

# Shingo Shimoda



## Current Position

Unit leader  
Intelligent Behavior Control unit,  
RIKEN, Center of Brain Science, CBS-TOYOTA collaboration center,  
2271-130, Shimo-shidami, Moriyama-ku  
Nagoya, Aichi, 463-0003  
Phone: +81-52-736-5861, FAX: +81-52-736-5862  
Email: [shingo.shimoda@riken.jp](mailto:shingo.shimoda@riken.jp)

## Education

**The University of Tokyo,**  
Ph.D Department of Electronics Engineering, 2005  
Thesis: *Hopping Mobility under Microgravity Environment*  
Advisor: Prof. Ichiro Nakatani

**The University of Tokyo,**  
M. Sci Department of Environmental studies, 2001  
Thesis: *Development of 2DOF Ultrasoci Motor*  
Advisor: Prof. Ken Sasaki

**The University of Tokyo,**  
B. Sci Department of Mechano-Infomatics, 1999  
Thesis: *Microgravity Rover for Asteroid using Magnetic Force*  
Advisor: Prof. Yoshihiko Nakamura

## Academic Position

2005-2007: **Research Scientist,**  
Biological control system laboratory, RIKEN

2003-2004: **Visiting student,**  
Field and space robotics laboratory,  
Massachusetts institute of technology

## Awards

- Chair of IEEE Robotics and Automation Society Most Active Technical Committee, 2017
- RIKEN Industry Partnerships Contribution Award, 2016
- IROS CoTeSys Cognitive Robotics Best Paper Award in IROS 2010
- General Chairs' Recognition Award in 48th IEEE Conference on Decision and Control (CDC2009)
- Research Incentive Award, *The Robotics Society of Japan*, 2002
- The Japan Securities Scholarship Foundation, 2001-2004

## Academic Activities

- Advanced Robotics Best Paper Award committee member 2018-
- Associate Editor of IEEE International Conference on Intelligent Robots and Systems, 2018
- Program Chair of RSJ Annual Conference, 2018
- Publication Chair of IEEE International Conference on Development and Learning and Epigenetic Robotics, 2018
- Ph.D thesis Co-Director at Monterrey Institute of Technology, Mexico, 2017
- Steering Committee Member of Japan Society of Mechanical Engineers, Robotics and Mechatronics Department 2017-
- Steering Committee Member of IEEE Transactions on Cognitive and Developmental systems 2016-
- Associate Editor of IEEE Transactions on Cognitive and Developmental systems 2016-
- Cognitive Robotics Best Paper Award Committee Member for International Conference on Robotics and Automation 2015 (ICRA2015)
- Co-Chair of IEEE Robotics and Automation Society Technical Committee on Cognitive Robotics 2014- (Principle chair from 2017- )
- Review Committee member for Japanese Journal of Comprehensive Rehabilitation Science, 2015-
- Chair of Robotics Society of Japan Technical Committee on Open Intelligence 2014-

- Founding Member of IEEE Robotics and Automation Society Technical Committee on Human Movement Understanding and Neuromechanics
- Advanced Robotics Best Paper Award committee member 2013–2015
- Guest editor of IEEE Systems Journal 2013
- Technical committee member for Intelligent Assistive Robots at the Robotics Science and Systems Conference 2013
- Program committee member for International Conference on NeuroRehabilitation 2012
- Research Encouragement Award committee member, The robotics society of Japan, 2011-2012
- Program committee member for RSJ annual conference 2010, 2013
- Associate Editor of journal of Advanced Robotics 2010 -
- Program committee member for Robotics Science and Systems 2010

