

# Takaaki Shiratori

## Contact Information

Disney Research, Pittsburgh, Walt Disney Imagineering  
4720 Forbes Avenue, Suite 110  
Pittsburgh PA 15213 USA  
Phone: +1-412-688-7405 (office), +1-412-973-1871 (cell)  
E-Mail: shiratori@disneyresearch.com  
Web: <http://www.cs.cmu.edu/~siratori/>

## Research Objective

To develop systems for capturing, designing, and interacting with animations of characters and robots.  
Research fields: Computer Graphics, Computer Vision, Human-Computer Interaction, Robotics.

## Education

Ph.D. in Information and Communication Engineering, March 2007  
The University of Tokyo, Japan  
Dissertation: "Synthesis of Dance Performance Based on Analyses of Human Motion and Music"  
Supervisor: Prof. Katsushi Ikeuchi

M.E. in Information and Communication Engineering, March 2004  
The University of Tokyo, Japan  
Thesis: "Detecting Dance Motion Structure using Motion Capture and Musical Information"  
Supervisor: Prof. Katsushi Ikeuchi

B.E in Information and Communication Engineering, March 2002  
The University of Tokyo, Japan  
Thesis: "Stabilization for Wearable Videos"  
Supervisor: Prof. Kiyoharu Aizawa  
Graduated with High Honors

## Research Experience

**Postdoctoral Associate** October 2010 – Present  
Disney Research, Pittsburgh, Walt Disney Imagineering  
Pittsburgh, PA, USA  
Advisor: Prof. Jessica K. Hodgins  
– Designing and developing user interfaces for character animation and 3D modeling.

**Adjunct Researcher** April 2011 – Present  
The University of Tokyo  
Tokyo, Japan  
Collaborator: Prof. Katsushi Ikeuchi  
– Studying online motion generation for humanoid robots.

**Visiting Researcher** October 2010 – Present  
**Project Scientist** April 2009 – September 2010  
**Postdoctoral Fellow** April 2008 – March 2009  
**Visiting Researcher** April 2007 – March 2008  
Robotics Institute, Carnegie Mellon University  
Pittsburgh, PA, USA  
Advisor: Prof. Jessica K. Hodgins  
– Designed and developed user interfaces for character animation.  
– Studied physically-based simulation for character animation.

**Ph.D. Candidate** April 2004 – March 2007  
**Masters Student** April 2002 – March 2004  
Dept. of Information and Communication Engineering, The University of Tokyo  
Tokyo, Japan  
Advisor: Prof. Katsushi Ikeuchi

- Studied motion representations and generation for humanoid robots.

#### Research Intern

Visual Computing Group, Microsoft Research Asia

Advisors: Dr. Yasuyuki Matsushita and Dr. Sing Bing Kang

- Studied video inpainting using optical flow.

July 2005 – November 2005

Beijing, P. R. China

## List of Publications

### A. Book Chapter

1. Takaaki Shiratori, Yasuyuki Matsushita, Sing Bing Kang, Xiaou Tang, “Video Completion by Motion Field Transfer,” *Innovation Together: Microsoft Research Asia Academic Research Collaboration*, Lolan Song Ed., ISBN 978-0-387-87860-7, Chapter 3, Springer-Verlag, 2008.

