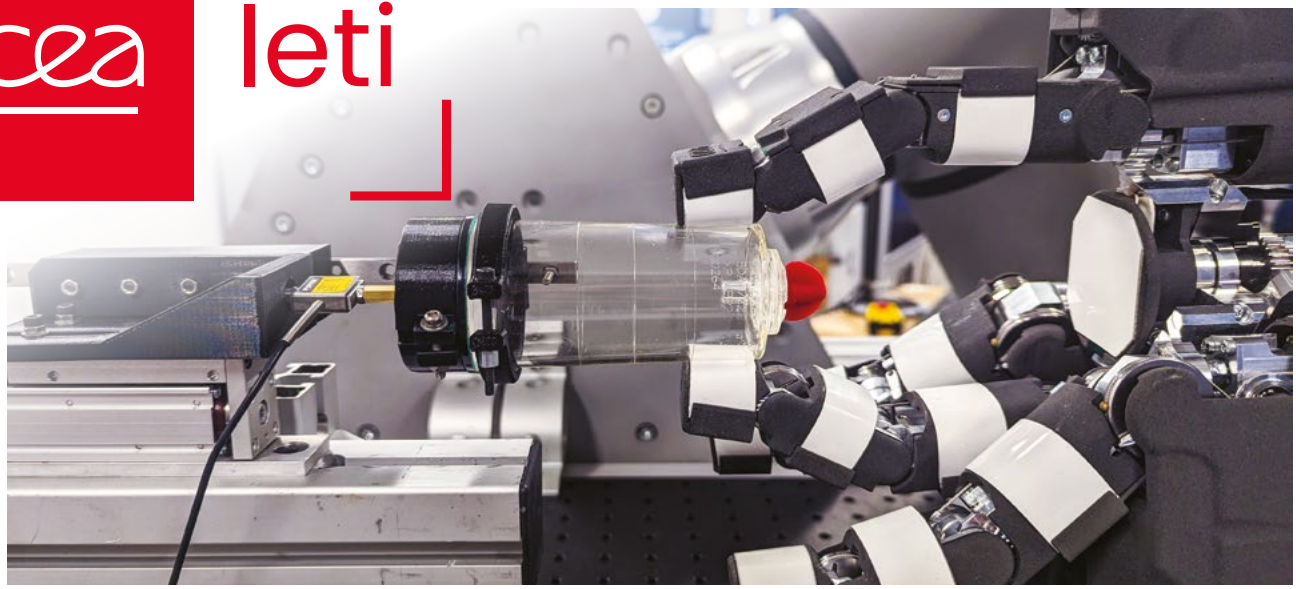

TactilePatch

Artificial touch technology that gives robots a human-like sense of touch

What it is

TactilePatch is a thin, flexible, conformable multi-touch sensing device developed by CEA-Leti to give robotic grippers enhanced perception. It measures the spatial distribution of the pressure between the sensing surface and object being manipulated to perceive the position and the orientation of the object in the gripper. It also measures any high-frequency tactile events, such as vibration, to detect potential slipping. This information is processed and sent to the controller to adjust grasping posture and force as needed.

It is made using low-cost printed electronics technologies that facilitate custom designs.

What it can do

In research conducted for the EU TraceBot project with CEA-List (tracebot.eu), the sensing device makes possible a new generation of smart dexterous robots for the traceable robotic handling of sterile medical products. It can also add value to applications in:

- **Entertainment**: originally developed in 2017 for a smart digital pen
- **Sports and paramedical**: smart shoe soles or footprint characterization
- **Retail**: smart supermarket shelf surfaces to track inventory
- **Medical**: smart hospital bed surfaces to prevent bedsores
- **Industry**: mechanical deformation measurement for predictive maintenance
- Any other application that requires thin, low-cost, sensitive surface sensing

What makes it unique

This very thin multi-layered sensor is based on CEA-Liten printed technologies for increased design flexibility and leverages CEA-Leti expertise in sensor system design, mecatronics and signal processing. One of its layers measures continuous pressure over the entire surface, imaging the two-dimensional distribution of pressure and spatially locating the points of contact with submillimeter precision. Another layer measures vibrations generated by high-frequency events or friction phenomena.

Near-sensor compute capabilities can pre-process information from the multi-touch surface. Instead of sending raw data to the robot controller, a preliminary interpretation (like "the object is slipping") can be sent so that the controller tightens the robot's grip.

What's next

Further research and development efforts will focus on:

- Improving the pressure-sensitive material
- Adding new sensitive layers
- Developing new near-sensor algorithms

At a glance

- Thin (<0.6 mm) conformable sensitive matrix
- 100 fps sensing speed
- Sub-millimeter contact point location
- Slip detection with 8.5 ms latency

▲ *Robotic phalanx equipped with TactilePatch*

Publications

Spectro-Temporal Recurrent Neural Network for Robotic Slip Detection with Piezoelectric Tactile Sensor, Théo Ayral, Saifeddine Aloui, and Mathieu Grossard, 2023, IEEE/ASME AIM 2023.

Interested in this technology?

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