## Session and Workshop Organization

- Special Ssession Organizer “Neurorehabilitation from clinical perspective and robotic perspective”, *International Conference on NeuroRehabilitation*, 2018
- Workshop Organizer “Worldwide consensus of Neurorehabilitation”, *International Conference on NeuroRehabilitation*, 2018
- Workshop Organizer “New horizons in cognitive robotics and AI”, *IEEE International Conference on Robotics and Automation*, 2018
- Organizer of 1st International Symposium on Functional Reconstruction of Hand, 2017
- Special Session Organizer with Dr. F. Alnajjar, “Role of Input Synergy for rehabilitation”, *International Conference on NeuroRehabilitation*, 2016
- Special Session Organizer with Dr. D. Torricelli, “Modular control in healthy and pathologic subjects”, *International Conference on NeuroRehabilitation*, 2016
- Workshop Organizer with Dr. F. Alnajjar, Dr. J. Moreno and Dr. D. Torricelli, “How to use muscle synergy beyond off-line analysis”, *International Conference of the IEEE Engineering in Medicine and Biology Society*, 2015
- Workshop Organizer with Dr. G. Sandini, Dr. M. Scheutz and Dr. D. Vernon, “Cognitive Robotics as Interdisciplinary science”, *IEEE International Conference on Robotics and Automation*, 2015

- Special Session Organizer with Dr. W. Takano and Dr. V. Berenz, “Development of robot behaviors and intelligence through body/environment interactions”, *RSJ annual conference*, 2013
- Special Session Organizer with Dr. K. Kitajo, “Systematic Rehabilitation based on brain rhythm, muscle synergies and tacit learning”, *International conference on Neuro Rehabilitation*, 2012
- Workshop Organizer with Dr. Juan. C. Moreno, “Behavior learning through body/environment interactions”, *International conference on Biomedical Robotics and Biomechatronics*, 2012

## List of Publication

### Journal Papers

- [1] Álvaro Costa García, Matti Itkonen, Hiroshi Yamasaki, Fady Alnajjar, and Shingo Shimoda, “A Novel Approach to the Segmentation of sEMG Data Based on the Activation and Deactivation of Muscle Synergies During Movement”, *IEEE Robotics and Automation Letters*, in press
- [2] Hiroki Kogami, Qi An, Ningjia Yang, Hiroshi Yamakawa, Yusuke Tamura, Atsushi Yamashita, Hajime Asama, Shingo Shimoda, Hiroshi Yamasaki, Matti Itkonen, Fady Alnajjar, Noriaki Hattori, Makoto Kinomoto, Kouji Takahashi, Takanori Fujii, Hironori Otomune and Ichiro Miyai, “Effect of Physical Therapy on Muscle Synergy Structure during Standing-up Motion of Hemiplegic Patients”, *IEEE Robotics and Automation Letters*, in press
- [3] Mitsuhiro Hayashibe and Shingo Shimoda, “Synergetic Learning Control Paradigm for Redundant Robot to Enhance Error-Energy Index”, *IEEE Transactions on Cognitive and Developmental Systems*, in press
- [4] Shintaro Oyama, Shingo Shimoda, Fady SK Alnajjar, Katsuyuki Iwatsuki, Minoru Hoshiyama, Hirotaka Tanaka and Hitoshi Hirata, “Biomechanical Reconstruction Using the Tacit Learning System: Intuitive Control of Prosthetic Hand Rotation ”, *Frontiers in Neurorobotics*, Volume10, Article19, 2016
- [5] Alejandro Lopez Rincon and Shingo Shimoda, “The Inverse Problem in Electroencephalography using the Bidomain Model of Electrical Activity”, *Journal of Neuroscience Method*, Vol. 274, pp.94-105, 2016
- [6] Hiroshi Yamasaki and Shingo Shimoda, “Spatiotemporal modular organization of muscle torques for sit-to-stand movements”, *Journal of Biomechanics*, Vol. 49, Issue 14, pp.3268-3274, 2016
- [7] Saugat Bhattacharyya and Shingo Shimoda and Mitsuhiro Hayashibe, “A Synergetic Brain-machine Interfacing Paradigm for Multi-DOF Robot Control”, *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, VOL. 46, NO. 7, 2016
- [8] Fady Alnajjar, Matti Itkonen, Vincent Berenz, Maxime Tournier, Chikara Nagai and Shingo Shimoda, “Sensory Synergy as Environmental Input Integration”, *Front. Neurosci.*, Vol. 8, Article 436, 2015
- [9] Tytus Wojtara, Fady Shibata Alnajjar, Shingo Shimoda and Hidenori Kimura, “Muscle Synergy Stability and Human Balance Maintenance”, *Journal of Neuro-Engineering and Rehabilitation*, 11:129, 2014
- [10] Mitsuhiro Hayashibe and Shingo Shimoda, “Synergetic Motor Control Paradigm for Optimizing Energy Efficiency of Multijoint Reaching via Tacit Learning”, *Front. Comput. Neurosci.*, Vol. 8, Article 21, 2014

