

Stan Birchfield

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EDUCATION

Ph.D., Stanford University, Electrical Engineering (Computer Science minor), 1999.
M.S., Stanford University, Electrical Engineering, 1996.
B.S., Clemson University, Electrical Engineering (*summa cum laude* with honors), 1993.

PROFESSIONAL EXPERIENCE

NVIDIA Corporation, Redmond, WA. Senior Research Manager, 2019-
NVIDIA Corporation, Redmond, WA. Principal Research Scientist, 2016-2019.
Microsoft and Microsoft Research, Redmond, WA. Principal Software Development Engineer, 2013-2016.
TrafficVision, Anderson, SC, Co-Founder and Technical Advisor, 2010-
Clemson University, Clemson, SC, Associate Professor of ECE (with tenure), 2009-2013.
Clemson University, Clemson, SC, Assistant Professor of ECE, 2003-2009.
Quindi Corporation, Palo Alto, CA, Research Engineer, Software Architect, and Technical Lead, 1999-2003.
Stanford University, Stanford, CA, Graduate Research Assistant, 1995-1999.
Autodesk Corporation, Mountain View, CA, Summer Intern, 1996-1997.
NASA Langley Research Center, Langley, VA, Summer Intern, 1992.

CONSULTING EXPERIENCE

National Institute for Medical Informatics, Washington, DC, 2004-2005.
Sun Microsystems, Menlo Park, CA, 2002-2003.
SRI International, Menlo Park, CA, 2002-2005.
Canon Research Center America, Palo Alto, CA, 1998-1999.
Swing Lab, Berkeley, CA, 1997.

PROFESSIONAL ACTIVITIES

Associate Editor, *IEEE Transactions on Intelligent Transportation Systems*, 2013-2016.
Associate Editor, *Machine Vision and Applications*, 2012-2018.
Associate Editor, IEEE Intl. Conference on Robotics and Automation (ICRA), 2012-2020.
Associate Editor, IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS), 2013-2020.
Editorial Board, *International Journal of Advanced Robotic Systems*, 2013-2014.
Program Committee, IEEE Conf. on Computer Vision and Pattern Recog. (CVPR), 2003-2013.
Program Committee, IEEE Intl. Conference on Computer Vision (ICCV), 2005-2011.
Program Committee, European Conference on Computer Vision (ECCV), 2006-2008.
Program Committee, British Machine Vision Conference (BMVC), 2008-2011.
Program Committee, Robotics Science and Systems (RSS), 2011-2013.
Program Committee, various workshops and symposia.
Co-Chair, ICRA 2013 session on Computer Vision, Karlsruhe, Germany.
Chair, IROS 2012 session on Point Cloud Processing, Vilamoura, Portugal.
Co-Chair, ICIRA 2012 session on Intelligent Visual Systems, Montreal, Quebec.
Co-Chair, IROS 2010 session on Navigation II, Taipei, Taiwan.
Area Chair, Workshop on Applications of Computer Vision (WACV), 2004.
Reviewer, various conferences and journals.
Reviewer, *Cambridge University Press*.
NSF Panelist, 2009-2011.

MEMBERSHIPS

Institute of Electrical and Electronics Engineers (IEEE), Senior member.

PUBLICATIONS

Books and Book Chapters

1. S. Birchfield. *Image Processing and Analysis*, Cengage Learning, 2017. ISBN 978-1-285-17952-0. (718 pages)
2. Z. Chen and S. T. Birchfield. Vision-Based Path Following without Calibration. In *Mobile Robots Navigation*, ed. A. Barrera, InTech, pages 427-446, Mar. 2010. ISBN 978-953-307-076-6.
3. S. J. Pundlik and S. T. Birchfield. Motion-Based View-Invariant Articulated Motion Detection and Pose Estimation Using Sparse Point Features. In *Advances in Visual Computing: Lecture Notes in Computer Science vol. 5875*, ed. G. Bebis, Springer, pages 425-434, 2009. ISBN 978-3-642-10330-8.

