Wearable skin tech from the University of Tokyo’s School of Engineering

The day is fast approaching when science fiction wonders like self-driving cars and robots that tend to our every need become commonplace.

When it comes to creating robots capable of interacting with people in such sophisticated ways, one key will be digitising human senses. Humans gather a huge amount of information about their environment constantly and in rich detail, all without even thinking about it. So how well can robots mimic this with their own sensors?

Under my skin

The answer is they are getting better all the time. Thanks to progress in the development of tactile sensor technology, high-performance robots will soon be able to handle many nursing-care tasks, for example. Imagine a robot that can move an elderly patient from a bed to a wheelchair. If the patient shifts slightly, the robot stops and asks, “Are you OK?”

Doctors may be just a few years away from tracking your vital signs via electronic skin worn on the body.

In one recent breakthrough, researchers led by Takao Someya, a professor at the University of Tokyo’s School of Engineering, developed a type of electronic skin. “If there is only a tiny amount of fluid, such as sweat, it sticks. Like this,”

Someya explained, placing a bit of the film on the back of his hand.

Researchers in Japan say they have developed an ultra-thin, lightweight e-skin that is stuck to the chest area using water spray and can be worn for a week at a time.

The technology was developed by Takao Someya, a professor at the University of Tokyo's Graduate School of Engineering. It has yet to undergo clinical trials, but Someya says he has started working with partners to develop manufacturing processes.

Made from a flexible material — polyvinyl alcohol — with a layer of gold, the e-skin is a wearable sensor that can pick up signals such as heartbeat and electrical impulses from muscle movement.

A small wireless transmitter strapped to the chest will send heartbeat data to a nearby smartphone or laptop, or to the cloud, allowing a doctor to monitor it remotely.

"E-skin is the next generation of wearables," Someya tells. "Today's mainstream wearables are in the form of smart watches and glasses, which are bulky. In contrast, e-skin is thin, lightweight, stretchable and durable."

Designed for older people

His latest e-skin was designed with Japan's rapidly aging population in mind. For remote health care to be most effective, Someya says it is important to monitor older people's health for long periods with high precision. Because of its durability, he says the e-skin is a powerful tool for monitoring chronic diseases like diabetes, as well as heart failure. It may also help detect early signs of illness. Someya is also developing an LED display, in partnership with Dai Nippon Printing (DNPCF), to be worn on the back of the user's hand. Designed for older people or those with who have difficulty using a smartphone, it will show heartbeat data transmitted by the e-skin in the form of large and easily understood graphics. It can also display simple emojis — including a heart and a rainbow — sent by friends and relatives from a smartphone, to help older people feel connected to their loved ones.

The LED display developed by the Takao Someya Group at the University of Tokyo.

The e-skin market was worth an estimated $4.5B in 2019, according to a report by Grand View Research. Because e-skin is highly flexible, sometimes with the ability to repair itself, it has the potential for use in robotics, prosthetics and health care. Someya and his team started developing e-skin for robots in the early 2000s. And other

research from their lab is being developed for the marketplace through two spin-off companies — Signtle, for medical applications, and Xenoma, for smart clothing.

E-skin for athletes

Xenoma has integrated e-skin into pyjamas that can monitor temperature in bed, and sportswear for fitness monitoring.

The startup has partnered with Taekwondo practitioner Mana Umehara to see how e-skin can benefit high-performance athletes. Its technology tracks her body movements and sends the information to a laptop, where software translates it into data visualisations. This kind of movement tracking normally requires multiple cameras, Someya says. During the pandemic, Umehara was unable to train with her coach but she could send data from the e-skin clothing, so her performance could be monitored remotely.

“Now I can get more precise instructions with numbers for how many centimetres to extend [my movement] or how powerful it should be,”

Someya says 5G will have a “tremendous impact” on wearable technologies, including e-skin, by increasing the amount of data that can be transmitted wirelessly at high speed, giving users access to their health information in real-time.

“The ultimate goal of e-skin is to monitor all the different types of human information easily, anywhere and anytime, without disturbing daily activities,” he says.

This article was originally published on ParlayMe.

Article by JANUARY BARNES