- [11] Fady Shibata Alnajjar, Tytus Wojtara, Hidenori Kimura and Shingo Shimoda, “Muscle Synergy Space: Learning Model To Create an Optimal Muscle Synergy”, *Front. Comput. Neurosci.*, Vol. 7, Article 136, 2013
- [12] Shingo Shimoda, Yuki Yoshihara and Hidenori Kimura, “Adaptability of tacit learning in bipedal locomotion”, *IEEE Transactions on Autonomous Mental Development*, Vol. 5, No. 2. pp. 152-161, 2013
- [13] Tytus Wojtara, Makoto Sasaki, Hitoshi Konosu, Masashi Yamashita, Shingo Shimoda, Fady ALNAJJAR and Hidenori Kimura, “Artificial Balancer - Supporting Device for Postural Refelex”, *Gait and Posture*, No.35, pp316-321, 2012
- [14] Shingo Shimoda and Hidenori Kimura, “Bio-mimetic Approach to Tacit Learning based on Compound Control”, *IEEE Transactions on Systems, Man, and Cybernetics-Part B*, Vol. 40, No. 1, pp.77-90, 2010
- [15] Tytus Wojtara, Masafumi Uchihara, Hideyuki Murayama, Shingo Shimoda, Satoshi Sakai, Hideo Fujimoto and Hidenori Kimura, “Human-Robot Collaboration in Precise Positioning of a Three-Dimensional Object”, *Automatica*, Vol.45, pp333-342, 2009
- [16] Shingo Shimoda and Hidenori Kimura, “Neural Computation Scheme of Compound Control: Tacit Learning for Bipedal Locomotion”, *Journal of Control, Measurement, and System Integration*, Vol. 1, No. 4, pp.275-283, 2008
- [17] Shingo Shimoda, Yoji Kuroda and Karl Iagnemma, “High-speed navigation of unmanned ground vehicles on uneven terrain using potential fields”, *Robotica*, Vol.25, pp.409-424, 2007
- [18] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “Attitude Control of Satellite with Two Wheels Considering Maneuver Path (In Japanese)”, *Transactions of the Society of Instrument and Control Engineer*, Vol. 41, No.10, 2005
- [19] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “Proposal of New Mobility and Landing Experiment in Microgravity Environment(in Japanese)”, *The Japan Society for Aeronautical and Space Sciences*, Vol. 53, No. 614, pp.108-115, 2005
- [20] Shingo Shimoda, Takashi Kubota, Ichiro Nakatani, “Four-Wheel Hopping Robot with Attitude Control Mechanism”, *Journal of Robotics and Mechatronics*, Vol.16 No.3, pp.319-326, 2004
- [21] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “Proposal of New Mobility Using Spring Mechanism in Microgravity Environment (In Japanese)”, *Journal of the Robotics Society of Japan*, Vol.21 No.6, pp83-89, 2003

- [22] Yoshihiko Nakamura, Shingo Shimoda and Sanefumi Shoji, “Microgravity Rover using Electro-magnetic Action (In Japanese)”, *Journal of the Robotics Society of Japan*, Vol.19 No.4, pp.71-77, 2001

