Goal 3 Realization of AI robots that autonomously learn, adapt to their environment, evolve in intelligence and act alongside human beings, by 2050.

Here begins our new MIRAI

MOONSHOT RESEARCH & DEVELOPMENT PROGRAM

Neuro-Robotics Pioneering Multimodal AI-Integrated Humanoid in Agriculture

Project manager

(selected in 2026)

HAYASHIBE Mitsuhiro

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Leader's institution

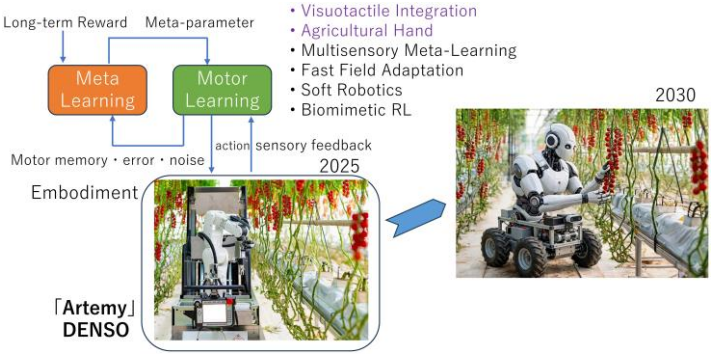
Tohoku University

R&D institutions

Tohoku University, DENSO Corporation, The University of Electro-Communications, University of Tsukuba

Summary of the project

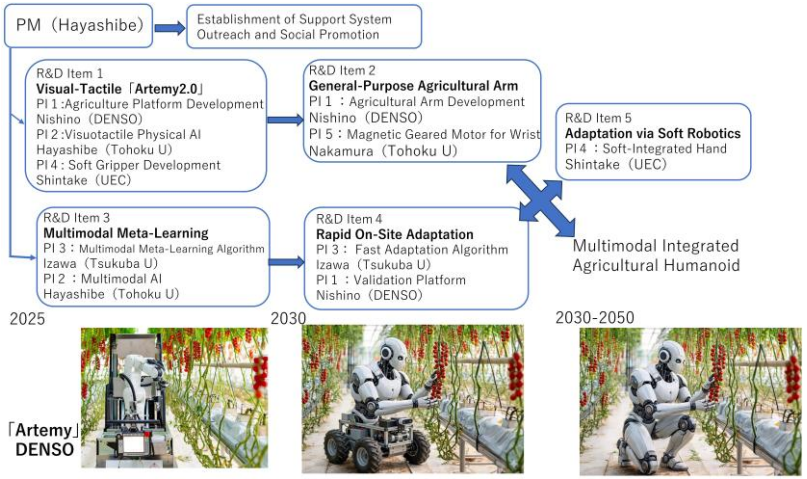
The number of agricultural workers in Japan has decreased by 55% in just 13 years. We face an unprecedented crisis that threatens the survival of agriculture as an industry. At present, delicate manipulation remains a capability that only humans can perform. To achieve AI-driven robotic automation in agriculture, key technical components—biomimetics, multimodal integration centered on visuo-tactile sensing, and meta-learning—play an indispensable role in realizing general-purpose embodied intelligence. We deploy "Artemy 2.0," created by adding tactile sensing capabilities to DENSO's agricultural robot Artemy, for early data collection. This drives the evolution into "Artemy 3.0," featuring enhanced embodied intelligence and wrist dexterity capable of executing harvesting, leaf pruning, and crop training. Furthermore, through "Agricultural Physical Foundation Model", we will realize multimodal integrated agricultural humanoids by combining rapid adaptation to unknown crops with physical adaptation driven by metacognition. By 2050, we aim to transform agriculture from "strenuous labor" into an "advanced intelligent industry" where humans and robots creatively coexist.



Milestone by 2030

We demonstrate that our proprietary agricultural AI humanoid prototype—comprising an upper-body humanoid mounted on a mobile platform—can execute and complete three or more types of practical farming tasks using tools, from start to finish, with minimal human assistance in standard greenhouse (unstructured) environments. Furthermore, we will establish an "Embodied AI Fusion Technology" that actively links a dual-arm physical body with multimodal AI—which integrates multisensory inputs (vision, touch, force sensing, etc.) in a brain-like manner—enabling rapid adaptation to unfamiliar tasks and tools with an extremely small number of learning iterations. Additionally, we will establish foundational technologies to enable intuitive communication (such as work instructions and feedback) between local farmers and robots in the field.

Project structure



*Certain illustrations in this document were created with the assistance of generative AI.

Japan Science and Technology Agency