

KUNIAKI NODA

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SUMMARY OF QUALIFICATIONS

- 2 Years' Research Experience on **Multimodal Integration** using **Deep Learning** at **Waseda University**. [1,2, 6-10]
 - Image, Audio, and Motion-dynamics Signal Processing by Deep Autoencoder and Deep Convolutional Neural Network.
 - Sensory-motor Integration Learning of Object Manipulation Behaviors by a Humanoid Robot and Audio-visual Speech Recognition.
- 3 Years' Research Experience on **Self-developmental Intelligence** from the Perspective of **Statistical Learning** Approach at **Sony Corporation**. [3, 11-14]
 - Bayesian Inferences, Hidden Markov Model, Particle Filter, etc.
- 5 Years' Research Experience on **Intelligent Robotics** from the Perspective of **Dynamical Systems** Approach at **Sony Corporation**. [5, 15]
 - Recurrent Neural Networks, Evolutionary Algorithms, Reinforcement Learning, etc.
- 2 Years' Experience on **Humanoid Entertainment Robot (QRIO) Product Development** Project at **Sony Corporation**. [16]
 - Artificial Emotion and Motivation Systems for Autonomous Behavior Control Mechanisms.

RESEARCH INTEREST

- Multi-modal Integration Learning using Deep Learning
 - Adaptive Behavior Generation of Humanoid Robots by Cross-modal Memory Retrieval Mechanisms utilizing Deep Learning Algorithms.
 - Robust Sensor Feature Extraction utilizing Deep Autoencoder.
- Self-developmental Agent and Intelligence
 - Incremental Learning of Environmental Model Structures without Explicit Teaching Signals.
 - Efficient Self-exploratory Behavior Generation Mechanisms.
- Intelligent Behavior Generation of Autonomous Agents
 - The Emergence of Communication Behaviors in the Field of Collective Robotics Research.
- Memory Mechanism
 - Self-organization of Generalized Symbol of Robot Behavior from Multidimensional Sensory-motor Temporal Sequence.
 - Large-scale Multimodal Dynamics Memory Mechanism which Realizes Generalization and Additional Learning.

SKILLS

- Programming Languages
 - C++, MATLAB, Python.
- Parallel Computing
 - MPI Programming for PC Cluster Environment.
 - NVIDIA CUDA Programming for GPGPU System.
- Machine Learning Algorithms
 - Deep Neural Network (Hessian-free) Optimization Algorithm Implementation using cuBLAS and MATLAB.
 - Particle Filter Algorithm Implementation using CUDA.
- 3D Dynamics Simulation and Computer Graphics
 - Rigid-body Dynamics Simulation using CUDA.
 - Development of 3D Multi-link Humanoid Robot Simulator with Microsoft DirectX or OpenGL.
- Working Knowledge of Linux and Windows Environments.
- Network Administration (DNS, SMTP, POP, SSH, HTTP, NIS, LDAP, NFS, etc.).

AWARDS

- JSPS Research Fellowships for Young Scientists (DC2), April 2014.
- Grant for Researchers Attending International Conferences, The Hara Research Foundation, August 2013.
- Best Paper Award, The Robotics Society of Japan, September 2012.
- Best Paper Award, ICDL-EpiRob 2011, August 2011.
- Hatakeyama Award, The Japan Society of Mechanical Engineers, March 1999.
(Given to the most distinguished student of Dept. Mechanical Eng., Waseda Univ.)

EDUCATION

September 2012 - Present

Ph.D. Candidate, Department of Intermedia Art and Science, Waseda University, Tokyo, Japan, Supervisor: Prof. Tetsuya Ogata (Waseda Univ.).

April 2000 - March 2002

Master of Engineering (M.Eng.), Department of Mechanical Engineering, Waseda University, Tokyo, Japan, Supervisor: Prof. Shigeki Sugano (Waseda Univ.).

April 1996 - March 2000

Bachelor of Engineering (B.Eng.), Department of Mechanical Engineering, Waseda University, Tokyo, Japan, Supervisor: Prof. Shigeki Sugano (Waseda Univ.).

PROFESSIONAL EXPERIENCE

January 2015 - Present

Researcher, Advanced Technology Center, Nissan Motor Co., Ltd., Kanagawa JAPAN

- Research on Autonomous Driving Cars.

