Title of Project : Understanding human recognition of material properties for innovation in SHITSUKAN science and technology

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Research Project Number : 15H05914   Researcher Number : 20396162

【Purpose of the Research Project】

Recognition of SHITSUKAN (see Keywords) is a marvelous ability of human's brain to read out the nature of objects. We obtain indispensable information for our living from SHITSUKAN sensed through multiple modalities. SHITSUKAN plays important roles not only in perception, but also in value-based behavior selection and body motor control. How our brain reads out SHITSUKAN from complex high-dimensional source information embedded in sensory signals is a hard but critical research question for scientific understanding of human sensory processing and advancement of information technologies. Our previous research project, "Brain and Information Science on SHITSUKAN (FY2010-2014)", has been successfully developing an interdisciplinary SHITSUKAN research in Japan. To continue and expand this world-leading activity, our new project is aiming at revealing the computational principle and neural mechanisms of human recognition of a wide range of SHITSUKAN in the real world, and at developing innovative technologies and applicable engineering scheme, through tight cooperation among information engineering, psychophysics and neuroscience.

【Content of the Research Project】

We will adopt two approaches for scientific understanding of SHITSUKAN recognition. Research groups in A01 will mainly adopt hypothesis-driven approaches to understand computational principles and neural mechanisms of recognition of a variety of SHITSUKAN, including surface properties given by complex optical processes, acoustic atmosphere, and emotion-evoking stimuli. Research groups in B01, on the other hand, will mainly adopt data-driven approaches. Integrating machine learning techniques (e.g., deep learning) and advanced cortical information decoding, we will develop a novel high-throughput scheme of SHITSUKAN research. Finally, research groups in C01 will develop cutting-edge SHITSUKAN technologies in haptics, computer graphics, digital fabrication and appearance control.
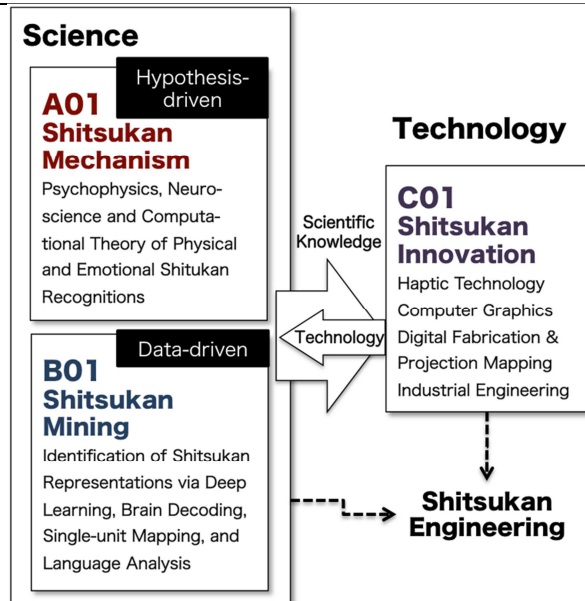

Figure 1 Area Organization

【Expected Research Achievements and Scientific Significance】

We will scientifically reveal computational principles and hierarchical cortical processing of recognition of a variety of SHITSUKAN. We will develop technologies for recognition, reproduction, edition, and control of a variety of SHITSUKAN, and eventually establish a field of SHITSUKAN engineering that can support industrial manufacturing and art.

【Key Words】

SHITSUKAN: A Japanese word that literarily means "the sense of quality." In this project, we use this term to refer to the senses of physical property (gloss, translucent), physical state (wet, dusty), material category (metal, ceramic), and subjective value (beautiful, yummy).

【Term of Project】   FY2015-2019

【Budget Allocation】 1,086,200 Thousand Yen

【Homepage Address and Other Contact Information】

http:// shitsukan.jp/ISST