

Brain mechanisms of dynamic image generation based on body schema

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【Outline of survey】

It has been suggested that the parietal cortex and hippocampus, which play an important role in embodied cognition, are involved in the dynamic operation of mental imagery in various cognitive processes, such as object recognition, language comprehension, and social communication. However, it remains unclear how the networks including these brain areas are involved in the processes of image generation, transformation, and matching. Therefore, the present study elucidates the dynamics of neural networks for the following two functions:

- (1) image generation, transformation, and matching processes in object recognition
- (2) the dynamic image generation and transformation processes on cognitive maps

We will clarify the commonalities and differences between characteristics of object recognition and cognitive map and investigate how these functions are realized based on a body schema. In addition to the experimental and modeling researches, a new technique for simultaneously recording fMRI and electroencephalographic data was developed in order to clarify the brain network dynamics.

【Expected results】

The importance of generating and transforming mental images in the acquisition of the cognitive function in the first two or three years of life is accepted. Furthermore, mental image processing plays an important role in various medical treatments for clinical psychological disorders, including hypnotic induction. Furthermore, it is noted that disturbance in the function of mental imagery is a critical factor in mental disorders, including depersonalization. Therefore, in terms of human communication and education, it is extremely important to elucidate the underlying mechanisms in the nervous system involving generation and transformation of mental images. Furthermore, our research will contribute to the fields of cognitive robotics and human-robot interaction.

【References by the principal investigator】

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- Ogawa, K., and Inui, T. (2007) Lateralization of the posterior parietal cortex for internal monitoring of self- versus externally generated movements. *Journal of Cognitive Neuroscience*, 19, 1827-1835.

【Term of project】 FY2008—2012

【Budget allocation】

162,000,000 yen (direct cost)

【Homepage address】

<http://www.cog.ist.i.kyoto-u.ac.jp/>