April 2014 - December 2014

JSPS Research Fellow (DC2)

- Research on Deep Learning for Robot Applications.
 - Multimodal integration learning and cross-modal memory retrieval of robot's object manipulation behavior.
 - Audio-visual speech recognition.

October 2010 - August 2012

**Researcher, System Technologies Laboratories, Sony Corporation, Tokyo JAPAN,
(Director: Masahiro Fujita)**

- Research on Developmental Understanding of Visuomotor Experience using Statistical Learning Approach.
 - Simultaneous segmentation and learning of foreground and background models from time series of images.
 - Modeling of sensory-motor integration learning mechanism using action-extended Hidden Markov Model.

August 2009 - September 2010

**Visiting Researcher, Laboratory of Intelligent Systems, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne SWITZERLAND,
(Director: Prof. Dario Floreano)**

- Research on Evolution of Communication Behaviors by Multiple Simulated Agents.
 - Understand the environmental and embodiment conditions for the artificial creatures to acquire sub-symbolic referential communication skills.

July 2006 - July 2009

**Researcher, System Technologies Laboratories, Sony Corporation, Tokyo JAPAN,
(Director: Masahiro Fujita)**

- Research on Self-development Intelligence under Mobile Robot Simulation Environment.
 - Large-scale dynamical memory and long-term behavior planning mechanism utilizing both discrete-time and continuous-time recurrent neural network.
 - Dynamical memory additional learning mechanism which realizes self-organization of environmental model based on sensory-motor experiences in the environment.

July 2004 - June 2006

**Researcher, Sony Intelligence Dynamics Laboratory, Inc., Tokyo JAPAN,
(Director: Dr. Toshitada Doi)**

- Research on Self-development Intelligence Utilizing Humanoid Robot QRIO.
 - Dynamic generation and switching of object handling behaviors by a humanoid robot using a recurrent neural network model. (Research adviser: Dr. Jun Tani)

April 2002 - June 2004

**Digital Creatures Laboratories, Sony Corporation, Tokyo JAPAN,
(Director: Dr. Toshitada Doi)**

- Product Development of Entertainment Humanoid Robot QRIO
 - Engaged in research activity along with software development project regarding

behavior control mechanism, internal state model, and emotion expression mechanism for an autonomous robot.

MEMBERSHIP OF ACADEMIC SOCIETIES

- Information Processing Society of Japan (2013-2014)
- IEEE Robotics and Automation Society (2012-)
- International Society for Adaptive Behavior, ISAB (2006-2008)
- Robotics Society of Japan, RSJ (2001-)
- The Japan Society of Mechanical Engineers, JSME (2001-2009)

PUBLICATIONS AND PRESENTATIONS

Journal Papers

[1] **Kuniaki NODA**, Yuki YAMAGUCHI, Kazuhiro NAKADAI, Hiroshi G. OKUNO, and Tetsuya OGATA: Audio-Visual Speech Recognition using Deep Learning, Applied Intelligence, (Published online), Dec. 2014. IF: 1.853

[2] **Kuniaki NODA**, Hiroaki ARIE, Yuki SUGA, and Tetsuya OGATA: Multimodal Integration Learning of Robot Behavior using Deep Neural Networks, Robotics and Autonomous Systems, Vol. 62, No. 6, pp. 721-736, 2014. IF: 1.156

[3] Yukiko HOSHINO, Kenta KAWAMOTO, **Kuniaki NODA**, and Kotaro SABE: Self-regulation Mechanism: a Principle for Continual Autonomous Learning in Open-ended Environments, Journal of Robotics Society of Japan, Vol. 29, No. 1, pp. 77-88, 2011. [**Winner of a Best Paper Award**]

[4] Mototaka SUZUKI, **Kuniaki NODA**, Yuki SUGA, Tetsuya OGATA, and Shigeki SUGANO: Dynamic Perception after Visually-guided Grasping by a Human-like Autonomous Robot, Advanced Robotics, VSP and Robotics Society of Japan, Vol. 20, No. 2, pp. 233-254, Feb. 2006.

[5] Masato ITO, **Kuniaki NODA**, Yukiko HOSHINO, and Jun TANI: "Dynamic and interactive generation of object handling behaviors by a small humanoid robot using a dynamic neural network model", Neural Networks, Vol. 19, pp.323-337, 2006.