### Books

- [1] G. Asin-Prieto, S. Shimoda, J. González, J. L. Pons, A. J. del-Ama, A. Gil-Agudo and J. C. Moreno “Testing the Generation of Speed-Dependent Gait Trajectories to Control a 6DoF Overground Exoskeleton, in Intelligent Robotics and Applications”, *Springer*, 2015
- [2] S. Shimoda, Á. Costa, G. Asin-Prieto, S. Okajima, E. Ináñez, Y. Hasegawa, J. M. Azorín, J. L. Pons and J. C. Moreno, “Joint Stiffness Tuning of Exoskeleton Robot H2 by Tacit Learning, in Symbiotic Interaction”, *Springer*, 2015
- [3] Shingo Shimoda, “Tacit learning -Machine learning paradigm based on the principles of biological learning - in Intelligent Assistive Robots”, *Springer*, 2014
- [4] Shingo Shimoda and Hidenori Kimura, “Trajectory optimization by Tacit learning, in Converging Clinical and Engineering Research on Neurorehabilitation”, *Springer*, 2012
- [5] Takashi Kubota, Kei Takahashi, Shingo Shimoda, Tetsuo Yoshimitsu and Ichiro Nakatani, “Locomotion Mechanism of Intelligent Unmanned Explorer for Deep Space Exploration, in Intelligent Unmanned Systems : Theory and Applications”, *Springer*, 2009
- [6] Hidenori Kimura and Shingo Shimoda, “New Type of Neural Computation, in Recent Advances in Learning and Control”, *Springer*, 2008

### Review papers

- [1] Shingo Shimoda, “Behavior Learning in Open Environment”, *Journal of Japanese Society of Tribologists*, in press
- [2] Shingo Shimoda, “Robot Rehabilitation”, *Monthly Book Medical Rehabilitation*, No. 204, pp.78-82, 2016
- [3] Shingo Shimoda, Yuki Yoshihara and Hidenori Kimura, “Behavior adaptation to the environment by tacit learning”, *Systems, Control and Information*, Vol. 55, No. 11, pp.473-479, 2011

### Reviewed Conference Proceedings

- [1] Hiroshi Yamasaki, Qi An, Hiroki Kogami, Ningjia Yang, Hiroshi Yamakawa, Yusuke Tamura, Atsushi Yamashita, Hajime Asama, Matti Itkonen, Fady Alnajjar, Shingo Shimoda, Noriaki Hattori, Makoto Kinomoto, Kouji Takahashi, Takanori Fujii, Hironori Otomune and Ichiro Miyai, “Dynamic skill of postural leg support during lateral leg lift while sitting reflects gait performance after stroke“, the 8th World Congress on Biomechanics, 2018

- [2] Shotaro Okajima, Hiroshi Yamasaki, Matti Itkonen, Álvaro Costa García, Fady Alnajjar, Yasuhisa Hasegawa and Shingo Shimoda, “Activate Neural Control Loop for Reflex and Experimental Verification”, IEEE International Conference on Robotics and Automation, 2018
- [3] Cesae Cnatu, Jesus Tamez-Duque, Shingo Shimoda and Rogelio Soto, “Design of a Knee-Rehabilitation Device with Automated Recovery Evaluation, Pain Monitoring, and Assistance-Parameter Updates”, IBERDISCAP2017
- [4] Cesae Cnatu, Rogelio Soto and Shingo Shimoda, “Design of a control system for a knee rehabilitation orthosis using a recovery status”, 2017 International Symposium on Wearable Robotics and Rehabilitation
- [5] Jose Gonzalez, Shingo Shimoda, Guillermo Asin-Prieto, Jose Luis Pons and Juan Camilo Moreno, “Joint Stiffness Modulation of Compliant Actuators for Lower Limb Exoskeletons”, IEEE-RAS-EMBS International Conference on Rehabilitation Robotics, 2017
- [6] Ningjia Yang, Qi An, Hiroshi Yamakawa, Yusuke Tamura, Atsushi Yamashita, Matti Itkonen, Fady Alnajjar, Shingo Shimoda, Hajime Asama, Noriaki Hattori and Ichiro Miyai, “Clarification of Muscle Synergy Structure During Standing-up Motion of Healthy Young, Elderly and Post-Stroke Patients”, IEEE-RAS-EMBS International Conference on Rehabilitation Robotics, 2017
- [7] Álvaro Costa García, Matti Itkonen, Hiroshi Yamasaki, Fady SK Alnajjar and Shingo Shimoda, “Importance of Muscle Selection for EMG Signal Analysis during Upper Limb Rehabilitation of Stroke Patients”, 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2017
- [8] Ghada M. Bani Musaa, Adel Al-Jumaily, Fady Alnajjar and Shingo Shimoda, “Analyze the human movements to help CNS to shape the synergy using CNMF and pattern recognition”, IEEE 4th International Symposium on Robotics and Intelligent Sensors, 2016
- [9] Hiroshi Yamasaki and Shingo Shimoda, “Posture Dependent Spatiotemporal Modulation of Dynamic Torques during Sit-to-Stand Movements”, International Conference on Neurorehabilitation, 2016
- [10] Fady S. Alnajjar and Shingo Shimoda, “Muscle Synergies Indices to Quantify the Skilled Behavior in Human”, International Conference on Neurorehabilitation, 2016
- [11] Fady S. Alnajjar and Fatimah Harib and Shaima AlAmeri and Asma Almarzoqi and Shingo Shimoda, “The role of Body Ownership and Attention to Enhance the Internal Model and Body Control Ability”, International Conference on Neurorehabilitation, 2016



