【International Leading Research】

Full-body electronic skins for *digital me*

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Project Information	Project Number : 22K21343 Project Period (FY) : 2022-2028 Keywords : Wearables, Biological information, Feedback, Behavioral change, e-skin, International comparison

Purpose and Significance of the Research

●Research background

With the advent of wearable sensors, various biological signals can be easily measured. The technological trends of wearables can be summarized as the following three points. First, there is a shift from short-term measurements to long-term continuous observations during activities in daily life. Second, there is a shift from single-parameter measurements to multimodal measurements. The third trend is the utilization of digital vital signs. The emphasis of research is gradually shifting to how to utilize the acquired data to effectively change the behaviors of people.

●Research purpose and significance

The objectives of this research are to develop the next generation sensing and feedback systems for monitoring human movement, human physiology, and human health, and to provide appropriate feedback to stimulate behavioral changes (Figure 1). A full-body e-skin is a clothing-type information platform for complete personal customization, in which all of the electronic elements such as sensors and elastic wiring can be freely positioned according to the shape of the human body. The e-skins can measure multiple biological information such as motor function, cardiopulmonary function, body temperature, and contact pressure with high accuracy for a long period of time during daily activities and offer excellent usability by being simply worn without any discomfort. It also has the function of providing physical stimulations by vibration and electricity. Changes in human behaviors and biosignals can be tracked for a long period of time while providing appropriate feedback based on the acquired information.

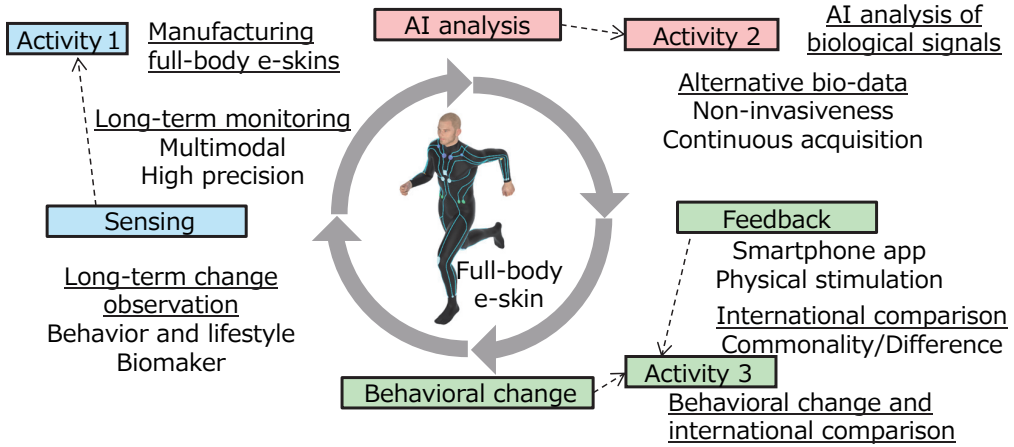
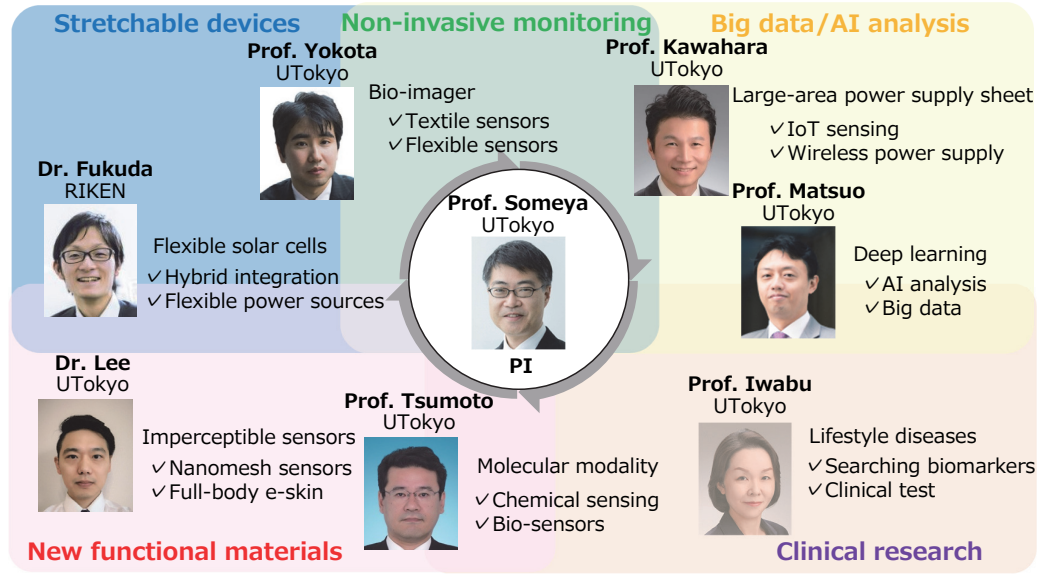


Figure 1. The overview of this research. Full-body e-skins can quantitatively visualize how people's behavior changes over a long period of time.

Organization of the Project Team

●Internal collaborative team



●International collaborators

Prof. Aaron Voon-Yew Thean
National University of Singapore
Ultra-low power chips

Prof. David Franklin
Technical University of Munich
Kinematics and cognitive science

Prof. Xenofon Strakosas
Linköping University
Flexible chemical sensor

Plan for Fostering Early-career Researchers

1. Effective resource allocation

We will establish a system that can manage the valuable research resources. We will not only increase the operating rate of the equipment, but also demonstrate its effectiveness in promoting cooperation. We will accelerate the scale of research by promptly and flexibly budgeting for issues for which positive prospects have been obtained through quick trials using common facilities.

2. Formation of the dream team

We will make the best effort to maintain and expand this network in the future so that human resources exchanges might be promoted with global top research institutes either in industry or academia. It is important to form a diverse team consisting of researchers with different expertise to produce synergetic effects by stimulating each other.

3. Environment to encourage a challenge

No matter how many talented people are gathered or how much resources are invested efficiently, good academic results cannot be produced without respect for original research. As the first step, a change of mindset is required for young people not to conduct the research that other people are doing. We will ask about the originality, encourage young researchers, delegate much flexibility to them, and take every possible measure to minimize the risk for them.

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