

# Xun (Sam) Zhou

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## Education

- University of Minnesota (UMN)**, College of Science & Engineering, Minneapolis, MN  
Ph.D. candidate, Computer Science, Expected: August 2011  
Thesis: “Motion-induced Robot-to-Robot Extrinsic Calibration”  
Advisor: Prof. Stergios I. Roumeliotis, GPA: 3.9/4.0
- Bradley University**, Peoria, IL, M.Sc. in Computer Science, Dec. 2003  
GPA: 4.0/4.0
- Sun Yat-sen University**, Guangzhou, China, B.Sc. in Physics, Jul. 2000  
Honors student

## Research Interests

Simultaneous localization and mapping (SLAM), autonomous vehicle navigation, multi-robot extrinsic calibration, computer vision and image processing.

## Research Experience

- Research Assistant**, Multiple Autonomous Robotics Systems Laboratory,  
UMN Dept. of Computer Science and Engineering 2005 – Present  
Supervisor: Prof. Stergios Roumeliotis
- Currently working on motion-induced robot-to-robot relative pose calibration under a NSF grant
    - ▷ Carried out theoretical analysis, and determined the maximum number of solutions for minimal and overdetermined systems
    - ▷ Designed and implemented algorithms for determining the relative pose analytically
  - Designed and implemented multi-robot SLAM algorithms which improve map-merging accuracy
  - Conducted experiments using robots equipped with laser scanners and cameras
  - Assisted with various grant proposal writing

## Class Projects

- Autonomous Parallel Parking: designed and implemented parallel parking algorithm on a Pioneer robot
- Traffic and Door Sign Recognition: investigated sign detection and classification in camera images
- Single-Camera Motion Estimation: estimated camera motion from point-feature correspondences
- Motion Strategies for Mobile Robot Formation: optimized robot motion to increase localization accuracy
- Squared-root SLAM: implemented squared root filter for mobile robot localization and mapping

## Teaching Experience

- Teaching Assistant**, UMN, Dept. of Computer Science and Engineering 2005 – 2009  
Pattern Recognition, Computational Aspects of Matrix Theory, Introduction to Robotics, Artificial Intelligence, Formal Languages and Automata Theory, Algorithms and Data Structures, Real-time and Embedded Systems
- Led discussion sessions of Formal Languages and Automata Theory, and Algorithms and Data Structures for classes of over 30 undergraduates
  - Graded homeworks and exams
  - Held weekly office hours to answer students’ questions
- Lecturer**, UMN, Dept. of Computer Science and Engineering May 4, 2010
- Gave an invited lecture on Cooperative Localization for the course: Sensing and Estimation in Robotics
- Teaching Assistant**, Bradley University Fall 2003
- Graded homeworks for Advance Data Structures and Algorithms class

## Work Experience

- Junior Robotics & Vision Engineer**, Evolution Robotics, Pasadena, CA. Jun.–Aug. 2010
- Designed and implemented an IMU-Vision system for performing vision-aided inertial navigation
  - Designed and implemented a Kalman filter-based attitude estimator using IMU and camera measurements.

## Skills and Background

- C/C++, Matlab, Maple, Java, HTML, SQL, Visual Basic, ASM, and OpenGL
- Linux and Windows operating systems
- Estimation, probability and random processes, computer vision, algebraic geometry, and optimization

## Awards

- Best Paper Award Finalist, IEEE/RSJ Int. Conf. Intell. Robots & Syst. (IROS) 2006
- Excellence in Research Award, UMN Dept. of Computer Science and Engineering 2007
- Outstanding Academic Achievement Award, Bradley University 2002
- Honors Student, Sun Yat-sen University 2000
- Second Place Scholarships, Sun Yat-sen University 1997 – 2000
- Second Prize in National Mathematics Modeling Contest, China 1998

## Publications

### Journal Articles

- J4.** **X. S. Zhou**, and S. I. Roumeliotis, *Motion-induced Robot-to-Robot Extrinsic Calibration in 3D*, IEEE Trans. Robot. (In preparation).
- J3.** O. Naroditsky, **X. S. Zhou**, J. Gallier, S. I. Roumeliotis, and K. Daniilidis, *Two Efficient Solutions for Visual Odometry Using Directional Correspondence*, IEEE Transactions on Pattern Analysis and Machine Intelligence, Aug. 2010. (In Revision)
- J2.** N. Trawny, **X. S. Zhou**, K. Zhou, and S. I. Roumeliotis, *Inter-robot Transformations in 3D*, IEEE Trans. Robot., 26 (2):225–243, Apr. 2010
- J1.** **X. S. Zhou**, and S. I. Roumeliotis, *Robot-to-Robot Relative Pose Estimation from Range Measurements*, IEEE Trans. Robot., 24 (6):1379–1393, Dec. 2008.