- [12] G. Asin-Prieto and S. Shimoda and J. Gonzalez and M. Villamnan and J. L. Pons and J. C. Moreno, “Tacit adaptability of a mechanically adjustable compliance and controllable equilibrium position actuator, a preliminary study”, The International Symposium on Wearable Robotics, 2016
- [13] Shotaro Okajima and Yasuhisa Hasegawa and Shingo Shimoda, “Acquisition of adaptive behavior of the robot through bow-tie structure”, The Sixth Joint IEEE International Conference Developmental Learning and Epigenetic Robotics, 2016
- [14] Alejandro Lopez-Rincon, Cesar Cantu, Rogelio Soto and Shingo Shimoda, “Simulating the Activation, Contraction and Movement of skeletal muscles using the Bidomain Model”, 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2016
- [15] Alejandro Lopez Rincon and Shingo Shimoda, “Design of a Video Game for Rehabilitation using Motion Capture, EMG analysis and Virtual Reality”, 26th International Conference on Electronics, Communications and Computers, 2016
- [16] S. Shimoda, Á. Costa, G. Asin-Prieto, S. Ok ajima, E. Ináñez, Y. Hasegawa, J. M. Azorín, J. L. Pons and J. C. Moreno, “Joint Stiffness Tuning of Exoskeleton Robot H2 by Tacit Learning”, *International Workshop on Symbiotic Interaction*, 2015
- [17] Joel Viau, Patrick Chouinard, Jean-Philippe Lucking Bigue, Guifre Julio, Francois Michaud\*, Shingo Shimoda and Jean-Sebastien Plante, “Projected PID Controller for Tendon-Driven Manipulators Actuated by Magneto-Rheological Clutches”. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2015
- [18] Fady SK. Alnajjar, Matti Itkonen, Chikara Nagai and Shingo Shimoda, “Sensory Synergy: Modeling the Neural Dynamics of Environmental Feedback to the Central Nervous System”, *7th International IEEE EMBS Conference on Neural Engineering*, 2015
- [19] Katsuyuki Iwatsuki, Shintaro Oyama, Fady Alnajjar, Shingo Shimoda, Michiro Yamamoto and Hitoshi Hirata, “Hand Prosthesis equipped with a Tacit Learning System to auto-regulate Forearm Rotation”, *the 69th Annual Meeting of the American Society for Surgery of the hand*, 2014
- [20] Vincent Berenz, Mitsuhiro Hayashibe, Fady Alnajjar and Shingo Shimoda, “Generalization of the Tacit Learning Controller Based on Periodic Tuning Functions”, *IEEE International conference on Biomedical Robotics and Biomechatronics*, 2014
- [21] Fady Alnajjar, Vincent Berenz, Ken-ichi Ozaki, kensuke Ohno and Shingo Shimoda, “Muscle Synergy Features in Behavioral Adaptation and Recovery”, *The international conference on NeuroRehabilitation*, 2014