Journal Publications

1. X. Zhao, D. Dawson, W. A. Sarasua, and S. Birchfield. Multiple Hypothesis Tracking with Kinematics and Appearance Models on Traffic Flow for Wide Area Traffic Surveillance. *ASCE Journal of Civil Engineering*, 33(3), May 2019.
2. X. Zhao, D. Dawson, W. A. Sarasua, and S. T. Birchfield. Automated Traffic Surveillance System with Aerial Camera Arrays Imagery: Macroscopic Data Collection with Vehicle Tracking, *Journal of Computing in Civil Engineering*, 31(3), 2017.
3. B. Peasley and S. Birchfield. RGBD Point Cloud Alignment Using Lucas-Kanade Data Association and Automatic Error Metric Selection. *IEEE Transactions on Robotics*, 31(6):1548-1554, Dec. 2015.
4. X. Huang, I. Walker, and S. Birchfield. Occlusion-Aware Multi-View Reconstruction of Articulated Objects for Manipulation. *Robotics and Autonomous Systems*, 62(4):497-505, Apr. 2014.
5. D. N. Dawson and S. T. Birchfield. An Energy Minimization Approach to Automatic Traffic Camera Calibration Using MCMC. *IEEE Trans. on Intelligent Transportation Systems*, 14(3):1095-1108, Sept. 2013.
6. R. B. Willimon, I. D. Walker, and S. Birchfield. Classification of Clothing Using Mid-Level Layers. *ISRN Robotics*, vol. 2013, Jan. 2013
7. B. Willimon, S. Birchfield, and I. Walker. Interactive Perception of Rigid and Non-Rigid Objects. *International Journal of Advanced Robotic Systems*, vol. 9, Sept. 2012.
8. V. N. Murali and S. T. Birchfield. Autonomous Exploration Using Rapid Perception of Low-Resolution Image Information. *Autonomous Robots*, 32(2):115-128, Feb. 2012.
9. N. N. Pradhan, N. V. Gohad, B. Orihuela, T. C. Burg, S. T. Birchfield, D. Rittschof, and A. S. Mount. Development of an Automated Algorithm for Tracking and Quantifying Barnacle Cyprid Settlement Behavior. *Journal of Experimental Marine Biology and Ecology*, volume 410, pages 21-28, Dec. 2011.
10. Z. Chen, Y. Li, and S. T. Birchfield. Visual Detection of Lintel-Occluded Doors by Integrating Multiple Cues Using a Data-Driven Markov Chain Monte Carlo Process. *Robotics and Auton. Sys.*, 59(11):966-976, Nov. 2011.
11. S. Pundlik, S. Birchfield, and D. Woodard. Iris Segmentation in Non-Ideal Images Using Graph Cuts. *Image and Vision Computing*, 28(12):1671-1681, Dec. 2010.
12. N. K. Kanhere, S. T. Birchfield, W. A. Sarasua, and S. Khoeini. Traffic Monitoring of Motorcycles During Special Events Using Video Detection. *Transportation Research Record*, No. 2160, pp. 69-76, 2010.
13. N. Kanhere and S. T. Birchfield. A Taxonomy and Analysis of Camera Calibration Methods for Traffic Monitoring Applications. *IEEE Transactions on Intelligent Transportation Systems*, 11(2): 441-452, June 2010.
14. G. Zeng, S. T. Birchfield, and C. E. Wells. Rapid Automated Detection of Roots in Minirhizotron Images. *Machine Vision and Applications*, 21(3):309-317, Apr. 2010.
15. Z. Chen and S. T. Birchfield. Qualitative Vision-Based Path Following. *IEEE Transactions on Robotics*, 25(3):749-754, June 2009.
16. N. K. Kanhere, S. T. Birchfield, and W. A. Sarasua. Automatic Camera Calibration Using Pattern Detection for Vision-Based Speed Sensing. *Transportation Research Record*, No. 2086, pp. 30-39, 2008.
17. S. J. Pundlik and S. T. Birchfield. Real-Time Motion Segmentation of Sparse Feature Points at Any Speed. *IEEE Transactions on Systems, Man, and Cybernetics Part B: Cybernetics*, 38(3):731-742, June 2008.
18. N. Kanhere and S. T. Birchfield. Real-Time Incremental Segmentation and Tracking of Vehicles at Low Camera Angles Using Stable Features. *IEEE Trans. on Intelligent Transportation Systems*, 9(1):148-160, Mar. 2008.
19. G. Zeng, S. T. Birchfield, and C. E. Wells. Automatic Discrimination of Fine Roots in Minirhizotron Images. *New Phytologist*, 177(2):549-557, Jan. 2008.

