Smart clothing of the future will automatically adjust itself according to the wearer's actual needs

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VTT Technical Research Centre of Finland Ltd has developed new technology that takes care of the thermal, moisture and flow-technical behaviour of smart clothing. The temperature of smart clothing, for example, is automatically adjusted according to the wearer's individual needs. The technology is also suited to demanding conditions such as hospitals and sports.

In its Smart Clothing project, VTT developed a technology that can be utilised in smart fabrics and clothing, able to calculate whether the wearer needs to be cooled or warmed based on initial data measured from the person and the environment. Furthermore, this technology is able to determine the needed warming or cooling power so that the thermal sensation of the person wearing the smart clothing remains optimal in varying conditions. The smart fabrics and clothing currently on the market faces the challenge of adjusting the individual temperature of a human body rapidly and automatically according to the wearer's actual need.

The technology is based on the Human Thermal Model calculation tool developed by VTT, enabling the calculation of a person's individual thermal sensation from the prevailing conditions. Individual thermal sensations are ultimately caused by differences in body composition. There are statistically significant differences between men and women, for example, because men have on average 5 to 15 kg more muscle mass

than women.

The wearable smart technology developed by VTT can be applied extensively even in demanding conditions, such as hospitals, nursing homes, and different consumer groups such as police officers, firemen, soldiers, outdoor workers, athletes and small babies.

In hospitals, the technology enables new solutions and makes individual treatment more effective. Wearable technology helps surgeons if they get too hot during an operation. The clothing is constantly calculating and adjusting how much the surgeon's body needs to be cooled. "Hospital patients have been asked about their most unpleasant experience, and the most common answer is feeling cold - pain comes only second", says Principal Scientist Pekka Tuomaala from VTT. For example, patients often feel cold after surgery. Body temperature can be individually adjusted, when a smart blanket identifies the person, measures the ambient temperature and adjusts the blanket's temperature to meet the patient's actual needs.

The Taiwan Textile Research Institute has already tested VTT's methods in designing clothing for long-distance runners in different temperatures. The technology can also be utilised when developing solutions for the individual recovery after a sporting event.

"VTT is now looking for companies to join in the development and productisation of this technology for the market. We also have extensive technological know-how, for example in fibre technology of the future, functional clothing solutions such as microfluidics, and detectors, sensors and the Internet of Things," Tuomaala says.

Provided by VTT Technical Research Centre of Finland