SS-32: Brain Engineering for Soft Behavior

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We can not discuss brain functions if they separated from body functions. For example, in the research field on embodied knowledge that analyzes the physical motion, it is necessary to acquire the knowledge from neural networks, fuzzy systems, and topological models, and to find a reciprocal relationship between brain functions and behavior, in order to analyze motion such as sports movement, dance, music performance, and ceramic art production. On the other hand, in the study of the modeling of brain functions, the mechanism of physiology and bodies characteristics such as vision motion, auditory motion, and physical motion is incorporated into the model of neural networks and hierarchical knowledge structure.

It is necessary to discuss brain engineering and soft behavior in one connected domain, when the relationship between the brain function and the body function is assumed to be a model like a signal processing structure by six-layers and protocol processing in the computer network. The main aim of this session is to introduce a new computing approach on brain and behavior. The topological models on brain functions control body and behavior. We notice that soft computing model should be an important model to analyze human behavior through brain and body. We call thus a research area " Brain Engineering for Soft Behavior."

This session treats various models to identify Brain Engineering for Soft Behavior, e.g., brain science, brain psychology, cognitive psychology, vision, learning system, reinforcement learning, motion behavior, motion analysis, and brain computer interface, relating soft computing as like fuzzy models and neural networks. These issues are germane to a wide modeling of biologically inspired models, not just to engineered learning systems and body analysis.

- Paper number 140: From electroencephalograms (EEGs) from subjects observing images of 4-legged mammal and/or fruit, and recalling their name, the authors supposed that both long shape and round shape visual stimuli are processes by Wernicke 's area, but only long shape pass through angular gyrus (AnG) before arriving at Wernicke 's area.

- Paper number 149: The authors considered that time measurement could be used as a new factor. The cerebral activation area for time is the basal ganglia, the cerebellum and right inferior parietal lobule, whereas there is no fixed opinion shown. Therefore, in this paper, they investigate brain function of time measurement using fMRI and consider whether it can be used for the BCI.

- Paper number 153: The authors analyzed the transition of the internal states of the circuit of rat hippocampal neurons cultured on a multi-electrodes-array-dish, and they analyzed transition of center of gravity and 64-dimensional feature-vectors of electrical activity patterns. Using X-means algorithm, feature vectors were classified into " pattern repertories " based on the spatial distribution of activity.

- Paper number 157: The authors proposed heuristic BCI that automatically extracts feature pattern of the brain wave specific to the certain cognitive task performed by a specific individual. In this study, they combined the heuristic BCI with the learning type fuzzy template matching (L-FTM) method. In addition, they implemented pruning that delete unsuitable rules with high compatibility degree to both of task and non-task status.

- Paper number 191: This paper investigated a robustness enhance- ment protocols for biologically-enabled machines (or bio- nanomachines) to reliably exchange information by means of molecules in the aqueous, intrabody environment. Simulation results show that the proposed protocol enhances robustness against molecule losses and in turn improves communication performance. They also reveal the impacts of forward error correction (FEC) overhead and molecule redundancy on the communication performance.

- Paper nuber 203: Untreated sleep apnea may result in higher risk for daytime drowsiness, heart conditions, high blood pressure, stroke and other health impairments. In this study, a Fuzzy Logic system with tuning was developed for classification of sleep apnea or hypopnea events during sleep for individuals at risk of sleep apnea.