20. S. T. Birchfield and D. K. Gillmor. Acoustic Source Direction System and Method (review of acoustical patent 7,039,198). *Journal of the Acoustical Society of America*, 122(2):702, 2007.
21. N. K. Kanhere, S. T. Birchfield, W. A. Sarasua, and T. C. Whitney. Real-Time Detection and Tracking of Vehicle Base Fronts for Measuring Traffic Counts and Speeds on Highways. *Transportation Research Record: Journal of the Transportation Research Board*, No. 1993, pp. 155-164, 2007.
22. S. T. Birchfield and S. Rangarajan. Spatial Histograms for Region-Based Tracking. *Electronics and Telecommunications Research Institute (ETRI) Journal*, 29(5):697-699, Oct. 2007.
23. S. T. Birchfield, B. Natarajan, and C. Tomasi. Correspondence as Energy-Based Segmentation. *Image and Vision Computing*, 25(8):1329-1340, Aug. 2007.
24. G. Zeng, S. T. Birchfield, and C. E. Wells. Detecting and Measuring Fine Roots in Minirhizotron Images Using Matched Filtering and Local Entropy Thresholding. *Machine Vision and Applications*, 17(4):265-278, 2006.
25. N. K. Kanhere, S. T. Birchfield, and W. A. Sarasua. Vehicle Segmentation and Tracking in the Presence of Occlusions. *Transportation Research Record: Journal of the Trans. Research Board*, No. 1944, pp. 89-97, 2006.
26. S. T. Birchfield and A. Subramanya. Microphone Array Position Calibration by Basis-Point Classical Multidimensional Scaling. *IEEE Transactions on Speech and Audio Processing*, 13(5):1025-1034, Sept. 2005.
27. S. Birchfield and C. Tomasi. Depth Discontinuities by Pixel-to-Pixel Stereo. *International Journal of Computer Vision*, 35(3):269-293, Dec. 1999.
28. S. Birchfield and C. Tomasi. A Pixel Dissimilarity Measure That is Insensitive to Image Sampling. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 20(4):401-406, Apr. 1998.
29. I. Nourbakhsh, R. Powers, and S. Birchfield. Dervish: An Office Navigating Robot. *AI Magazine*, 16(2):53-60, Summer 1995.

