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Top -level research and data

Realization of machine intelligence that can adapt to dynamic environments through a constructivist approach to imitation learning, motor-language integration, human-machine cooperation, multimodal active perception, etc., which integrates an artificial neural circuit model (deep learning) and a multi-degree-of-freedom robot

(Representative papers)

1. Curriculum-based Offline Network Training for Improvement of Peg-in-hole Task Performance for Holes in Concrete.Yasutomi, A.Y., Mori, H., Ogata, T. (2022) 2022 IEEE/SICE International Symposium on System Integration, SII 2022, pp. 712-717.
2. Efficient multitask learning with an embodied predictive model for door opening and entry with whole-body control.Ito, H., Yamamoto, K., Mori, H. and 1 more. (2022) Science Robotics, 7 (65).
3. Transferable Task Execution from Pixels through Deep Planning Domain Learning. Kase, K., Paxton, C., Mazhar, H. and 2 more. (2020) Proceedings - IEEE International Conference on Robotics and Automation, pp. 10459-10465.

Keyword

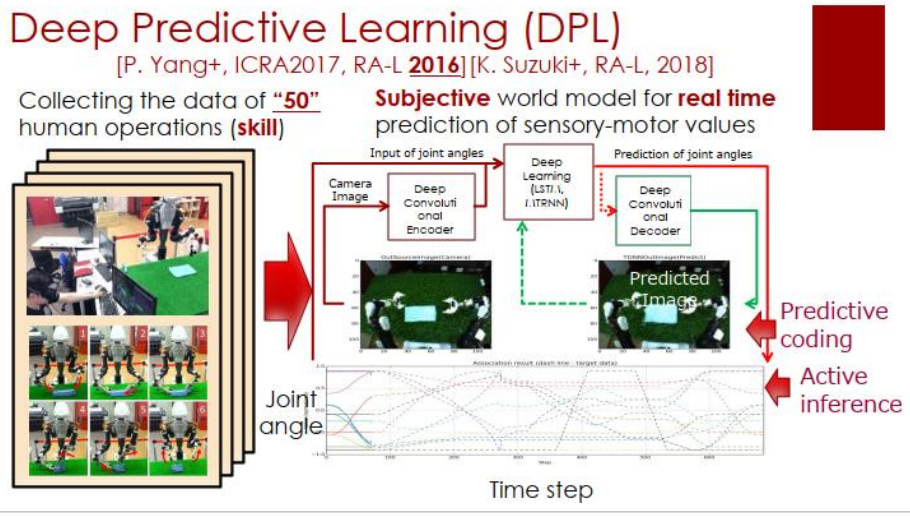
- Deep predictive learning
- Cognitive Robotics

Deployment targets (sites, materials, etc.)

Medical / nursing / long-term care sites, manufacturing industry

Features (implementation means, etc.)

A computational algorithm that can determine and execute the next action so that the difference between past learning content and reality is minimized was devised while referencing the free energy principle that allows for the interpretation of the workings of the biological brain, and the robot can flexibly perform its next task even for unlearned tasks and environments. Furthermore, with this technology, the robot can switch between multiple predictive models in real time depending on the situation, allowing it to flexibly respond to sudden changes in work content or the environment.



Associated proprietary technologies

- Deep predictive learning technology based on brain function
  "Deep predictive learning," which is an algorithm that minimizes the prediction error between reality and the model, referencing the fact that living organisms behave in a way that minimizes the difference in the real world and the brain prediction error
- Action generation technology using deep predictive learning
  Development of a method that allows the robot to acquire the desired motion without programming by simply teaching the necessary motion to the robot multiple times through remote control and then learning it on a computer for several hours
- Real-time switching technology for multiple prediction models
  The robot autonomously selects the predictive model with the highest confidence to take actions appropriate to the situation

Expected outcome/ applications

Human-coexisting robots as social infrastructure in the fields of daily life support, medical care, long-term care, welfare, public services, etc.

Associated SDGs