# Samarth Manoj Brahmbhatt

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## EDUCATION

*Master of Science in Engineering*, Robotics
University of Pennsylvania, PA GPA 3.81/4.00 Expected May 2014

*Bachelor of Technology*, Electronics & Communication Engineering
Nirma University, Ahmedabad, India GPA 9.04/10.00 May 2012

## RESEARCH EXPERIENCE

*GRASP Laboratory, University of Pennsylvania* Summer 2013

**Detection and 6-DOF pose estimation of objects from a single 2D image**

Collaborated with three other Ph.D. students under the guidance of Prof. Kostas Daniilidis to develop a system to detect objects in images using their shape and estimate their 6-DOF pose by matching the shape with the outline of a pre-computed 3D model in heavily cluttered scenes. Contributed to:

- SIFT feature based object outline matching for pose estimation
- Motion-field based algorithm for iteratively deciding the pose of the 3D model in space to match its silhouette with outline of detected object
- Putting the silhouette extraction, detection and pose-estimation modules together into an efficient pipeline executable on a Willow Garage PR2 robot

*GRASP Laboratory, University of Pennsylvania* Spring 2013

**Robocup 2013 Humanoid Kid-size soccer international competition**

Our team won the Kid-size competition after competing against teams from Iran, Indonesia, Japan, Germany and England. Contributed to:

- Particle filter based localization system that used goal posts and field lines as landmarks and odometry information from the walk engine
- Player self-localization orientation disambiguation based on goalkeeper ball estimate

*Nirma University, India* January - May 2012

**Object seeker robot**

- Developed a real time object detection (using Speeded Up Robust Features) and stereo imaging system
- Used it to control a simple wheeled robot that could recognize objects, estimate its distance to them, drive up to them and grip them

*University of Southern California* Summer 2011

**Robot arm control using 3D information**

- Researched the Microsoft Kinect sensor and Point Cloud Library
- Designed a vision system to determine position of known objects and guide a robotic arm to that position

*Schneider India Innovation Challenge 2011* August 2011

**Fuel saving at traffic signals**

- Designed and prototyped a system that used accelerometers, magnetometers and wireless communication to automatically switch off engines of cars opposite red signals at traffic intersections

## PUBLICATIONS

- "Single Image 3D Object Detection and Pose Estimation for Grasping" - Menglong Zhu, Kosta Derpanis, Yinfei Yang, **Samarth Brahmbhatt**, Mabel Zhang, Cody Phillips and Kostas Daniilidis (Submitted to International Conference on Robotics and Automation 2014)
- "RoboCup 2013 Humanoid Kidsize League Winner" - Daniel D. Lee, Seung-Joon Yi, Stephen McGill, Yida Zhang, Larry Vadakedathu, **Samarth Brahmbhatt**, Richa Agrawal and Vibhavari Dasagi (Accepted at Robocup Symposium 2014)
- "Practical OpenCV" - **Samarth Brahmbhatt** (book published by Apress Media LLC)

## TEACHING EXPERIENCE

Teaching Assistant for

- Introduction to Robotics (MEAM 520): Responsible for weekly office hours and conducting a class project on mobile robots.
- Design of Mechatronic systems (MEAM 510): Responsible for weekly lab hours and conducting a newly added project in which students make an autonomous golfer robot.

## ACADEMIC PROJECTS

**Learning in Robotics (ESE 650)** Spring 2013

- RGB-D point-cloud registration for 3D mapping (wiki)
- Planar Simultaneous Localization and Mapping using a particle filter (wiki)
- Image panoramas using 3-DOF orientation tracking by an Unscented Kalman Filter (wiki)
- Path planning in aerial photographs using imitation learning (wiki)
- Probabilistic color image segmentation using Gaussian Mixture Models (wiki)

**Computer Vision and Computational Photography (CIS 581)** Fall 2013

- Logo replacement using Shape Context feature matching (wiki)
- Panoramas by Corner appearance feature matching (wiki)
- Image Morphing by Thin Plate Splines (wiki)

**Machine Perception (CIS 580)** Spring 2013

- Image stitching using vanishing points and matching points (wiki)
- Logo warping using perspective transforms (wiki)

**Machine Learning (CIS 520)** Fall 2012

- Song genre classification using lyrics and audio features
- Optical character recogniton using boosted decision trees

## COMPUTER SKILLS

- *Programming Languages*: C, C++, Python, Matlab, Unix shell scripting
- *Libraries and Tools*: OpenCV, Point Cloud Library, iPython, Vim, Git, Microsoft Office, LaTeX
- *Operating Systems*: Microsoft Windows, Linux flavors, ROS

## HONORS

- Best overall student in the Electronics and Communication department, Nirma University
- Second prize for final year project, Electronics and Communication department, Nirma University
- Dhirubhai Ambani Scholarship for all four years of undergraduate study

## EXTRACURRICULAR INTERESTS

- Reading history, science fiction and World War 2, Cold War stories
- Long distance running, swimming, skateboarding