Refereed Conference Proceedings

1. T. E. Lee, J. Tremblay, T. To, J. Cheng, T. Mosier, O. Kroemer, D. Fox, S. Birchfield. Camera-to-Robot Pose Estimation from a Single Image. *International Conference on Robotics and Automation (ICRA)*, Paris, France, May 2020.
2. S. Iqbal, J. Tremblay, T. To, J. Cheng, E. Leitch, A. Campbell, K. Leung, D. McKay, S. Birchfield. Toward Sim-to-Real Directional Semantic Grasping. *International Conference on Robotics and Automation (ICRA)*, Paris, France, May 2020.
3. A. Handa, K. Van Wyk, W. Yang, J. Liang, Y.-W. Chao, Q. Wan, S. Birchfield, N. Ratliff, D. Fox. DexPilot: Vision Based Teleoperation of Dexterous Robotic Hand-Arm System. *International Conference on Robotics and Automation (ICRA)*, Paris, France, May 2020.
4. V. Kumar, T. Hermans, D. Fox, S. Birchfield, J. Tremblay. Contextual Reinforcement Learning of Visuo-tactile Multi-fingered Grasping Policies. arXiv:1911.09233, November 2019.
5. Z. Tang, M. Naphade, S. Birchfield, J. Tremblay, W. Hodge, R. Kumar, S. Wang, X. Yang. PAMTRI: Pose-Aware Multi-Task Learning for Vehicle Re-Identification Using Highly Randomized Synthetic Data. *International Conference on Computer Vision (ICCV)*, Seoul, South Korea, October 2019.
6. H.-Y. Tseng, S. De Mello, J. Tremblay, S. Liu, S. Birchfield, M.-H. Yang, J. Kautz. Few-Shot Viewpoint Estimation. *British Machine Vision Conference (BMVC)*, Cardiff, UK, September 2019.
7. Z. Tang, M. Naphade, M.-Y. Liu, X. Yang, S. Birchfield, S. Wang, R. Kumar, D. Anastasiu, J.-N. Hwang. CityFlow: A City-Scale Benchmark for Multi-Target Multi-Camera Vehicle Tracking and Re-Identification. *Conference on Computer Vision and Pattern Recognition (CVPR)*, Long Beach, California, June 2019.
8. B. Sundaralingam, A. Lambert, A. Handa, B. Boots, T. Hermans, S. Birchfield, N. Ratliff, D. Fox. Robust Learning of Tactile Force Estimation through Robot Interaction. *IEEE International Conference on Robotics and Automation (ICRA)*, Montreal, Canada, May 2019. **Best Robot Manipulation Paper, finalist.**
9. A. Prakash, S. Boochoon, M. Brophy, D. Acuna, E. Cameracci, G. State, O. Shapira, S. Birchfield. Structured Domain Randomization: Bridging the Reality Gap by Context-Aware Synthetic Data. *IEEE International Conference on Robotics and Automation (ICRA)*, Montreal, Canada, May 2019.
10. C.-A. Cheng, M. Mukadam, J. Issac, S. Birchfield, D. Fox, B. Boots, N. Ratliff. RMPflow: A Computational Graph for Automatic Motion Policy Generation. *International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Mérida, México, December 2018.
11. J. Tremblay, T. To, B. Sundaralingam, Y. Xiang, D. Fox, S. Birchfield. Deep Object Pose Estimation for Semantic Robotic Grasping of Household Objects. *Conference on Robot Learning (CoRL)*, Zürich, Switzerland, October 2018.

