

*Special Issue on
Symbol Emergence in Robotics and Cognitive Systems*

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Scope:

Innovations in artificial intelligence have opened the door to the next generation of cognitive robotics. Indeed, deep learning and statistical machine learning provide a wide range of cognitive modules, e.g., image and speech recognition, localization and mapping, natural language processing, and motion planning. However, most of the achievements in artificial intelligence are made in computer and simulation environments. In contrast with the conventional artificial intelligence that is optimized with large amounts of prepared data, we, human beings, learn a variety of skills and knowledge from our own sensorimotor experiences. To develop a cognitive and developmental robot that can learn and adapt in real environments, we still have a huge amount of challenges because the world is full of uncertainty and dynamic changes. Also, emphasizing the developmental aspects

of cognition is important to understand the developmental process of human cognitive systems.

Finally, robots need to have cognitive capabilities that enable them to learn a language as a symbolic system to achieve human-like dynamic and context-dependent semantic communication in an uncertain and complex real-world environment. Therefore, language learning and understanding is also a critical research topic in robotics. To this aim, symbol emergence in robotics is a research field that regards symbolic interactions and cognitive capabilities that enable people to communicate as dynamic phenomena in contrast with conventional artificial intelligence.

Recently, many projects related to symbol emergence and cognitive dynamics in robotics and cognitive systems have been conducted. This special issue aims to not only report the latest research results in these fields, but also to further discuss the future cognitive robotics in the 2020s and beyond. Therefore, this special issue focuses on the new frontiers in cognitive robotics, emphasizing symbol emergence, cognitive development, and language learning. Papers on recent achievements in cognitive robotics are welcome. We also welcome survey and short papers that clarify current essential topics in symbol emergence in robotics, cognitive robotics, and artificial intelligence. Prospective contributed papers are invited to cover, but are not limited to, the following topics:

- Cognitive robotics
- Developmental robotics
- Symbol emergence in robotics
- Deep learning for robotics
- Neuro/brain-inspired robotic
- Soft robotics
- Reinforcement learning
- Representation learning
- Simulation and competition platform for evaluating AI and robotics
- Artificial intelligence in real-world environments
- Learning-based human-robot interactions
- Natural language processing in robotics
- Partial/shared autonomy
- Service robotics
- Evolution of language and cooperative behaviors

Submission:

The full-length manuscript (either PDF or Microsoft Word file) should be sent to the office of Advanced Robotics, Robotics Society of Japan, through its homepage at: <https://www.rsj.or.jp/pub/ar/submission.html>. Templates for the manuscript as well as instructions for the Authors are available at the homepage.

Website:

Further information will be provided via the following website: <https://si-ar.emergent-symbol.systems/>.