### Conference Papers

- C7.** **X. S. Zhou**, K. Zhou, and S. I. Roumeliotis, *Optimal Motion Strategies for Localization in Leader-Follower Formations*, IEEE/RSJ Int. Conf. Intell. Robots & Syst., San Francisco, CA, Sep. 25–30, 2011. (To appear)
- C6.** **X. S. Zhou** and S. I. Roumeliotis. *Determining the Robot-to-Robot 3D Relative pose using Combinations of Range and Bearing Measurements (Part II)*, IEEE Int. Conf. on Robot. & Autom. (ICRA), Shanghai, China, May 9–13, 2011.
- C5.** **X. S. Zhou**, and S. I. Roumeliotis. *Determining the Robot-to-Robot 3D Relative Pose using Combinations of Range and Bearing Measurements: 14 Minimal Problems and Analytical Solutions to 3 of them*, IEEE/RSJ Int. Conf. Intell. Robots & Syst. (IROS), Taipei, Taiwan, Oct. 18–22, 2010, pp. 2983–2990.
- C4.** N. Trawny, **X. S. Zhou**, and S. I. Roumeliotis. *3D Relative Pose Estimation from Six Distances*, Robotics: Science and Systems (RSS), Seattle, WA, Jun. 28 – Jul. 1, 2009.
- C3.** N. Trawny, **X. S. Zhou**, K. X. Zhou, and S. I. Roumeliotis. *3D Relative Pose Estimation from Distance-Only Measurements*, in Proc. IEEE/RSJ Int. Conf. Intell. Robots & Syst. (IROS), San Diego, CA, Oct. 29–Nov. 2 2007, pp. 1071–1078.
- C2.** **X. S. Zhou**, and S. I. Roumeliotis *Determining the Robot-to-Robot Relative Pose Using Range-only Measurements*, in Proc. IEEE Int. Conf. on Robot. & Autom. (ICRA), Rome, Italy, Apr. 10–14 2007, pp. 4025–4031.
- C1.** **X. S. Zhou**, and S. I. Roumeliotis *Multi-robot SLAM with Unknown Initial Correspondence: The Robot Rendezvous Case*, in Proc. IEEE/RJS Int. Conf. Intell. Robots & Syst. (IROS), Beijing, China, Oct. 9–15 2006, pp. 1785–1792. (**best paper finalist**)

### Technical Reports

- T3.** X. S. Zhou, and S. I. Roumeliotis, *Determining the Robot-to-Robot Relative Pose using Range and/or Bearing Measurements*, Feb. 2010.
- T2.** X. S. Zhou, and S.I. Roumeliotis. *Determining the Robot-to-Robot Relative Pose Using Range-only Measurements*, May, 2006
- T1.** X. S. Zhou, and S.I. Roumeliotis. *Multi Robot SLAM Map Alignment with Rendezvous*, June, 2005

### Presentations

- P7.** IEEE Int. Conf. Robot. & Autom. (ICRA), presented paper **C6.** May 12, 2011
- P6.** UMN SPINCOM Seminar, Solving Polynomial Equations, Dec. 16, 2010
- P5.** IEEE/RSJ Int. Conf. Intell. Robots. & Syst. (IROS), presented paper **C5.** Oct. 20, 2010
- P4.** UMN Robotics Mixer Meeting, Motion-induced Robot-to-Robot Extrinsic Calibration Jun. 15, 2009
- P3.** IEEE Int. Conf. Robot. & Autom. (ICRA), presented paper **C2.** Apr. 14, 2007
- P2.** IEEE/RSJ Int. Conf. Intell. Robots & Syst. (IROS), presented paper **C1.** Oct. 9, 2006
- P1.** UMN Robotics Seminar, Multi-robot SLAM with Unknown Initial Correspondence Oct. 21, 2005

### Service

- Reviewer for:**
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| ICRA               | IROS                                     | RSS                   |
| IEEE Trans. Robot. | EURASIP J. Advances in Signal Processing | Robot. & Auton. Syst. |

### Technical Societies Memberships

IEEE, IEEE Robotics and Automation Society

### Activities

- Violin, Kenwood Symphony Orchestra, Minneapolis, MN 2008 – Present
- Violin, Campus Orchestra, University of Minnesota 2006
- Table Tennis Club, Bradley University 2001 – 2003
- Violin, Campus Orchestra, Sun Yat-sen University 1997 – 1999