### B. Refereed Journal Articles

1. Takaaki Shiratori, Hyun Soo Park, Leonid Sigal, Yaser Sheikh, Jessica K. Hodgins, “Motion Capture from Body-Mounted Cameras,” *ACM Transactions on Graphics*, Vol. 30, No. 4 (*Proc. ACM SIGGRAPH*), July 2011.
2. Takaaki Shiratori, Jessica K. Hodgins, “Accelerometer-based User Interfaces for the Control of a Physically Simulated Characters,” *ACM Transactions on Graphics*, Vol. 27, No. 5 (*Proc. ACM SIGGRAPH Asia*), December 2008.
3. Takaaki Shiratori, Katsushi Ikeuchi, “Synthesis of Dance Performance Based on Analyses of Human Motion and Music,” *IPSJ Transactions on Computer Vision and Image Media*, Vol. 1, No.1, pp. 34–47, June 2008.
4. Manoj Perera, Takaaki Shiratori, Shunsuke Kudoh, Atsushi Nakazawa, Katsushi Ikeuchi, “Task Recognition and Person Identification in Dance Sequences with Multi Factor Tensor Analysis,” *IEICE Transactions on Information and Systems*, Vol. E91–D, No. 5, pp. 1531–1542, May 2008.
5. Katsushi Ikeuchi, Takaaki Shiratori, Shunsuke Kudoh, Hirohisa Hirukawa, Shin’ichiro Nakaoka, Fumio Kanehiro, “Robots that Learn to Dance from Observation,” *IEEE Intelligent Systems*, Vol. 23, No. 2, pp. 74–76, March 2008.
6. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, “Dancing-to-Music Character Animation,” *Computer Graphics Forum*, Vol. 25, No. 3 (*Proc. Eurographics*), pp. 449–458, September 2006.
7. Atsushi Nakazawa, Shin’ichiro Nakaoka, Takaaki Shiratori, Katsushi Ikeuchi, “Analysis and Synthesis of Human Motions using Motion Capture,” *The Journal of Three Dimensional Images*, Vol. 17, No. 4, pp. 77–84, December 2003.

### C. Refereed Conference Papers

1. Naoki Numaguchi, Atsushi Nakazawa, Takaaki Shiratori, Jessica K. Hodgins, “A Puppet Interface for Retrieval of Motion Capture Data,” In *Proc. ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, pp. 157-166, August 2011.
2. Karl D. D. Willis, Ivan Poupyrev, Takaaki Shiratori, “MotionBeam: A Metaphor for Character Interaction with Handheld Projectors,” In *Proc. ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)*, Papers and Notes, pp. 1031–1040, May 2011.
3. Huber P. H. Shum, Taku Komura, Takaaki Shiratori, Shu Takagi, “Physically-based Character Control in Low Dimensional Space,” In *Proc. International Conference on Motion in Games (MIG)*, pp. 23–34, October 2010.
4. Shunsuke Kudoh, Takahiro Okamoto, Takaaki Shiratori, Shin’ichiro Nakaoka, Katsushi Ikeuchi, “Toward a Dancing-to-Music Humanoid Robot: Temporal Scaling Model of Whole Body Motion for a Dancing Humanoid Robot,” In *Proc. International Workshop on Robots and Musical Expressions* (in conjunction with IROS 2010), October 2010.