12. J. Tremblay, T. To, and S. Birchfield. Falling Things: A Synthetic Dataset for 3D Object Detection and Pose Estimation. *CVPR Workshop on Real World Challenges and New Benchmarks for Deep Learning in Robotic Vision*, Salt Lake City, Utah, June 2018.
13. N. Smolyanskiy, A. Kamenev, and S. Birchfield. On the Importance of Stereo for Accurate Depth Estimation: An Efficient Semi-Supervised Deep Neural Network Approach. *CVPR Workshop on Autonomous Driving (WAD)*, Salt Lake City, Utah, June 2018.
14. J. Tremblay, A. Prakash, D. Acuna, M. Brophy, V. Jampani, C. Anil, T. To, E. Cameracci, S. Boochoon, and S. Birchfield. Training Deep Networks with Synthetic Data: Bridging the Reality Gap by Domain Randomization. *CVPR Workshop on Autonomous Driving (WAD)*, Salt Lake City, Utah, June 2018.
15. J. Tremblay, T. To, A. Molchanov, S. Tyree, J. Kautz, and S. Birchfield. Synthetically Trained Neural Networks for Learning Human-Readable Plans from Real-World Demonstrations. *IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, May 2018.
16. A. Molchanov, K. Hausman, S. Birchfield, G. Sukhatme. Region Growing Curriculum Generation for Reinforcement Learning. arXiv:1804.06516, April 2018.
17. N. D. Ratliff, J. Issac, D. Kappler, S. Birchfield, D. Fox. Riemannian Motion Policies. arXiv:1801.02854, January 2018.
18. N Smolyanskiy, A Kamenev, J Smith, S Birchfield. Toward Low-Flying Autonomous MAV Trail Navigation Using Deep Neural Networks for Environmental Awareness. *IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, Vancouver, Canada, Sept. 2017.
19. S. Birchfield. Reverse-Projection Method for Measuring Camera MTF. *IS&T International Symposium on Electronic Imaging: Image Quality and System Performance XIV*, Jan. 2017.
20. X. Zhao, D. Dawson, W. A. Sarasua, and S. T. Birchfield. An Automated Traffic Surveillance System with Aerial Camera Arrays: Data Collection with Vehicle Tracking. *Transp. Research Board Annual Meeting*, Washington, D.C., Jan. 2016.
21. A. Feniello, H. Dang, and S. Birchfield. Program Synthesis by Examples for Object Repositioning Tasks. *IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, Chicago, Sept. 2014.
22. S. Hickson, S. Birchfield, I. Essa, and H. Christensen, Efficient Hierarchical Graph-Based Segmentation of RGBD Videos, *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, Columbus, Ohio, June 2014.
23. H. Kikkeri, G. Parent, M. Jalobeanu, and S. Birchfield. An Inexpensive Method for Evaluating the Localization Performance of a Mobile Robot Navigation System. *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China, May 2014.
24. B. Peasley and S. Birchfield. Fast and Accurate PoseSLAM by Combining Relative and Global State Spaces. *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China, May 2014.
25. N. Pradhan, S. Birchfield, and T. Burg. A Person Follower Mobile Robot System for Indoor Environments. *Workshop on Assistance and Service Robotics in a Human Environment (with IROS)*, Tokyo, Japan, Nov. 2013.
26. N. Pradhan, T. Burg, S. Birchfield, and U. Hasirci. Indoor Navigation for Mobile Robots using Predictive Fields. *American Control Conference (ACC)*, Washington, DC, June 2013.
27. B. Peasley and S. Birchfield. Improving Projective Data Association with Lucas-Kanade for RGBD-ICP. *IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, May 2013.
28. B. Willimon, I. Walker, and S. Birchfield. A New Approach to Clothing Classification using Mid-Level Layers. *IEEE Intl. Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, May 2013.
29. B. Willimon, I. Walker, and S. Birchfield. 3D Non-Rigid Deformable Surface Estimation without Feature Correspondence. *IEEE Intl. Conf. on Robotics and Automation (ICRA)*, Karlsruhe, Germany, May 2013.
30. B. Peasley and S. Birchfield. Real-Time Obstacle Detection and Avoidance in the Presence of Specular Surfaces Using an Active 3D Sensor. *IEEE Workshop on Robot Vision (WoRV)*, Clearwater, Florida, Jan. 2013.
31. B. Willimon, S. Hickson, I. Walker, and S. Birchfield. An Energy Minimization Approach to 3D Non-Rigid Deformable Surface Estimation Using RGBD Data. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vilamoura, Portugal, Oct. 2012.
32. B. Peasley, S. Birchfield, A. Cunningham, and F. Dellaert. Accurate On-Line 3D Occupancy Grids Using Manhattan World Constraints. *Intl. Conf. on Intell. Robots and Systems (IROS)*, Vilamoura, Portugal, Oct. 2012.
33. Y. Li, V. Murali, and S. T. Birchfield. Extracting Minimalistic Corridor Geometry from Low-Resolution Images. *Intl. Conf. on Intell. Robotics and Applications (ICIRA)*, Montreal, Quebec, Canada, Oct. 2012.
34. X. Huang, I. Walker, and S. Birchfield. Occlusion-Aware Reconstruction and Manipulation of 3D Articulated Objects. *IEEE Intl. Conf. on Robotics and Automation (ICRA)*, St. Paul, Minnesota, May 2012.
35. B. Willimon, S. Birchfield, and I. Walker. Model for Unfolding Laundry using Interactive Perception. *IEEE Intl. Conference on Intelligent Robots and Systems (IROS)*, San Francisco, California, Sept. 2011.