- [22] Fady SK Alnajjar, Vincent Berenz and Shingo Shimoda, “The Functional Role of Automatic Body Response in Shaping Voluntary Actions Based on Muscle Synergy Theory”, *International IEEE EMBS Conference on Neural Engineering*, 2013
- [23] Vincent Berenz, Fady SK Alnajjar, Mitsuhiro Hayashibe and Shingo Shimoda, “Tacit learning for emergence of task-related behavior through signal accumulation”, *Symposium on Emergent Trends in Artificial Intelligence & Robotics*, 2013
- [24] Shintaro Oyama, Shingo Shimoda, Katsuyuki Iwatuki and Hitoshi Hirata, “Tacit learning program enhances operability of myoelectric hand prostheses”, *the 68th Annual Meeting of the American Society for Surgery of the hand*, 2013
- [25] Mitsuhiro Hayashibe and Shingo Shimoda, “Emergence of Motor Synergy in Vertical Reaching Task via Tacit Learning”, *the 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 2013
- [26] Shingo Shimoda, “Adaptation? Learning? Features of biological learning”, *23th International Symposium on Micro-NanoMechatronics and Human Science*, 2012
- [27] Shingo Shimoda and Hidenori Kimura, “Trajectory optimization by Tacit learning”, *International Conference on NeuroRehabilitation*, 2012
- [28] Tytus Wojtara, Fady Alnajjar, Shingo Shimoda and Hidenori Kimura, “Voluntary and Reflex Muscle Synergies in Upper Limbs”, *International Conference on NeuroRehabilitation*, 2012
- [29] Fady Alnajjar, Tytus Wojtara, Shingo Shimoda, and Hidenori Kimura, “The Rule of the Dependency Level of the Sensory Synergy in Recruiting Muscle Synergy”, *International Conference on NeuroRehabilitation*, 2012
- [30] Shingo Shimoda, Yuki Yoshihara, Kenji Fujimot, Takashi Yamamoto, Iwao Maeda and Hidenori Kimura, “Stability analysis of tacit learning based on environmental signal accumulation”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2012
- [31] Fady Alnajjar, Tytus Wojtara, Shingo Shimoda, Masashi Yamashita, Hidenori Kimura, “A bio-inspired computational model to simulate the neuro-sensorimotor basis for postural-reflex-response in Human”, *IEEE International conference on Biomedical Robotics and Biomechatronics*, 2012
- [32] Tytus Wojtara, Makoto Sasaki, Fady Alnajjar, Shingo Shimoda, Hitoshi Konosu, Masashi Yamashita, Hidenori Kimura, “Lateral Balance Supporting Device for Postural Reflex Ambulatory Experiments”, *IEEE International conference on Biomedical Robotics and Biomechatronics*, 2012

- [33] Kazutoshi Hayashi, Izumi Yawata, Shingo Shimoda and Hidenori Kimura, “Modeling of circulation dynamics in shock”, *The 39th Annual meeting of the Japanese association for acute medicine*, 2011
- [34] Shingo Shimoda, Yuki Yoshihara and Hidenori Kimura, “Emergence of bipedal walking through body/environment interaction”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2010 (Cognitive Robotics Best Paper Award)
- [35] Reiko J. Tanaka, Lu Gaohua, Shingo Shimoda and Hidenori Kimura, “Compound control — adaptation to multiple environmental changes”, *IEEE International Conference on Decision and Control*, pp.6183-6188, 2009 (General Chairs’ Recognition Award)
- [36] Shingo Shimoda and Hidenori Kimura, “Bio-mimetic Machine Learning based on Compound Control”, *IEEE International Conference on Biomedical Robotics and Biomechatronics*, 2008
- [37] Karl Iagnemma, Shingo Shimoda and Zvi Shiller, “Near-Optimal Navigation of High Speed Mobile Robots on Uneven Terrain”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2008
- [38] Tytus Wojtara, Masafumi Uchihara, Hideyuki Murayama, Shingo Shimoda, Satoshi Sakai, Hideo Fujimoto and Hidenori Kimura, “Human-Robot Cooperation in Precise Positioning of a Flat Object”, *International Federation of Automatic Control 2008 (IFAC’08)*, Seoul, Korea, 2008
- [39] Shingo Shimoda and Hidenori Kimura, “Theoretical Approach of Robot Control based on Compound Control”, *12th Robotics Symposia*, 2007
- [40] Shingo Shimoda, Takefumi Asahi, Hideo Fujimoto and Hidenori Kimura, “Robot Control based on Compound Control Theory”, *11th Robotics Symposia*, 2006
- [41] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “New Planetary Explorer with Appropriate Mobility Mechanism for Gravity Environment”, *8th International Symposium on Artificial Intelligence, Robotics and Automation in Space*, 2005
- [42] K.G. Moesl, T. Kubota, T. Sato, S. Shimoda, I. Nakatani, “New Position Estimation Method based on Map Matching for Planetary Rover”, *8th International Symposium on Artificial Intelligence, Robotics and Automation in Space*, 2005
- [43] Shingo Shimoda, Yoji Kuroda and Karl Iagnemma, “Potential Field Navigation of High Speed Unmanned Ground Vehicles on Uneven Terrain”, *IEEE International Conference on Robotics and Automation*, 2005

