

Kazutaka Takahashi

Postdoctoral scholar

Department of Organismal Biology and Anatomy

University of Chicago

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General Information

Nationality: Japanese Citizen

Date of Birth: 15 September 1972

Marital Status: Married

EDUCATION

Ph. D. in Control and Estimation February 2007

Massachusetts Institute of Technology, Cambridge MA

Major: Control and Estimation Minor: Biomedical Engineering

Thesis title: *Modeling cerebrotocerebellar control in horizontal planar arm movements of humans and the monkey*

Bachelor in Aerospace Engineering and Mechanics with distinction August 1997

University of Minnesota, Twin Cities, Minneapolis, MN

EXPERIENCE

Postdoctoral scholar Oct. '06 - Present

Nicholas Hatsopoulos Laboratory, Department of Organismal Biology and Anatomy

University of Chicago, Chicago, IL

- Spatiotemporal analysis of motor cortical activities recorded using multielectrode arrays and of interactions of local field potentials and unit spiking activities.
- Modeling of skeletomuscular system of an upper extremity
- Characterization of cortical activities during reaching and grasping
- Analysis of neural activity during chewing behaviors (joint work with Prof. Ross in OBA at University of Chicago)

Research Assistant Jan. '00 - Jan. '06

Computer Science and Artificial Intelligence Laboratory (CSAIL) and

Laboratory for Information and Decision Systems (LIDS), MIT Cambridge, MA

- Analysis and modeling of primate neuromuscular systems: Modeling of cerebrocerebellar function for limb control, application of optimal or nonlinear control for primate motor system, analysis and characterization of limb kinematics.

Teaching Assistant / Recitation Instructor Sep. '00 - May '06

Dept. of Electrical Engineering and Computer Science (EECS) MIT, Cambridge MA

- Recitation instructor for Signals and Systems (6.003) for one semester
- Head teaching assistant for Signals and Systems (6.003) for five semesters
- Teaching assistant for Signals and Systems (6.003), Introduction to Communication, Control, and Signal Processing (6.011), Dynamic Systems and Control (6.241) for one semester respectively

Teaching assistant for High Performance Computation (SMA5221) Jan. '00 - May '00

Singapore MIT Alliance (SMA), MIT, Cambridge, MA

Research Assistant

Jan. '98 - Jan '00

Information Control Engineering Group

Dept. Aeronautics and Astronautics, MIT, Cambridge, MA

- Dynamical system modeling of rotating machinery and turbomachinery blades
- DSP implementation of MIMO optimal controllers for gas turbine compressor blades

Teaching assistant for Advanced Aircraft Control (16.333)

Jan. '98 - May '98

Dept. of Aeronautics and Astronautics, MIT, Cambridge, MA

Undergraduate Research Project

Jan. '97 - Aug. '97

Dept. of Aerospace Engineering and Mechanics, U of Minnesota, Minneapolis, MN

- System identification of shape memory alloy as active sensor and actuator for flexible structural control application.

Undergraduate Research Project

Jan. '96 - Aug. '96

Dept. of Aerospace Engineering and Mechanics, U of Minnesota, Minneapolis, MN

- Developing algorithm and visualization C++ codes for Particle Velocimetry for mixing flows.

PUBLICATIONS **Journal papers**

- Saleh M. **Takahashi K.**, Amit Y. and Hatsopoulos N.G., "Grasping in Primary Motor Cortex: Encoding Using a Generalized Linear Model Framework", In revision. *Journal of Neuroscience*.
- **Takahashi K.**, Saleh M., Penn R.D., and Hatsopoulos N.G., "Propagating waves in human motor cortex", In revision (highly reviewed, near acceptance) *Frontiers in Human Neuroscience*.
- **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "A model of Purkinje cell simple spiking and cerebellar control during circular hand movement", submitted to *Biological Cybernetics*.
- Roitman A.V., Massaquoi S.G., **Takahashi K.**, Ebner T.J., "Kinematic analysis of manual tracking in monkeys: characterization of movement intermittencies during a circular tracking task", *J.Neurophysiol.* 2004 Feb;91(2):901-11.

Book chapters

- Hatsopoulos N.G., Olmedo L., **Takahashi K.**, "Proximal-to-distal sequencing behavior and motor cortex" accepted for *Progress in Motor control*
- Jo S. and **Takahashi K.** (2010). "Neurobiologically inspired distributed and hierarchical system for control and learning", *Biomimetics Learning From Nature*, Amitava Mukherjee (Ed.), INTECH, ISBN: 978-953-307-025-4, Available from: <http://sciyo.com/articles/show/title/neurobiologically-inspired-distributed-and-hierarchical-system-for-control-and-learning> (**both authors contributed equally**).

