身体性認知科学に関する研究教育成果

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Time frame

Arrival on 3 August 2003; departure 27 March 2004.

Research

The goal of my research as a COE member has been to further develop the approach of "embodied intelligence" by taking into account the research on dynamics and emergence of behavior which has a strong tradition at the University of Tokyo. Although the dynamical systems perspective has a lot of intuitive appeal in connecting the agent dynamics with discrete memory states (or symbolic states), exploiting the approach for design and achieving higher levels of complexity have turned out to be major research issues.

- Weekly research seminars with Prof. Yasuo Kuniyoshi, students from Mechano-Informatics, and researchers from other institutions.

- Completion of a number of research papers: "Developmental robotics: a survey", Connection Science, in press, together with Max Lungarella, Giulio Sandini, and Giorgio Metta; "New robotics: design principles for intelligent systems," Artificial Life Journal, in press, together with Fumiya Iida and Josh Bongard; several conference papers.

- Draft chapters of book "How the body shapes the way we think: the embodied revolution in artificial intelligence", MIT Press, together with Britta Glatzeder.

- Draft paper: "Design principles for business creation: Strategy, innovation, and entrepreneurship in the perspective of the new cognitive sciences.", together with Simon Grand.

- Planning of experiments with Prof. Kuniyoshi and his students in the domain of "developmental robotics" with the goal to work towards quantification of morphology/materials to establish a "common currency" for "trading" with control and computation.

Teaching

The most significant part of my time has been invested into the preparation and the running of the project "The AI Lectures from Tokyo.". The goal of this project has been to explore new communication media and forms of teaching. In particular we have been focusing on effectiveness of teaching in a global context, creation of a "sense of presence", cultural differences, and community formation. Another goal has been to increase the visibility of Japanese research world-wide.

A series of 10 lectures of 2 hours each, was delivered from the Todai Campus (Eng. Bld. 2, room 28) first to 4 other universities (Beijing, Warsaw, Munich, and Zurich), and then to two additional ones (Jiddah in Saudi Arabia, and Lodz in Poland). We were also connected with Rodney Brooks of MIT CSAIL. All lectures were fully interactive with the possibility for students from all over the world to participate. The lectures were complemented with contributions from leading researchers, mainly from Japan, in a slot titled "The latest from …" and two "Future Trends" sessions, where we had, for example, contributions from Professors Asada (Osaka), Hirose (TIT), Inaba, Inoue, Kuniyoshi, Murata (TIT), Nakamura, Okada, Shimoyama, and Yokoi (Hokkaido). Additional contributions came from Beijing, Warsaw, Munich, and Zurich.

First lecture: 4 Nov. 2003

Last lecture: 27 Jan. 2004

For all the lectures we had live video streaming; streams, downloadable versions, and slides are available on the internet (http://tokyolectures.org).

The web page also includes a forum and a chat room (roughly 900 registrations).

A final workshop on this project will take place at Todai, 8/9 March 2004, with video conferencing to the other sites. Goal: Planning of further activities; collecting, maintaining, and disseminating the know-how acquired during this lecture series.

We also had discussions with Todai students (undergraduate and graduate) on the content of the lectures, and students from other universities on a regular basis.

External lectures

A series of invited lectures and seminars in Japan and at international conferences was delivered during the COE period:

1. "Designing robot brains: the interaction of morphology, materials and (neural) control." JSP Robot Brain Project, Ito, 20 Aug. 2003.

2. "Automated design of intelligent embodied systems." Faculty, School of Information Science and Technology, University of Tokyo, 21 Aug. 2003.

3. "Interacting with the real world: design principles for intelligent systems." COE Symposium on Real world information systems, 8 Sept. 2003

4. "Real-world interaction – design principles for intelligent systems." ATR Workshop on Ubiquitous Experience Media, 9 Sept. 2003.

5. "Interacting with the real world: design principles for intelligent systems." Waseda University meeting on co-creation, TIT Yokohama Campus, 29 Sept. 2003.

6. "The dynamics of embodiment in the emergence of cognition." Fall Academy on Dynamical Systems in Cognitive Science, Monte Verita, 20 Oct. 2003.

7. "Exploring 'ecological balance' using artificial evolution and morphogenesis", RIKEN Yokohama Institute, 9 Jan. 2004.

8. "Engineering adaptive systems", lecture for the Yamaha design team, 16 Jan. 2004.

9. "Engineering adaptive systems: design principles for intelligent systems." Sony Life Dynamics Laboratory, 19 Jan. 2005.

10. "Designing intelligence – interacting with the real world." 9th Int. Conference on Artificial Life and Robotics, Beppu, 2004.

11. "Designing autonomous agents: the interaction of morphology, materials, control and environment", Int. Conf. on Intelligent Autonomous Systems, Amsterdam, 12 March 2004.

Other

The general goal of these activities was mostly "networking" so that by the time I leave Todai, there will be a firm basis for cooperation at different levels, research, educational, workshops and conferences, publications, international lectures, etc.

- Establishing contacts and taking first steps for a contract of cooperation between the University of Tokyo and the University of Zurich.

- Making contacts for the project "Transfer network": International cooperation with Japanese researchers concerning publication activities to increase visibility of Japanese Research world wide.

- Editorial activities on the Proceedings of the international seminar on "Embodied Artificial Intelligence", to be published by Springer Verlag, LNCS, Spring 2004.

- Organizational meetings for "The AI Lectures from Tokyo" in Zurich (Oct. 2003, and January 2004).

- Lab visits and contacts.

- Contacts with Japanese companies concerning the potential commercialization of the Mini-Dog (designed and built by Fumiya Iida).

Tokyo, 9 February 2004