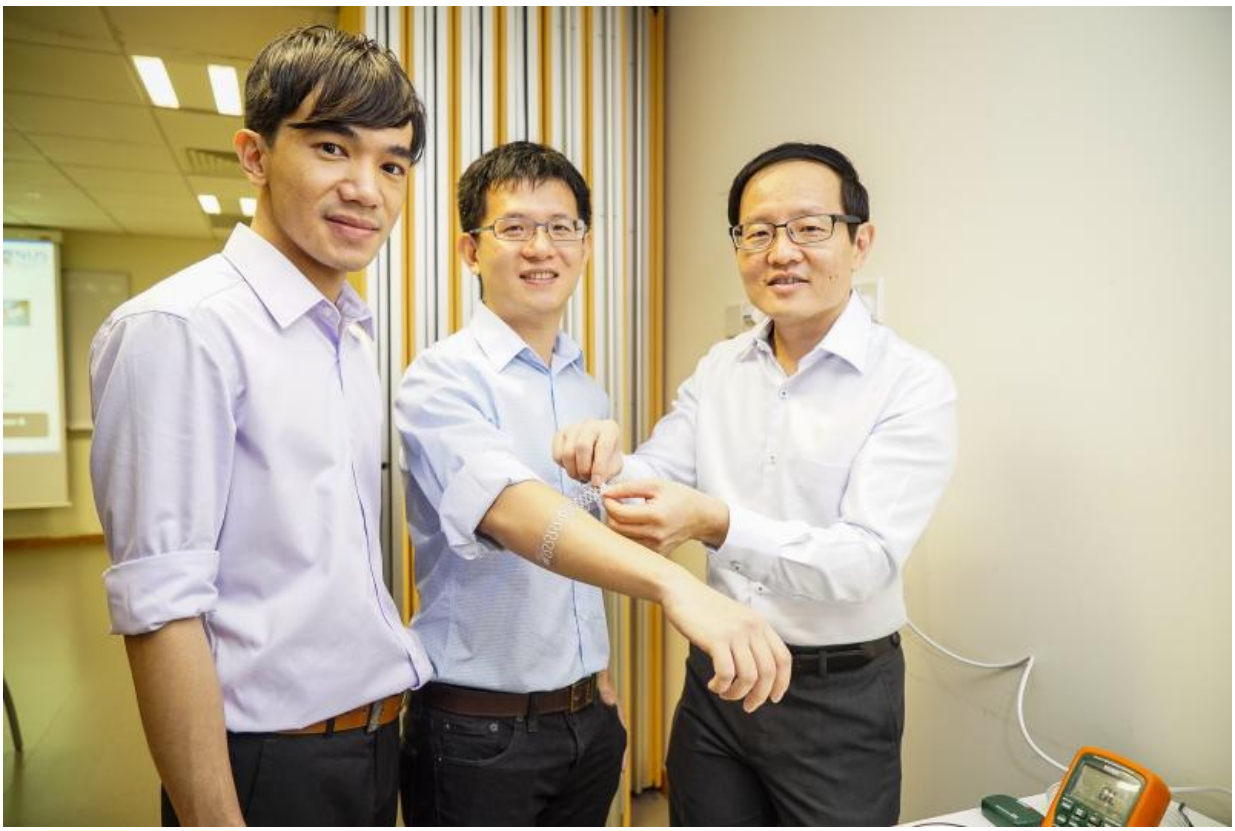
Highly flexible and wearable tactile sensor for robotics, electronics and healthcare applications

September 23 2015



A team of scientists from the NUS Faculty of Engineering has developed a wearable liquid-based microfluidic tactile sensor that is small, thin, highly flexible and durable. Credit: National University of Singapore

A team of scientists from the National University of Singapore (NUS) Faculty of Engineering has developed a wearable liquid-based microfluidic tactile sensor that is small, thin, highly flexible and durable. Simple and cost-effective to produce, this novel device is very suitable for applications such as soft robotics, wearable consumer electronics, smart medical prosthetic devices, as well as real-time healthcare monitoring.

Tactile sensors are data acquisition devices that detect and measure a diversity of properties arising from physical interaction and translate the information acquired to be analysed by an interconnected intelligent system. Conventional tactile sensors that are available today are typically rigid and in solid-state form, restricting various natural body movements when used and may also be subjected to plastic deformation and failure when pressure is exerted, resulting in compromises in conformability, durability and overall robustness.

Addressing the limitations of existing tactile sensors, a team of researchers led by Professor Lim Chwee Teck from NUS' Department of Biomedical Engineering achieves a significant technological breakthrough by adopting a liquid-based pressure sensing method in the design of such sensors.

Novel liquid-based pressure sensing element

The newly developed microfluidic tactile sensor is fabricated on a flexible substrate like silicone rubber, and uses non-corrosive, non-toxic 2D nanomaterial suspension in liquid form, such as graphene oxide, as the pressure sensing element to recognise force-induced changes.

The NUS team has put the device through rigorous tests and also subjected it to various strenuous deformations, such as pressing, bending or stretching, to validate the robustness and versatility of its invention. In

fact, despite having placed the device under extreme abusive mechanical force, such as running a car tyre over it, the electrical output was highly uniformed and there was no damage to the functionality of the device.

From idea to market

The team's invention will further advance the applications of tactile sensors, which are already increasingly utilised for monitoring critical parameters in biomedical applications, especially for those that may come in contact with human skin or where human movement is highly versatile.

"This liquid-based microfluidic tactile sensor, which is the first of its kind, addresses an existing gap in the market. Being thin and flexible, the sensor gives a better fit when monitoring natural body movements. Its small size, durability and ease of production further differentiate this novel device from conventional tactile sensors. With the rapid advancement of healthcare and biomedical technologies as well as consumer electronics, we are optimistic about new possibilities to commercialise our invention," said Prof Lim.

The NUS team has already filed a patent for its creation and is also keen to explore licensing partnerships in commercial development. Earlier this year, it participated in InnovFest unBound, Asia's premier technology transfer event organised by NUS Enterprise aimed at showcasing Asian innovation to a global audience and taking technology out to the market.

Provided by National University of Singapore

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