Peer reviewed conference papers

- **Takahashi K.**, Massaquoi S.G., "Neuroengineering Model of human limb control - gainscheduled feedback control approach", 46th IEEE Conference on Decision and Control, New Orleans, LA., Dec., 2007
- Massaquoi, S.G., Jo, S. and **Takahashi, K.**, "Cerebro-cerebellar implementation of gainscheduled feedback control", 45th Annual Allerton Conference, Urbana-Champaign, IL 2007

Conference talks/posters

- (talk) Suminski A.J. **Takahashi K.**, Hatsopoulos N.G., "Differential modulation of beta local field potentials in motor cortex during multi-sensory action observation", in Nanosymposium on Cortical Neurophysiology for Movement Control, The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (talk) **Takahashi K.**, Ross C., Hatsopoulos N.G., Iriarte-Diaz J., Lemberg J., "Relation between local field potentials in MIO and feeding behavior in macaque monkeys" in Nanosymposium on Dynamics of Large Neuron Assemblies, The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (talk) **Takahashi K.**, Massaquoi S.G., "Neuroengineering Model of human limb control - gainscheduled feedback control approach", 46th IEEE Conference on Decision and Control, New Orleans, LA., Dec., 2007
- (talk) **Takahashi K.**, Hatsopoulos N.G., "Copropagating waves of local field potentials and single-unit spiking in motor cortex", The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2007
- (poster) Olmedo L., **Takahashi K.**, Rajan A. and Hatsopoulos N.G., "Proximal to distal sequencing behavior and spatiotemporal dynamics of beta oscillations in primary motor cortex during self-paced simulated climbing" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) **Takahashi K.**, Iriarte-Diaz J., Ross C., and Hatsopoulos N.G., "Various phases of feeding behaviors in macaque monkeys are signaled by multiple bands of local field potentials in MIO" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Saleh M., **Takahashi K.**, Amit Y., Hatsopoulos N.G., "Grasping in primary motor cortex: Encoding study using the generalized linear model framework" The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Brown, K.A., **Takahashi K.**, Iriarte-Diaz J., Hatsopoulos N.G., Ross C., MI-orofacial neurons modulate activity with stage of chewing sequence and phase of chewing cycle, The annual meeting, Society for Neuroscience, San Diego, CA., Nov., 2010
- (poster) Ross C., Hatsopoulos N.G, Konecki M., Iriarte-Diaz J., **Takahashi K.**, "MIO neuron activity modulates to phases of the gape cycle during feeding in macaque monkeys" The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (poster) Saleh M., **Takahashi K.**, Amit Y., Hatsopoulos N.G., "Encoding of grasping kinematics in primary motor cortex" The annual meeting, Society for Neuroscience, Chicago, IL., Oct., 2009
- (poster) **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Nonlinear anatomical cerebrotocerebellar model of Purkinje cell simple spiking", The annual meeting, Society for Neuroscience, Washington D.C., Nov., 2005
- (poster) **Takahashi K.**, Roitman A.V., Ebner T.J., Massaquoi S.G., "Nonlinear models of Purkinje cell simple spike and cerebrotocerebellar control during primate circular arm movement", The Society of the Neural Control of Movement Annual Meeting, Key Biscayne, FL., April, 2005

AWARDS

- MIT EECS - Department Special Recognition Award (2005)
- MIT EECS - Frederick C. Hennie III Teaching Award (2002)

PROFESSIONAL ACTIVITIES *Participant* Sep-Oct. '10
International Workshop on Timing and Dynamics in Biological Systems at Max-Planck Institute, Dresden, Germany

Participant Nov. '09
International Workshop in Synchronization and Multiscale Complex Dynamics in the Brain at Max-Planck Institute, Dresden, Germany

Participant Aug. '06
Summer course in Neuroinformatics at Marine Biology Laboratory, Woods Hole, MA

Session Organizer and Chair Dec. '09
Control and estimation applications in neuroscience session, 48th IEEE Conf. on Decision and Control, Shanghai, China

Reviewers IEEE EMBS conference 2009, 2010

Session Organizer and Chair Dec. '08
Control and estimation applications in neuroscience session, 47th IEEE Conf. on Decision and Control, Cancun, Mexico

Invited instructor Dec. '08
Workshop on control and estimation applications in neuroscience, 47th IEEE Conf. on Decision and Control, Cancun, Mexico

Chicago Chapter Chair IEEE Engineering in Medicine and Biology Society

INVITED TALKS

- National Center for Neurology and Psychiatry, Japan, Mar 2010
- National Institute for Physiological Sciences, Japan, Mar 2010
- Northeastern University, Sep 2008
- University of Illinois Urbana-Champaign, Apr 2008
- Tokyo Metropolitan Institute for Neuroscience, Dec 2007
- Tamagawa University, Japan, Dec 2007
- University of Minnesota, March 2006
- University of Chicago, March 2006
- NYU, March 2006

PROFESSIONAL ASSOCIATIONS

- IEEE Control System Society
- IEEE Engineering in Medicine and Biology Society
- The Neural Control of Movement Society
- Society for Neuroscience

REFERENCES

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