

Smart sensors allow you to control robots with just a wave of your hand

27 February 2024

Scientists have developed an innovative solution to empower individuals with disabilities or mobility impairments to control robotic prostheses, machinery and wheelchairs.

Waving your hand at a robot and controlling it to pick up an item may sound like a Jedi using the Force in a Star Wars movie, but this has become a reality at Nanyang Technological University, Singapore (NTU Singapore).

NTU Singapore has set up a high-tech pilot laboratory capable of rapid prototyping ultrathin and stretchable electronics that detect bioelectric signals from skin, muscles and organs, and transmit these signals to control robots or other electronic devices.

When these smart sensors are attached to limbs or the head, they empower individuals with limb disabilities or mobility impairments by providing an accessible method to control robotic prostheses, machinery, and motorised wheelchairs using alternative muscle movements and bio-signals.

According to the UN, about 15 percent of the world's population is living with some form of disability.

NTU researchers developed these innovative soft electronics devices by combining in-house designed soft materials and processes with commercially available hardware components.

This hybrid combination allows the NTU team to integrate many types of sensors on the market, such as wireless connectivity, accelerometer, temperature sensing, and monitoring vitals like heart rate, blood pressure, oxygen levels, and more.

The resulting sensors, encased in a gel-like skin, are soft, flexible and stretchable, similar to silicon bandages used in healthcare. These sensors adhere to the skin, enable joint movement, and come in various sizes and thicknesses, ranging from centimetres to sub-microns – thinner than the width of a human hair (0.01mm).

"We aim to address some of humanity's most pressing challenges, from climate change to healthcare advancements. My goal is to establish a new centre of excellence for soft electronics, building a team of industry experts and commercial partners to swiftly bring these technologies to market," NTU Professor Chen Xiaodong, who led the study, explained.

To kickstart the scaling-up process, Professor Chen has established the pilot laboratory which aims to co-develop and produce soft electronic devices with industry partners, including Small and Medium Enterprises (SMEs).

Through joint projects, Professor Chen hopes to establish industry standards that will facilitate the mass production of soft electronics in the future and develop the necessary expertise for this emerging industry.



Image: NTU Singapore