Professor Hideyoshi Yanagisawa

Department of Mechanical Engineering

Acceptable course(s)

➢ Master's Degree

➢ Doctoral Degree

Research Topics

Our research areas include design engineering/science, *Kansei* (emotional) engineering and computational neuroscience. Currently, we are preliminary working on mathematical/computational principles of human cognition and behaviors (*Principia Kansei*) and their application to design issues.
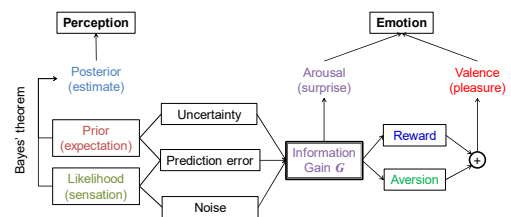
1. Principle-based modeling of human cognition and behavior for design

We have developed mathematical principles of human perceptions [1] and emotions [3] based on the free energy principle, the unified brain theory based on Bayesian inference. Expected research topics are the updating of models including human behaviors and consciousness, and their applications to human centered design.

2. Sense of agency and its application to HMS design

The sense of agency (SoA) refers to the subjective awareness that one is initiating, executing, and controlling one's own volitional actions in the world. SoA is an important factor for designing pleasure and safety in human-machine system(HMS). We have proposed a fundamental mathematical theory that predicts SoA and its conditions [2]. Based on the theory, we welcome themes to develop a computational agent model to simulate and optimize SoA in HMS.

3. Computational aesthetic design

Can computers understand and create beauty? We are currently working on developing a computational design generator that optimize aesthetic features such as novelty, complexity, and order, based on emotion models that we have developed [4]. We welcome themes for developing computational systems that produce beauty.

Articles Related to Research Topics

[1] Yanagisawa, H. (2016). A computational model of perceptual expectation effect based on neural coding principles. Sensory Studies, 31(5), 430–439.

[2] Taniyama, K., Yanagisawa, H. (2023). Free-energy model of sense of agency for human-machine interface design based on comparator model. Proceedings of the Design Society, Vol.3, 1945–1954.

[3] Yanagisawa, H., et al. (2023). Free energy model of emotional valence in dual-process perceptions. Neural Networks, 157, 422–436.

[4] Honda, S, Yanagisawa, H., Kato, T. (2022). Aesthetic shape generation system based on novelty and complexity. Journal of Engineering Design, 33(12), 1016-1035.

Lab. Web page: https://www.design.t.u-tokyo.ac.jp/people/professor/hideyoshi-yanagisawa