

Adaptive Motor Behaviors through Dynamic Interactions among the Body, Brain and Environment

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Animals behave adaptively in diverse environments. Motor control system consists of <Body> with various action outputs and sensory inputs, <Brain> as the central controller, and <Environment>. The body includes large number of sensors and actuators, and connects the brain with the environment. The interaction between the body and environment imposes some constraints on the redundant degree of freedom in the total dynamical system. Then, the body and environment are the controlled object and builds up the external dynamics to the brain. On the other hand, the body connects with the brain, which builds up the internal dynamics. Accordingly, it is essential in the motor control to self-adjust the dynamic relations among the brain, body and environment corresponding to the purpose of his/her action or movement under an infinite variety of environments. That is, in the dynamical system with the redundant degree of freedom composed of the brain, body and environment, it is the most important problem in the adaptation to environment to find some constraints from the spatiotemporal contexts and to create the internal dynamics appropriate to the forthcoming environment.

The talk will first introduce “Mobiligence (Mobile Intelligence) Project” (2005.09 – 2010.03) in Japan, where the focus is on three adaptive mechanisms, i.e. 1) Adaptation to environment, 2) Physical adaptation and 3) Social adaptation. Then, I would like to present recent research results on adaptive motor behaviors to dynamic environments.