36. N. Pradhan, T. C. Burg, and S. Birchfield. Robot Crowd Navigation using Predictive Position Fields in the Potential Function Framework, *American Control Conference (ACC)*, San Francisco, California, July 2011.
37. B. Willimon, S. Birchfield, and I. Walker. Classification of Clothing using Interactive Perception. *IEEE International Conference on Robotics and Automation (ICRA)*, Shanghai, China, May 2011.
38. N. K. Kanhere, S. T. Birchfield, W. A. Sarasua, and S. Khoeini. Evaluation of a Computer-Vision Tracking System for Collecting Traffic Data. *Transp. Research Board Annual Meeting*, Washington, D.C., Jan. 2011.
39. T. J. Grindinger, V. N. Murali, S. Tetreault, A. T. Duchowski, S. T. Birchfield, and P. Orero. Algorithm for Discriminating Aggregate Gaze Points: Comparison with Salient Regions-Of-Interest. *International Workshop on Gaze Sensing and Interactions (IWGSI)*, Queenstown, New Zealand, Nov. 2010.
40. Y. Li and S. Birchfield. Image-Based Segmentation of Indoor Corridor Floors for a Mobile Robot. *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Taipei, Taiwan, Oct. 2010.
41. B. Willimon, S. Birchfield, and I. Walker. Rigid and Non-Rigid Classification Using Interactive Perception. *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Taipei, Taiwan, Oct. 2010.
42. N. K. Kanhere, S. T. Birchfield, W. A. Sarasua, and S. Khoeini. Traffic Monitoring of Motorcycles During Special Events Using Video Detection. *Transp. Research Board Annual Meeting*, Washington, D.C., Jan. 2010.
43. S. J. Pundlik and S. T. Birchfield. Motion-Based View-Invariant Articulated Motion Detection and Pose Estimation Using Sparse Point Features. *Intl. Symp. on Visual Computing (ISVC)*, Las Vegas, Nev., Nov. 2009.
44. P. Chockalingam, N. Pradeep, and S. T. Birchfield. Adaptive Fragments-Based Tracking of Non-Rigid Objects Using Level Sets. *International Conference on Computer Vision (ICCV)*, Kyoto, Japan, Sept. 2009.
45. W. J. Ryan, D. L. Woodard, A. T. Duchowski, and S. T. Birchfield. Adapting Starburst for Elliptical Iris Segmentation. *Intl. Conf. on Biometrics: Theory, Applications and Sys. (BTAS)*, Washington, D.C., Sept. 2008.
46. S. T. Birchfield and S. J. Pundlik. Joint Tracking of Features and Edges. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Anchorage, Alaska, June 2008.
47. S. J. Pundlik, D. L. Woodard, and S. T. Birchfield. Non-Ideal Iris Segmentation Using Graph Cuts. *IEEE Computer Society Workshop on Biometrics (in association with CVPR)*, Anchorage, Alaska, June 2008.
48. Z. Chen and S. Birchfield. Visual Detection of Lintel-Occluded Doors from a Single Image. *Workshop on Visual Localization for Mobile Platforms (with CVPR)*, Anchorage, Alaska, June 2008.
49. V. Murali and S. Birchfield. Autonomous Navigation and Mapping Using Monocular Low-Resolution Grayscale Vision. *Workshop on Visual Localization for Mobile Platforms (with CVPR)*, Anchorage, Alaska, June 2008.
50. W. J. Ryan, A. T. Duchowski, and S. T. Birchfield. Limbus/Pupil Switching for Wearable Eye Tracking Under Variable Lighting Conditions. *Symp. on Eye Tracking Res. and Appl. (ETRA)*, Savannah, Ga., Mar. 2008.
51. N. K. Kanhere, S. T. Birchfield, and W. A. Sarasua. Automatic Camera Calibration Using Pattern Detection for Vision-Based Speed Sensing. *Transp. Research Board Annual Meeting*, Washington, D.C., Jan. 2008.
52. Z. Chen and S. T. Birchfield. Person Following with a Mobile Robot Using Binocular Feature-Based Tracking. *IEEE Intl. Conf. on Intelligent Robots and Systems (IROS)*, San Diego, California, pp. 815-820, Oct. 2007.
53. N. Rane and S. Birchfield. Isomap Tracking with Particle Filtering. *IEEE International Conference on Image Processing (ICIP)*, San Antonio, Texas, vol. 2, pp. 513-516, Sept. 2007.
54. N. K. Kanhere, S. T. Birchfield, W. A. Sarasua, and T. C. Whitney. Real-Time Detection and Tracking of Vehicle Base Fronts for Measuring Traffic Counts and Speeds on Highways. *Transportation Research Board Annual Meeting*, Washington, D.C., Jan. 2007.
55. S. J. Pundlik and S. T. Birchfield. Motion Segmentation at Any Speed. *British Machine Vision Conference (BMVC)*, Edinburgh, Scotland, vol. 1, pp. 427-436, Sept. 2006.
56. Z. Chen and S. T. Birchfield. Qualitative Vision-Based Mobile Robot Navigation. *IEEE International Conference on Robotics and Automation (ICRA)*, Orlando, Florida, pp. 2686-2692, May 2006.
57. N. K. Kanhere, S. T. Birchfield, and W. A. Sarasua. Vehicle Segmentation and Tracking in the Presence of Occlusions. *Transportation Research Board Annual Meeting*, Washington, D.C., Jan. 2006.
58. S. T. Birchfield and S. Rangarajan. Spatiograms Versus Histograms for Region-Based Tracking. *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, San Diego, California, vol. 2, pp. 1158-1163, June 2005.
59. N. K. Kanhere, S. J. Pundlik, and S. T. Birchfield. Vehicle Segmentation and Tracking from a Low-Angle Off-Axis Camera. *Computer Vision and Pattern Recog. (CVPR)*, San Diego, Calif., pp. 1152-1157, June 2005.
60. S. K. Guduru, S. V. Narasimhan, S. T. Birchfield, and B. Z. Gao. Analysis of Neurite Outgrowth for a Laser Patterned Neuronal Culture. *IEEE EMBS Special Topic Conf. on Neural Eng.*, Arlington, Va., Mar. 2005.
61. S. T. Birchfield and R. Gangishetty. Acoustic Localization by Interaural Level Difference. *IEEE Intl. Conf. on Acoustics, Speech and Signal Processing (ICASSP)*, Philadelphia, Pennsylvania, pp. 1109-1112, Mar. 2005.
62. S. T. Birchfield. A Unifying Framework for Acoustic Localization. *Proceedings of the 12th European Signal Processing Conference (EUSIPCO)*, Vienna, Austria, Sept. 2004.