- [44] Takashi Kubota, Ichiro Nakatani, Keisuke Watanabe and Shingo Shimoda, “Study on Mole-Typed Deep Driller Robot for Subsurface Exploration”, *IEEE International Conference on Robotics and Automation*, 2005
- [45] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ Attitude Control of Two-Wheel-Satellite using Riemannian Geometry”, *AIAA Guidance, Navigation, and Control Conference*, 2004
- [46] Kei Takahashi, Shingo Shimoda, Kojiro Iizuka, Takashi Kubota and Ichiro Nakatani, “A Study of Locomotion Mechanism based on Gravitational Environment”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2004
- [47] Shingo Shimoda, Andreas Wingert, Kei Takahashi, Takashi Kubota and Ichiro Nakatani, “ Hopping Direction Controllability for Small Body Exploration Robot”, *IEEE International Conference on Robotics and Automation*, 2004
- [48] Takashi Kubota, Keisuke Watanabe, Shingo Shimoda and Ichiro Nakatani, “ Deep Drilling Robot for Subsurface Exploration”, *8th International Conference on Intelligent Engineering Systems*, 2004
- [49] Ichiro Nakatani, Takashi Kubota, Tetsuo Yoshimitsu, Shingo Shimoda, Riho Ejiri, Keisuke Watanabe and Kei Takahashi, “ Research on Planetary Exploration Robots”, *International Symposium on Electronics for Future Generations*, 2004
- [50] Shingo Shimoda, Andreas Wingert, Kei Takahashi, Takashi Kubota and Ichiro Nakatani, “ Microgravity Hopping Robot with Controlled Hopping and Landing Capability”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2003
- [51] Yoji Kuroda, Toshiharu Kurosawa, Akiyoshi Tsuchiya, Shingo Shimoda and Takashi Kubota, “ Position Estimation Scheme for Lunar Rover Based on Integration of the Sun and the Earth Observation and Dead Reckoning”, *7th Int. Symposium on Artificial Intelligence, Robotics and Automation in Space*, 2003
- [52] Keisuke Watanabe, Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ A Mole-Type Drilling Robot for Lunar Subsurface Exploration”, *7th Int. Symposium on Artificial Intelligence, Robotics and Automation in Space*, 2003
- [53] Takashi Kubota, Shingo Shimoda, Tetsuo Yoshimitsu and Ichiro Nakatani, “ Small Body Exploration Robot with Hopping Mechanism”, *the IASTED Int. Conf. On Robotics and Applications*, 2003
- [54] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ Study on Attitude Control of Hopping Robot(In Japanese)”, *8th Robotics Symposia*, 2003

- [55] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ New Mechanism of Attitude Control for Hopping Robot”, *IEEE/RSJ International Conference on Intelligent Robots and System*, 2002
- [56] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ New Mobility System Based on Elastic Energy under Microgravity”, *IEEE International Conference on Robotics and Automation*, 2002
- [57] Shingo Shimoda, Takashi Kubota and Ichiro Nakatani, “ Proposal of Posture Control Mechanism of the Spring-Type Microgravity Rover(In Japanese)”, *7th Robotics Symposia*, 2002
- [58] Shingo Shimoda, Masayuki Ueyama, Shinya Matsuda, Takashi Matsuo, Ken Sasaki and Kiyoshi Itao, “ Design of 2DOF Pyramid-Type Ultrasonic Motor”, *IEEE/RSJ International Conference on Intelligent Robots and System*, 2001
- [59] Shingo Shimoda Takashi Kubota and Ichirou Nakatani, “ New Mobility Using Elastic Energy in the Microgravity Environment”, *The Fourth IFAC Symposium on Intelligent Autonomous Vehicles*, 2001
- [60] Shingo Shimoda and Takashi Kubota, “ Proposal of Mobility using Elastic Energy in the Microgravity Environment(In Japanese)”, *6th Robotics Symposia*, 2001
- [61] Shingo Shimoda, Sanefumi Shoji and Yoshihiko Nakamura, “ Mobility of a Microgravity Rover using Internal Electro-Magnetic Levitation”, *IEEE/RSJ International Conference on Intelligent Robots and System*, 2000
- [62] Shingo Shimoda, Ken Sasaki and Kiyoshi Itao, “ Design of Ultrasonic Motor for Driving Spherical Surface”, *International Conference on Machine Automation*, 2000