5. Takahiro Okamoto, Takaaki Shiratori, Shunsuke Kudoh, Katsushi Ikeuchi, "Temporal Scaling of Leg Motion for Music Feedback System of a Dancing Humanoid Robot," In *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 2256–2263, October 2010.
6. Bjoern Rennhak, Takaaki Shiratori, Shunsuke Kudoh, Phongtharin Vinayavekhin, Katsushi Ikeuchi, "Detecting dance motion structure using body components and turning motions," In *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 2264–2269, October 2010.
7. Hyun Soo Park, Takaaki Shiratori, Iain Matthews, Yaser Sheikh, "3D Reconstruction of a Moving Point from a Series of 2D Projections," In *Proc. European Conference on Computer Vision (ECCV)*, pp. 158–171, September 2010 (oral presentation).
8. Takaaki Shiratori, Brooke Coley, Rakié Cham, Jessica K. Hodgins, "Simulating Balance Recovery Responses to Trips Based on Biomechanical Principles," In *Proc. ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, pp. 37–46, August 2009.
9. Takaaki Shiratori, Atsushi Nakazawa, Shin'ichiro Nakaoka, Shunsuke Kudoh, Katsushi Ikeuchi, "Task Models of Upper Body Motion for a Dancing Humanoid Robot Based on Motion and Music Features," In *Proc. International Workshop on Art and Robots* (in conjunction with IROS 2008), September 2008.
10. Takaaki Shiratori, Shunsuke Kudoh, Shin'ichiro Nakaoka, Katsushi Ikeuchi, "Temporal Scaling of Upper Body Motion for Sound Feedback System of a Dancing Humanoid Robot," In *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3251–3257, October 2007.
11. Manoj Perera, Takaaki Shiratori, Shunsuke Kudoh, Atsushi Nakazawa, Katsushi Ikeuchi, "Multilinear Analysis for Task Recognition and Person Identification," In *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1409–1415, October 2007.
12. Miti Ruchanurucks, Shunsuke Kudoh, Koichi Ogawara, Takaaki Shiratori, Katsushi Ikeuchi, "Humanoid Robot Painter: From Object to Trajectory," In *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 339–345, October 2007.
13. Jun Takamatsu, Takaaki Shiratori, Shin'ichiro Nakaoka, Shunsuke Kudoh, Atsushi Nakazawa, Fumio Kanehiro, Katsushi Ikeuchi, "Entertainment Robot: Learning from Observation Paradigm for Humanoid Robot Dancing," In *Proc. International Workshop on Art and Robots* (in conjunction with IROS 2007), October 2007.
14. Miti Ruchanurucks, Shunsuke Kudoh, Koichi Ogawara, Takaaki Shiratori, Katsushi Ikeuchi, "Humanoid Robot Painter: Visual Perception and High-Level Planning," In *Proc. IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3028–3033, April 2007.
15. Daisuke Miyazaki, Mawo Kamakura, Tomoaki Higo, Yasuhide Okamoto, Rei Kawakami, Takaaki Shiratori, Akifumi Ikari, Shintaro Ono, Yoshihiro Sato, Mina Oya, Masayuki Tanaka, Katsushi Ikeuchi, Masanori Aoyagi, "3D Digital Archive of the Burghers of Calais," In *Proc. International Conference on Virtual Systems and Multimedia (VSMM)*, pp. 399–407, October 2006.
16. Manoj Perera, Takaaki Shiratori, Shunsuke Kudoh, Atsushi Nakazawa, Katsushi Ikeuchi, "Task Recognition and Style Analysis in Dance Sequences," In *Proc. IEEE Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, pp. 329–334, September 2006.
17. Takaaki Shiratori, Yasuyuki Matsushita, Sing Bing Kang, Xiaoou Tang, "Video Completion by Motion Field Transfer," In *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 411–418, June 2006.
18. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Synthesizing Dance Performance Using Musical and Motion Features," In *Proc. IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3654–3659, May 2006.
19. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Detecting Dance Motion Structure using Motion Capture and Musical Information," In *Proc. International Conference on Virtual Systems and Multimedia (VSMM)*, November 2004.

20. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Detecting Dance Motion Structure through Music Analysis," In *Proc. IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, pp. 857-862, May 2004.
21. Atsushi Nakazawa, Shinichiro Nakaoka, Takaaki Shiratori, Katsushi Ikeuchi, "Analysis and Synthesis of Human Motions using Motion Capture," In *Proc. International Conference on Humans and Computers (HC)*, August 2003.
22. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Rhythmic Motion Analysis using Motion Capture and Musical Information," In *Proc. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, pp. 89-94, July 2003.
23. Atsushi Nakazawa, Shinichiro Nakaoka, Takaaki Shiratori, Katsushi Ikeuchi, "Analysis and Synthesis of Human Dance Motions," In *Proc. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, pp. 83-88, July 2003.

#### **D. Conference Abstract & Unrefereed Conference Papers**

1. Takaaki Shiratori, Brooke Coley, Rakié Cham, Jessica K. Hodgins, "Modeling and Simulation of Balance Recovery Responses to Tripping," In *Proc. Annual Meeting for the American Society of Biomechanics*, August 2009.
2. Takaaki Shiratori, Yasuyuki Matsushita, Sing Bing Kang, Xiaou Tang, "Video Completion by Motion Field Transfer," In *Proc. Microsoft IJARC Symposium*, November 2006.
3. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Structure Detection of Dance Sequence using Motion Capture and Musical Information," In *Proc. International Symposium on CREST Digital Archiving Project*, March 2005.

#### **E. Invited Articles**

1. Takaaki Shiratori, Jessica K. Hodgins, "Interface for Controlling a Character: Designing and Evaluating Accelerometer-based User Interfaces," *Image Lab*, Japan Industrial Publishing Co. Ltd., January 2009 (in Japanese).
2. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Digitizing Human Motion and its Application: Analyzing and Synthesizing Dance Motion Using Motion Capture and Musical Information," *Image Lab*, Japan Industrial Publishing Co. Ltd., March 2006 (in Japanese).

