

HYUN SOO PARK

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RESEARCH INTEREST

To develop and design machines that integrate social intelligence into their functions.

- **Social intelligence:** social scene understanding; social cameras; ego-centric vision; social behavior prediction; 3D joint attention (social saliency); social anomaly detection
- **Motion reconstruction:** 3D reconstruction of dynamic scenes (nonrigid/rigid structure from motion); markerless motion capture; inside-out motion capture; intent capture
- **Robotics:** social robot; robot dynamics and controls; motion planning; vision-based SLAM

EDUCATION

2009-2014

Ph.D. in Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA, USA

Thesis: Social scene understanding from social cameras ([thesis link](#))

Area of study: Computer vision and graphics

Advisor: Prof. Yaser Sheikh

Thesis committees: Prof. Yaser Sheikh

Prof. Jessica Hodgins

Prof. Kenji Shimada

Prof. Leven Burak Kara

Prof. Chris Bregler (external member)

2009

M.S. in Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA, USA

Bio-inspired quadrupedal water running robot

Area of study: Multibody dynamics and controls

Advisor: Prof. Metin Sitti

2007

B.S. in Mechanical Engineering, POSTECH, Pohang, Korea

RESEARCH AND INTERNSHIP

- 2009-2014 **Research Assistant (Ph.D.)** in Carnegie Mellon University, Pittsburgh, PA, USA
I developed a computational basis for social scene understanding from social cameras — a camera held or worn by a social member that inherits his/her gaze behavior. The social cameras encode scene motion (exo-motion) and gaze motion of wearers (ego-motion). I provided a 3D representation of the exo-motion from multiview social cameras via 3D dynamic scene reconstruction. In conjunction with the exo-motion, I studied social behavior captured by ego-motion of the social cameras, which provided a predictive model of social scenes.
Advisor: Prof. Yaser Sheikh
- Summer, 2013 **Internship** in Microsoft Research, Redmond, WA, USA
While **Microsoft PhotoSynthTM** provides compelling viewing experiences for navigating static scenes, it cannot be applicable for dynamic scenes. I developed a method to navigate a dynamic scene in 3D captured by a monocular camera.
Groups: **Graphics, Interactive Visual Media**
Mentors: Dr. Neel Joshi
 Dr. Sudipta Sinha
- Summer, 2011 **Internship** in Disney Research, Pittsburgh, PA, USA
I developed a method to cluster 2D trajectories of human body motion and to estimate joint location based on the clustering from a monocular video sequence.
Mentor: Dr. Leonid Sigal
- 2007-2009 **Research Assistant (M.S.)** in Carnegie Mellon University, Pittsburgh, PA, USA
I designed and implemented a bio-inspired robotic system that is capable of running on the water surface using the drag force induced by a compliant foot pad. I developed a computational model for the water running robot that allowed me to study the dynamics, controls, and stability.
Advisor: Prof. Metin Sitti
- 2007-2009 **Independent Research (M.S.)** in Carnegie Mellon University, Pittsburgh, PA, USA
I implemented a bearing only visual SLAM on the LAGR robot platform for multi-agent coverage missions.
Advisor: Prof. Howie Choset
- 2007-2008 **Part-time Research Associate** in SimLab Co., Seoul, South Korea
I developed an automatic mathematical model creating software for the RoboticsLab simulator. The algorithm takes CAD models and produces a mathematical model to simulate full multibody dynamics and controls. The software is featured in the commercialized robotics simulator, **RoboticsLab**
Supervisors: Dr. Jonghoon Park
 Dr. Kyung-sok Chang
- 2007 **Research Associate** in Pohang Institute of Intelligent Robotics, Pohang, South Korea
I implemented a robotic and haptic simulator, piroCORE which was a prototype of RoboticsLab.
Mentor: Dr. Jonghoon Park
- Winter, 2005 **Internship** in WebENG Korea, Seoul, South Korea
I implemented a dynamics engine for a collision simulation in a mobile car game.

TEACHING

Spring, 2014	Guest lecture on “Structure from Motion and its Applications”, Computer Vision in Carnegie Mellon University, PA, USA Instructor: Dr. Kris Kitani
Spring, 2013	Guest lecture on “Nonrigid Structure from Motion”, Geometry based Methods in Vision in Carnegie Mellon University, PA, USA Instructor: Prof. Martial Hebert
Fall, 2012	Assistantship on Engineering Computation in Carnegie Mellon University, PA, USA Instructor: Dr. Soji Yamakawa
Fall, 2011	Assistantship on Fundamental of Mechanical Engineering in Carnegie Mellon University, PA, USA Instructor: Prof. Jack Beuth
Spring, 2007	Assistantship on Advanced Robotics in POSTECH, Pohang, South Korea Instructor: Dr. Jonghoon Park

PUBLICATION

2014	*I. Arev, * H. S. Park , Y. Sheikh, J. Hodgins, and A. Shamir, “Automatic Editing of Footage from Multiple Social Cameras”, ACM Transactions on Graphics (SIGGRAPH) (* indicates joint first authors) H. Joo, H. S. Park , and Y. Sheikh, “ Optimal Visibility Estimation for Large-scale Dynamic 3D Reconstruction ”, IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
2013	H. S. Park , E. Jain, and Y. Sheikh, “ Predicting Primary Gaze Behavior using Social Saliency Fields ”, International Conference on Computer Vision (ICCV) H. S. Park* , Y. Wang*, E. Nurvitadhi, J. C. Hoe, Y. Sheikh, and Mei Chen, “3D Point Cloud Reduction using Mixed-integer Quadratic Programming”, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Second International Workshop on Visual Analysis and Geo-Localization of Large-Scale Imagery (* indicates equal contribution)
2012	H. S. Park , E. Jain, and Y. Sheikh, “ 3D Social Saliency from Head-mounted Cameras ”, Advances in Neural Information Processing Systems (NIPS)
2011	T. Shiratori, H. S. Park , L. Sigal, Y. Sheikh, and J. Hodgins, “ Motion Capture from Body-Mounted Cameras ”, ACM Transactions on Graphics (SIGGRAPH) H. S. Park and Y. Sheikh, “ 3D Reconstruction of a Smooth Articulated Trajectory from a Monocular Image Sequence ”, International Conference on Computer Vision (ICCV)
2010	H. S. Park , T. Shiratori, I. Matthews, and Y. Sheikh, “ 3D Reconstruction of a Moving Point from a Series of 2D Projections ”, European Conference on Computer Vision (ECCV) H. S. Park , S. Floyd, and M. Sitti, “Roll and Pitch Motion Analysis of a Biologically Inspired Quadruped Water Runner Robot”, International Journal of Robotics Research (IJRR)
2009	H. S. Park and M. Sitti, “Compliant Footpad Design Analysis for a Bio-Inspired Quadruped Amphibious Robot”, IEEE/RSJ International Conference on Intelligent Robots and System (IROS)

- H. S. Park**, S. Floyd, and M. Sitti, “Dynamic Modeling and Analysis of Pitch Motion of a Basilisk Lizard Inspired Quadruped Robot Running on Water”, International Conference on Robotics and Automation (ICRA)
- 2008 **H. S. Park**, S. Floyd, and M. Sitti, “Dynamic Modeling of a Basilisk Lizard Inspired Quadruped Robot Running on Water”, IEEE/RSJ International Conference on Intelligent Robots and System (IROS)
- H. S. Park**, S. Floyd, and M. Sitti, “3-D Simulation of Bio-inspired Water Running Robot”, International Symposium on Adaptive Motion of Animals and Machines (AMAM)
- Under review **H. S. Park**, T. Shiratori, I. Matthews, and Y. Sheikh, “3D Trajectory Reconstruction under Perspective Projection”, International Journal of Computer Vision (IJCV)

PATENT

- 2011 T. Shiratori, **H. S. Park**, L. Sigal, Y. Sheikh, and J. Hodgins, “Motion Capture from Body-mounted Cameras”, US Patent Application 13/165,619

INVITED TALK

- 2014 **Predicting Gaze Behavior using Gaze Fields**
- Mid Atlantic Computer Vision Workshop (MACVW)
- Social Scene Understanding from Social Cameras**
- Stanford University (hosted by Prof. Silvio Savarese)
 - University of Pennsylvania (hosted by Prof. Jianbo Shi)
 - Disney Research Pittsburgh (hosted by Dr. Iain Matthews)
- 2013 **Computational Sport Scene Understanding from Body-worn Cameras**
- ICCV Workshop on Vision-based Sports Analytics
- Social Scene Understanding from Social Cameras**
- ETHZ and Disney Research, Zurich (hosted by Prof. Marc Pollefeys)
 - Stanford University (hosted by Prof. Fei-Fei Li)
 - University of Washington (hosted by Prof. Steven Seitz)
 - University of Illinois at Urbana-Champaign (hosted by Prof. Derek Hoiem)
 - Toyota Technological Institute at Chicago (hosted by Prof. Raquel Urtasun)
 - University of California Irvine (hosted by Prof. Deva Ramanan)
 - Carnegie Mellon University VASC Seminar
- 2012 **Social Scene Understanding**
- Seoul National University (hosted by Prof. Jehee Lee)
 - Korea University (hosted by Prof. Nakju Doh)
 - POSTECH (hosted by Prof. Bohyung Han)

- 2011 **The Ins and Outs of Human Motion Reconstruction from Videos**
- New York University (hosted by Prof. Chris Bregler)
- 3D Reconstruction of a Smooth Articulated Trajectory from a Monocular Image Sequence**
- Carnegie Mellon University VASC Seminar
- 2010 **3D Reconstruction of a Moving Point from a Series of 2D Projections**
- Carnegie Mellon University VASC Seminar
- 2008 **Dynamic Modeling of a Basilisk Lizard Inspired Quadruped Robot Running on Water**
- Carnegie Mellon University Bennett Conference
- 2006 **Horizontally Movable Vehicle without Inclination**
- POSTECH-TokyoTech-KNU Joint Workshop in Mechanical Engineering

SELECTED PRESS COVERAGE

- 2013 Wired, **Head-mounted cameras could help robots socialise with humans**
 Talking Points Memo, **The Next Visual Frontier: Gaze Detection**
 Space Daily, **Head-mounted cameras could help robots understand social interactions**
 National Science Foundation, **Head-mounted Cameras Could Help Robots Understand Social Interactions**
 Kurzweil Accelerating Intelligence, **Head-mounted cameras could help robots understand social interactions**
- 2011 Washington Post, **Disney and Carnegie Mellon Create Mocap On The Go**
 MSNBC, **A big move for motion capture**
 Inside Science, **Motion Capture Inside Out**
 Pittsburgh Post-Gazette, **CMU teams with Disney to refine human-like animation**
 Reuters, **Body-Mounted Cameras Turn Motion Capture Inside Out**
 Slashdot, **Breaking Motion Capture Out of the Studio (Japanese version)**
 Discovery News, **Actors wear 20 cameras for new motion capture**
 Pittsburgh Business Times, **CMU and Disney Research Pittsburgh take motion capture to new levels**
 Wired, **Disney Research Turns Mo-Cap Inside-Out With Body-Mounted Cameras**
 Coolest Gadgets, **Motion capture technology improved by Carnegie Mellon and Disney**
 PR Newswire, **Body-Mounted Cameras Turn Motion Capture Inside Out**

TechCrunch, **Disney And Carnegie Mellon Create Motion Capture On The Go (Japanese version)**

slashCAM, **Free-body motion capture using cameras**

PROFESSIONAL SERVICE

Reviewer for Transactions on Graphics (TOG), Transactions on Visualization and Computer Graphics (TVCG), IET Computer Vision, CVPR (2014,2013,2012,2011,2010), ECCV (2012,2010), ICCV (2013,2011), ICRA (2014,2009)

Organizer of **5th International Workshop on Human Behavior Understanding (HBU'2014) in Conjunction with ECCV**

COLLABORATION

2013-present	Microsoft Research, Redmond
2009-present	Disney Research, Pittsburgh
2012-present	Intel Science and Technology Centers - Embedded Computing
2013	Texas Instruments

AWARD AND SCHOLARSHIP

2006	Bronze Medal from Capstone Design Fair Korea
2006	Encourage Award from Korea Intelligent Robot Contest
2004-2005	Superior Achievement Scholarship for 1st Rank GPA, POSTECH
2005-2006	Hyogok Scholarship from POSTECH
2000	Chongju Scholarship

EXPERIENCE

2001-2003	Military Service in ROK Army, South Korea
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REFERENCE

Available upon request.