International Conference Papers

[6] Alexander SCHMITZ, Yusuke BANSHO, **Kuniaki NODA**, Hiroyasu IWATA, Tetsuya OGATA, Shigeki SUGANO: Tactile Object Recognition Using Deep Learning and Dropout, Proc. of IEEE-RAS International Conference on Humanoid Robots (Humanoids 2014), pp. 1044-1050, Nov. 2014, Madrid, Spain.

[7] **Kuniaki NODA**, Yuki YAMAGUCHI, Kazuhiro Nakadai, Hiroshi G. OKUNO, and Tetsuya OGATA: Lipreading using Convolutional Neural Network, Proc. of Interspeech, pp. 1149-1153, Sep. 14-18, 2014, Singapore.

[8] Yuki YAMAGUCHI, **Kuniaki NODA**, Shun NISHIDE, Hiroshi G. OKUNO, and Tetsuya OGATA: Learning and Association of Synaesthesia Phenomenon using Deep Neural Networks, Proc. of IEEE/SICE Int. Symposium on System Integration (SII2013), pp. 659-664, Dec. 15-17, 2013, Kobe, Japan.

[9] **Kuniaki NODA**, Hiroaki ARIE, Yuki SUGA, and Tetsuya OGATA: Intersensory Causality Modeling using Deep Neural Networks, Proc. of IEEE Int. Conf. on Systems, Man, and Cybernetics (SMC2013), pp.1995-2000, Oct. 2013, Manchester, UK. [**Grant from the Hara Research Foundation**]

[10] **Kuniaki NODA**, Hiroaki ARIE, Yuki SUGA, and Tetsuya OGATA: Multimodal Integration Learning of Object Manipulation Behaviors using Deep Neural Networks, Proc. of IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS2013), pp.1728-1733, Nov. 2013, Tokyo, Japan.

[11] Harumitsu NOBUTA, Kenta KAWAMOTO, **Kuniaki NODA**, Kohtaro SABE, Hiroshi G. OKUNO, Shun NISHIDE, and Tetsuya OGATA: Body Area Segmentation from Visual Scene based on Predictability of Neuro-dynamical System, Proc. of IEEE International Joint Conference on Neural Networks (IJCNN2012), Jun. 2012, Brisbane, Australia.

[12] **Kuniaki NODA**, Kenta KAWAMOTO, Takashi HASUO, Kotaro SABE: A Generative Model for Developmental Understanding of Visuomotor Experience, Proc. of IEEE Int. Conf. on Development and Learning and Epigenetic Robotics (ICDL-EpiRob2011), Aug. 2011, Frankfurt, Germany.

[13] Kenta KAWAMOTO, **Kuniaki NODA**, Takashi HASUO, Kotaro SABE: Development of Object Manipulation through Self-exploratory Visuomotor Experience, Proc. of IEEE Int. Conf. on Development and Learning and Epigenetic Robotics (ICDL-EpiRob2011), Aug. 2011, Frankfurt, Germany. **[Winner of a Best Paper Award]**

[14] Kenta KAWAMOTO, Yukiko HOSHINO, **Kuniaki NODA**, Kohtaro SABE: Self-regulation Mechanism for Continual Autonomous Learning in Open-ended Environments, Proc. of Int. Conf. on Epigenetic Robotics (EpiRob2009), Nov. 2009, Venice, Italy.

[15] **Kuniaki NODA**, Masato ITO, Yukiko HOSHINO, and Jun TANI: Dynamic Generation and Switching of Object Handling Behaviors by a Humanoid Robot Using a Recurrent Neural Network Model, Proc. of Int. Conf. on the Simulation of Adaptive Behavior (SAB'06), Lecture Notes in Artificial Intelligence, Vol.4095, pp.185-196, Sept. 2006, Rome, Italy.

[16] Fumihide TANAKA, **Kuniaki NODA**, Tsutomu SAWADA, Masahiro FUJITA: Associated Emotion and Its Expression in an Entertainment Robot QRIO, Proc. of Int. Conf. on Entertainment Computing, (ICEC2004), pp. 499-504, Sept. 2004, Eindhoven, Netherlands.

[17] **Kuniaki NODA**, Mototaka SUZUKI, Naofumi TSUCHIYA, Yuki SUGA, Tetsuya OGATA, and Shigeki SUGANO: Robust Modeling of Dynamics Environment based on Robot Embodiment, Proc. of IEEE Int. Conf. on Robotics and Automation (ICRA2003), pp.3565-3570, Sept. 2003.

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