#### **F. Invited/Seminar Talks**

1. "User Interfaces for Character Animation and Character Interaction"  
SRI Sarnoff, Host: Dr. Ajay Divakaran, Apri 2012.  
Microsoft Research Asia, Host: Dr. Yi Ma and Dr. Yasuyuki Matsushita, March 2012.
2. "3D Motion Reconstruction from Images and Videos: Inside-out and Outside-in Approaches"  
Georgia Institute of Technology, Host: Prof. Irfan Essa, October 2011.  
Columbia University, CVGC Seminar, Host: Prof. Eitan Grinspun and Dr. Hao Li, October 2011.  
University of California, Berkeley, Host: Prof. Ruzena Bajcsy, September 2011.  
Stanford University, Host: Prof. Vladlen Koltun, September 2011.  
The University of Tokyo, Host: Prof. Yoichi Sato, July 2011.  
The University of Tokyo, Host: Prof. Katsushi Ikeuchi, June 2011.  
The University of Electro-Communications, Host: Prof. Shunsuke Kudoh, June 2011.
3. "Accelerometer-based User Interfaces for the Control of a Physically Simulated Character"  
Toppan Printing Co. Ltd., Host: Dr. Tomohito Masuda, July 2009.  
OLM Digital, Inc., Host: Dr. Ken Anjyo, July 2009.  
Osaka University, Host: Prof. Atsushi Nakazawa, July 2009.  
The University of Tokyo, Host: Prof. Katsushi Ikeuchi, July 2009.

The University of Tokyo, Host: Prof. Toshihiko Yamasaki, December 2008.

*Guest lecture* for Course "Physically Based Character Animation," Carnegie Mellon University, Instructor: Prof. Nancy S. Pollard, April 2009.

4. "Controlling a Character with Sensors"  
Square Enix Co. Ltd., Host: Mr. Naoto Yoshioka, June 2009.
5. "User Interfaces for Capturing and Controlling a Human-like Character"  
Disney Research, Pittsburgh, Host: Prof. Jessica K. Hodgins, November 2008.
6. "Synthesis of Dance Performance Based on Analyses of Human Motion and Music"  
Carnegie Mellon University, Host: Prof. Jessica K. Hodgins, June 2007.
7. "Dancing-to-Music Character Animation"  
Digital Human Research Center, National Institute of Advanced Industrial Science and Technology (AIST),  
Host: Prof. Shigeru Kuriyama, August 2006.  
*Invited Talk*, The Visual Computing/IPSJ SIG-CG Joint Symposium, June 2006.
8. "Detecting Dance Structure Using Motion Capture and Music Information"  
*Guest Lecture* for Course "Character Animation", University of Aizu, Japan, Instructor: Prof. Minoru Ueda,  
May 2004.

## G. Patents

1. Takaaki Shiratori, Hyun Soo Park, Leonid Sigal, Yaser Sheikh and Jessica K. Hodgins, "Motion Capture from Body-Mounted Cameras," US Patent Application 13/165,619, 2011.
2. Takaaki Shiratori, Yasuyuki Matsushita, Sing Bing Kang and Xiaou Tang, "Video Completion by Motion Field Transfer," US Patent Application 11/559,861, 2006.
3. Takaaki Shiratori, Atsushi Nakazawa, Katsushi Ikeuchi, "Methods and programs for synthesizing dance motion," Japan Patent Application 2005-200922, 2005.

## Honors

- Research Fellowship for Young Scientists (DC2 & PD), Japan Society for the Promotion of Science, April 2006 - March 2008.

## Funding

- JSPS Research Promotion Fund for Young Scientists, "A Study on Analysis and Synthesis of Human Motion for Sound Feedback Control," PI: Takaaki Shiratori, April 2006 - March 2008, ¥1,900,000 (approx. \$19,000).

