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Agent-embedded robots with machine intelligence

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To develop agent-embedded robots with machine intelligence (MI), the design of intelligence operating architecture (iOA) is required for sensing, thinking and action. One of the key modules in iOA is the memory module for storing temporal event sequences of tasks, the mechanism of thought for reasoning, and motion planning for execution, among others. This talk introduces how to develop agent-embedded robots with MI based on iOA, focusing on long-term memory for active knowledge acquisition and adaptive knowledge application. The long-term memory is developed as an integrated multi-memory neural model, in which episodic memory is designed using a Deep DRN (Developmental Resonance Network) neural model and semantic memory is built using the DRN-tree. Procedural memory is also designed using the context-based RNN (recurrent neural network) to store the trajectories of the manipulators along with context information and then retrieve them according to the context without conscious thinking. Robots are taught either by human demonstration or symbolic description. A behavior appropriate to the current situation is selected by the mechanism of thought learned through machine intelligence learning, while a proper task is retrieved from the Deep DRN model. The behaviors are executed safely and quickly with the motion planning algorithm. The effectiveness of the agent-embedded robot development is verified through experiments with a humanoid robot, Mybot, developed in the Robot Intelligence Technology Lab. At KAIST, Agent-embedded Mybot is introduced mainly for natural interactions including VQA (Visual Question Answering) with humans. In the last part, AI World Cup shall be introduced, which has three categories, AI Soccer, AI Commentator, and AI Reporter.

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