63. A. Subramanya and S. T. Birchfield. Extension and Evaluation of MDS for Geometric Microphone Array Calibration. *European Signal Processing Conference (EUSIPCO)*, Vienna, Austria, Sept. 2004.
64. S. T. Birchfield. Geometric Microphone Array Calibration by Multidimensional Scaling. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Hong Kong, vol. 5, pp. 157-160, May 2003.
65. S. T. Birchfield and D. K. Gillmor. Fast Bayesian Acoustic Localization. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Orlando, Florida, vol. 2, pp. 1793-1796, May 2002.
66. S. T. Birchfield and D. Gillmor. Acoustic Source Direction by Hemisphere Sampling. *IEEE Intl. Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Salt Lake City, Utah, vol. 5, pp. 3053-3056, May 2001.
67. S. Birchfield and C. Tomasi. Multiway Cut for Stereo and Motion with Slanted Surfaces. *IEEE International Conference on Computer Vision (ICCV)*, Kerkyra, Greece, vol. 1, pp. 489-495, Sept. 1999.
68. S. Birchfield. Elliptical Head Tracking Using Intensity Gradients and Color Histograms. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Santa Barbara, California, pp. 232-237, June 1998.
69. S. Birchfield and C. Tomasi. Depth Discontinuities by Pixel-to-Pixel Stereo. *IEEE International Conference on Computer Vision (ICCV)*, Mumbai, India, pp. 1073-1080, Jan. 1998.