### Invited lectures

- [1] “Robot Intelligence beyond AI - From space exploration to new barrier-free life with robots-”, 3rd Joint Symposium on Social Robotics, UAE, 2018
- [2] “Role of Muscle Synergy in NeuroFeedback Rehabilitation”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Canada, 2017
- [3] “Intelligent Robot Control for Supporting Human Behaviors”, *The 11th International Convention on Rehabilitation Engineering and Assistive Technology*, Japan, 2017
- [4] “Bio-mimetic controller to adapt prosthesis motions to user’s motion intentions”, *Lunchon Seminar at International Symposium on Intelligent Functional Reconstruction of Hand*, Japan, 2017

- [5] “Bio-mimetic intelligence and its application for prosthetic hand”, *National Electric Prosthetic Hand Conference*, Japan, 2017
- [6] “Exoskeleton robot control to detect the wearer’s motion intentions”, *Global Robot Expo*, Spain, 2017
- [7] “Walking support of semi-spinal cord injury patients by lower-limb exoskeleton robot”, *Workshop at IEEE International Conference on Intelligent Robot and Systems*, Korea, 2016
- [8] “Forearm prosthesis control based on biological control principle”, *Japan Hand Joint Surgery Workshop*, Nagoya, 2015
- [9] “Investigations of biological control principle and its engineering application”, *Japan Society of Mechanical Engineers Special seminar*, Univ. of Shunshu, 2014
- [10] “Behavior coordination between human and prosthetic devices”, *International Workshop on Wearable Robotics*, Spain, 2014
- [11] “Walking gait adaptation by tacit learning”, *Workshop at IEEE International Conference on Robotics and Automation*, Hong Kong, 2014
- [12] “Human Motion Analysis based on Muscle Synergy and Tacit Learning”, *Workshop at IEEE International Conference on Robotics and Automation*, Hong Kong, 2014
- [13] “Body/Environment Interactions for Behavior Learning”, *Workshop at IEEE International Conference on Robotics and Automation*, Germany, 2013
- [14] “Electric arm control by bio-mimetic control: Tacit learning”, *Annual meeting of the Japan society of reconstructive microsurgery*, Japan, 2012
- [15] “Tacit learning: a biomimetic learning”, *The Annual conference of the institute of systems, control and information engineers*, Japan, 2011
- [16] “Robot Intelligence - Hardware intelligence and Software intelligence”, *I-shu university symposium*, Taiwan, 2010
- [17] “Learning scheme based on biological control principle”, *1st Control theory working seminar*, Japan, 2009

**Patent Application Number**

- P2007-76807 PowerAssist (2005-266438) (Japan)
- P2009-087114 Tacit learning (2007-257123) (Japan)
- P2008-213119 Collaboration Task (2007-056681) (Japan)

- PTC/JP2008/067774 Tacit learning (International)
- P2008-36777 task assist device (2006-214618) (Japan)
- P2008-126888 Window fitting (2006-315580) (Japan)
- P2009-39814 power assist (2007-207152) (Japan)
- P2009-39815 power assist2 (2007-207228) (Japan)
- P2008-225607 Tacit learning (2007-059672) (Japan)
- P2009-39814 power assist (2007-207152) (Japan)
- P2009-39815 power assist (2007-207228) (Japan)
- P2015-73805 SSI SCI (Japan)
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