## Professional Activities

- Program committee member:  
ACM SIGGRAPH Asia Sketch & Poster (2009), ACM SIGGRAPH/Eurographics Symposium on Computer Animation (2009), IEEE International Conference on Computer Vision (2009).
- Journal reviewer:  
ACM SIGGRAPH, ACM SIGGRAPH Asia, Eurographics, IEEE Transactions on Visualization and Computer Graphics, IEEE Transactions on Circuits and Systems for Video Technology, Computer & Graphics, The Visual Computer, SPIE Optical Engineering, Neural Networks, EURASIP Journal on Advances in Signal Processing, EURASIP Journal on Audio, Speech, and Music Processing, Transactions on Virtual Reality Society of Japan, Journal of Robotics Society of Japan, IEICE Transactions on Information and Systems.

- Conference reviewer: European Conference on Computer Vision, IEEE Virtual Reality, ACM Symposium on User Interface Software and Technology, ACM SIGCHI Conference on Human Factors in Computing Systems (Papers & Notes), IEEE International Conference on Robotics and Automation, IEEE/RSJ International Conference on Intelligent Robotics and Systems, IEEE-RAS International Conference on Humanoid Robots, IEEE International Symposium on Robot and Human Interactive Communication, International Workshop on Robots and Musical Expressions, Computer Graphics International, APSIPA Annual Summit and Conference.
- A member of IEEE and ACM.

## Student Mentoring

- Naoki Numaguchi, M.S., Osaka University, now working at Sony  
Puppet interface for retrieving motion capture data (C.1, F.1), April 2009 - March 2011.
- Kei Ninomiya, M.S., Osaka University, now working at Nintendo  
Puppet interface for editing character animations, April 2009 - March 2011.
- Takahiro Okamoto, Ph.D. student at The University of Tokyo  
Music feedback system for entertainment robots (C.4, C.5, F.2), April 2009 - Present.
- Hyun Soo Park, Ph.D. student at Carnegie Mellon University  
Non-rigid structure from motion (B.1, C.7), November 2009 - Present.
- Karl D. D. Willis, Ph.D. candidate at Carnegie Mellon University  
Character interaction using handheld projectors (C.2, F.4), June 2010 - Present.

## Selected Media Coverage

IEEE Spectrum (September 2011 Issue), "News Brief: Motion Capture in Reverse," 2011.  
 Essential Public Radio, "Body Mounted Cameras Coming to The People," 2011.  
 Reuters, "Body-Mounted Cameras Turn Motion Capture Inside Out," 2011.  
 MSNBC, "A big move for motion capture," 2011.  
 Discovery News, "Actors Wear 20 Cameras for New Motion Capture," 2011.  
 Washington Post, "Body-Mounted Cameras Turn Motion Capture Inside Out," 2011.  
 International Business Times, "With Wearable Cameras, Motion Capture Turns Inside Out," 2011.  
 Pittsburgh Business Times, "CMU and Disney Research Pittsburgh take motion capture to new levels," 2011.  
 PR Newswire, "Body-Mounted Cameras Turn Motion Capture Inside Out," 2011.  
 Pittsburgh Post-Gazette, "CMU teams with Disney to refine human-like animation," 2011.  
 Wired.com, "Disney Research Turns Mo-Cap Inside-Out With Body-Mounted Cameras," 2011.  
 Gizmodo, "Disney's New Way to Do Motion Capture Lets You Record It Anywhere," 2011.  
 Slashdot, "Breaking Motion Capture Out of the Studio," 2011.  
 TechCrunch, "Disney And Carnegie Mellon Create Motion Capture On The Go," 2011.  
 Gizmag, "Motion capture system makes actors the camera instead of putting them in front of it," 2011.  
 Laser Focus World, "Body-mounted cameras view surroundings, capture subject's motions," 2011.  
 New Scientist, "Cellphone motion projector throws gaming onto the wall," 2011.  
 Creative Applications Network, "MotionBeam," 2011.  
 PCWorld, "MotionBeam Lets You Control Games With a Projector," 2011.  
 Wired, "Augmented Reality: Disney Research Projects Cartoon Characters Into Real Spaces," 2011.  
 TechCrunch, "Disney Research Shows Pico Projector-Based Games With MotionBeam Prototype," 2011.  
 TechNewsDaily, "Disney Ups the Ante in Hand-Held Gaming Technology," 2011.  
 CNET Asia, "Disney MotionBeam weds Pico projection with motion control," 2011.

## Spoken Language

English (fluent) and Japanese (native).

April 10, 2012