Learning to Learn: Principles of Active On-Site Learning for General-Purpose Robots

Project manager

(selected in 2026)

NONAKA Tetsushi

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Leader's institution

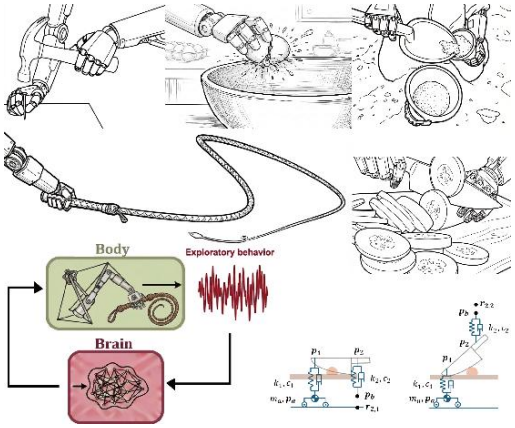
Kobe University

R&D institutions

Kobe University, The University of Tokyo

Summary of the project

Toward the realization of robots that continuously learn from the environment in which they are embedded, this project explores the principle of "learning to learn": learning to obtain information relevant to the situation by spontaneously acting on the environment. We focus on tasks in which a robot uses tools on the spot to organize purposive encounters with the environment. Drawing on the approaches of reservoir computing and embodied intelligence, we aim to open a path toward robots that actively move their bodies to tune their attention to the information that specifies affordances–the possibilities for action offered by the human environment.



Schematic images of robots learning to control their actions through active engagement with the environment

Milestone by 2028

By 2028, we will formalize the principles for generating behavior that acts on the environment in order to attune to task-relevant modes of interaction, and we will realize a robot that autonomously acquires such "self-tuning behavior" across a range of tool-use tasks.

Project structure

Project Manager (PM)
NONAKA Tetsushi (Kobe University)

R&D Item
Principles of generating embodied active self-tuning behavior



Theme 1

Structuring of information through body–environment interaction and on-site learning

PI: NAKAJIMA Kohei (The University of Tokyo)

Using a reservoir-computing framework, we build the mathematics and theory for robots that keep learning from data structured through active interaction between "this" body and "this" environment.



Theme 2

Generation of self-tuning behavior for flexible robotic tool use

PI: IIDA Fumiya (The University of Tokyo)

We generate embodied attention that moves to detect task-relevant modes of interaction in the body–environment system, aiming for flexible robot action in tool-use settings.



Theme 3

Generative principles of human self-tuning behavior

PI: NONAKA Tetsushi (Kobe University)

From the perspective of embodied cognitive science, we examine how people learn ways of acting on the environment to elicit information, and approach the generative principles of human self-tuning behavior.