INVITED PRESENTATIONS

1. NVIDIA GTC Conference, Santa Clara, CA, March 2019.
2. University of Washington, Seattle, WA, May 2017.
3. Invited speaker, Robotics Summer School, Czech Technical University, Prague, Czech Republic, July 2014.
4. Invited speaker, ICRA 2014 Workshop on Manipulation of Flexible Objects, Hong Kong, May 2014.
5. University of Washington, Seattle, WA, May 2014.
6. Invited speaker, RSS 2013 Workshop on Manipulation with Uncertain Models, Berlin, Germany, June 2013.
7. Invited speaker, ICRA 2013 Workshop on Interactive Perception, Karlsruhe, Germany, May 2013.
8. University of Central Florida, Orlando, FL, Nov. 2012.
9. University of South Carolina, Columbia, SC, Oct. 2011.
10. TRANSP0 2010 Conference, Ponte Vedra Beach, Florida, Dec. 2010.
11. IROS Conference, Taipei, Taiwan, Oct. 2010.
12. TRB Committee, National Academy of Sciences, Woods Hole, Massachusetts, June 2010.
13. TRB Annual Meeting, Washington DC, Jan. 2010.
14. NATMEC Conference, Seattle, WA, June 2010.
15. FHWA Motorcycle Demonstration, Washington, DC, May 2008.
16. FHWA Motorcycle Traffic Symposium, Washington, DC, Oct. 2007.
17. CVPR Workshop, Anchorage, Alaska, 2008.
18. BMVC Conference, Edinburgh, Scotland, Sept. 2006.
19. ICRA Conference, Orlando, Florida, May 2006.
20. EUSIPCO Conference, Vienna, Austria, Sept. 2004.
21. EUSIPCO Conference, Vienna, Austria, Sept. 2004.
22. ICASSP Conference, Orlando, Florida, May 2002.
23. St. Olaf College, Northfield, MN, Dec. 2004.
24. IBM Almaden Research Center, San Jose, CA, Oct. 2002.
25. SRI International, Menlo Park, CA, Oct. 2002.
26. Georgia Tech, Atlanta, GA, Oct. 2002.
27. Clemson University, Clemson, SC, Oct. 2002.
28. Hewlett-Packard Laboratories, Palo Alto, CA, Sept. 2002.
29. Honda Research Laboratory, Mountain View, CA, Sept. 2002.
30. Xerox Palo Alto Research Center, Palo Alto, CA, Mar. 1999.
31. Hewlett-Packard Laboratories, Palo Alto, CA, Mar. 1999.
32. Intel Microprocessor Research Laboratories, Santa Clara, CA, Feb. 1999.
33. SRI International, Menlo Park, CA, Feb. 1999.
34. Interval Research Center, Palo Alto, CA, Jan. 1999.
35. IBM Almaden Research Center, San Jose, CA, Oct. 1998.
36. San Francisco Bay Area Vision Meeting, Interval Research, Palo Alto, CA, Apr. 1998.

PATENTS

1. S. Iqbal, J. Tremblay, T.H. To, J. Cheng, E. Leitch, D.J. McKay, S.T. Birchfield. Robotic control system. US Patent App. 16/549,831. February 2020.

2. J. Tremblay, T. H. To, S. T. Birchfield. Detecting and estimating the pose of an object using a neural network model. US Patent App. 16/405,662. October 2019.
3. S. T. Birchfield. Camera testing using reverse projection. US Patent 10,429,271. Patent issued October 2019.
4. N. Smolyanskiy, A. Kamenev, S. Birchfield. Stereo depth estimation using deep neural networks. US Patent App. 16/356,439. September 2019.
5. J. Tremblay, A. Prakash, M. A. Brophy, V. Jampani, C. Anil, S. T. Birchfield, T. H. To, D. J. A. Marrero. Generation of Synthetic Images for Training a Neural Network Model. US Patent App. 16/256,820. August 2019.
6. J. Tremblay, S. Birchfield, S. Tyree, T. To, J. Kautz, A. Molchanov. Learning robotic tasks using one or more neural networks. US Patent App. 16/255,038. July 2019.
7. N. Smolyanskiy, A. Kamenev, J. D. Smith, S. T. Birchfield. Performing autonomous path navigation using deep neural networks. US Patent App. 15/939,116. October 2018.
8. S. T. Birchfield, A. Bhattacharjee, K. J. Venalainen, A. Baker. Simultaneous authentication system for multi-user collaboration. US Patent App. 15/410,357. July 2018.
9. C. Ferrier, S. T. Birchfield, A. Kirk, and C. Zhang. Probabilistic Face Detection, filed 2015.
10. O. A. Whyte, R. Cutler, A. Bhattacharjee, A. P. M. Kowdle, A. Kirk, and S. T. Birchfield. Active Speaker Location Detection, issued Apr. 2017. U.S. Patent 9,621,795. Issued May 2018, U.S. Patent 9,980,040.
11. A. Feniello, S. Birchfield, H. Dang, and S. Gulwani. Program Synthesis for Robotic Tasks, filed May 2014, issued Aug. 2017. U.S. Patent 9,737,990.
12. A. