Hyun Soo Park

CONTACT INFORMATION

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RESEARCH INTERESTS

Understanding social dynamics from body-mounted cameras; Active scene reconstruction in 3D (Nonrigid structure from motion); Motion capture from a camera network; Multiview geometry in computer vision; Robotic dynamics and controls; Motion planning

EDUCATION

Carnegie Mellon University, Pittsburgh, PA, 15213, USA

Ph.D., (09/2009 - present)

- Advisor: Prof. Yaser Sheikh
- Area of Study: Computer vision and computer graphics

M.S., (05/2009)

- Advisor: Prof. Metin Sitti
- Area of Study: Dynamics and controls in robotics

POSTECH, Pohang, Korea

B.S., (02/2007)

EXPERIENCE AND RESEARCH

Research Assistant **06/2009 - present**

- Advisor: Prof. Yaser Sheikh
- Motion capture from body-mounted cameras (SIGGRAPH 2011): We propose a novel motion capture system using body-mounted cameras. We attach a camera on each limb and the camera captures environments. From the camera poses which are reconstructed from the structure from motion algorithm and the camera network structure, an underlying human skeleton and its motion are estimated. This self-contained motion capture system allows us to capture in outside and wide area without drift.
- Trajectory reconstruction under perspective projection (ECCV 2010): We propose a linear solution for reconstructing the 3D trajectory of a moving point from its correspondence in a collection of 2D perspective images. We developed the geometric analysis of the trajectory triangulation problem by considering the relation between camera and point motion.
- Articulated trajectory reconstruction (ICCV 2011): Human body is an articulated structure by a joint and the distance between joints is fixed. We develop an algorithm to reconstruct trajectories which preserve the 3D distance from a monocular image sequence.
- Event visualization in 3D: When a compelling event (dynamic scene) attracts great attention, many points of view at many time instants are captured by the crowd's cameras. Leveraging this phenomenon, we propose the method which people can experience and navigate the event intuitively in 3D.

Teaching Assistant **Fall/2011**

- Fundamentals of Mechanical Engineering, CMU, USA
- Instructor: Prof. Jack Beuth

Internship **05/2011 - 08/2011**

- Disney Research, Pittsburgh
- Advisor: Dr. Leonid Sigal
- 2D trajectory clustering and joint position estimation for an articulated structure from a monocular image sequence.

Research Student **09/2007 - 05/2009**

- NanoRobotics Lab., CMU, USA
- Advisor: Prof. Metin Sitti
- Water running robot: We develop a bio-inspired robotic system which is capable of running on the water surface using the drag force induced by a footpad. Mathematical modeling enabled us to analyze design, dynamics, controls, and stability of the system and based on modeling, a real robot has been built.

Independent Research **12/2007 - 05/2009**

- BioRobotics Lab., CMU, USA
- Advisor: Prof. Howie Choset
- Vision-based SLAM: I programmed a vision based SLAM algorithm (using the extended Kalman filtering) on the LAGR robot platform for coverage missions with multi-robots.

Part-time Programmer **12/2007 - 08/2008**

- SimLab Co., Korea
- Advisor: Dr. Jonghoon Park
- Automatic mathematical model creation for RoboticsLab (a robotic simulator): I programmed an automatic mathematical model creating software for the RoboticsLab simulator using C++ and SolidWorks API. This program enables to user to simulate a robot from the CAD model directly. This is now commercialized: http://www.rlab.co.kr/

Teaching Assistant **Spring/2007**

- Advanced Robotics, Mechanical Engineering, POSTECH, Korea
- Instructor: Dr. Jonghoon Park

Research Associate **10/2006 - 07/2007**

- PIRO (Pohang Institute of Intelligent Robotics), Korea
- Advisor: Dr. Jonghoon Park
- Development of robotic simulator: I was involved in the development of a robotic simulator, piroCORE which was a prototype of RoboticsLab. Specifically, my tasks were a simulation of dynamics and haptic device implementations.

Internship **Winter/2005**

- WebENG Korea, Korea
- Development of a car racing game physics engine: I implemented a physics engine for car collision to generate realistic car racing game in mobile device.

Military Service **02/2001 - 04/2003**

- 6XX 19R CS/CO HQ, FDC, ROK Army in Chol-Won, Korea

Journal Publications

T. Shiratori, H. S. Park, L. Sigal, Y. Sheikh, and J. Hodgins Motion Capture from Body-Mounted Cameras *ACM Transactions on Graphics (Proc. ACM SIGGRAPH)*, August, 2011.

H. S. Park, T. Shiratori, I. Matthews and Y. Sheikh, Reconstructing a 3D Trajectory under Perspective Projection, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, (under review).

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*, December, 2009.

Conference Publications

H. S. Park and Y. Sheikh, 3D Reconstruction of a Smooth Articulated Trajectory from a Monocular Image Sequence, *2011 International Conference on Computer Vision (ICCV)*.

H. S. Park, T. Shiratori, I. Matthews, and Y. Sheikh, 3D Reconstruction of a Moving Point from a Series of 2D Projections (oral), *2010 European Conference on Computer Vision (ECCV)*.

H. S. Park and M. Sitti, Compliant Footpad Design Analysis for a Bio-Inspired Quadruped Amphibious Robot, *2009 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, *2009 International Conference on Robotics and Automation (ICRA)*.

H. S. Park, S. Floyd, and M. Sitti, Dynamic Modeling of a Basilisk Lizard Inspired Quadruped Robot Running on Water, *2008 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, *2008 International symposium on Adaptive Motion of Animals and Machines (AMAM)*.

Seminars

H. S. Park, The Ins and Outs of Human Motion Reconstruction from Videos, *Vision Learning Graphics Group Seminar (September, 26, 2011)*, Department of Computer Science, NYU.

H. S. Park, 3D Reconstruction of a Smooth Articulated Trajectory from a Monocular Image Sequence, *VASC Seminar (September, 19, 2011)*, Robotics Institute, CMU.

H. S. Park, 3D Reconstruction of a Moving Point from a Series of 2D Projections, *VASC Seminar (July, 12, 2010)*, Robotics Institute, CMU.

H. S. Park, Dynamic Modeling of a Basilisk Lizard Inspired Quadruped Robot Running on Water, *Bennett Conference*, Mechanical Engineering, CMU.

H. S. Park and S. Kim, Horizontally Movable Vehicle without Inclination, *2nd POSTECH-Tokyo Tech.-KNU Joint Workshop on Mechanical Engineering*.

Selected Press Coverages

Washington Post, **Disney and Carnegie Mellon Create Mocap On The Go**

MSNBC, **A big move for motion capture**

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**

Distinction and Scholarship

Bronze medal from *the Capstone Design Fair Korea* **11/2006**

Encouragement award from *the Korea Intelligent Robot Contest* **10/2006**

Superior achievement scholarship (1st rank), *POSTECH* **Spring/2004, Fall/2005**

Hyogok scholarship, *POSTECH* **Fall/2005, Spring,Fall/2006**

References

Prof. Yaser Sheikh
- Assistant research professor in Robotic Institute, School of Computer Science, CMU
- *E-mail*: yaser@cs.cmu.edu

Prof. Jessica Hodgins
- Professor in Robotic Institute and Computer Science Department, School of Computer Science, CMU
- *E-mail*: jkh@cs.cmu.edu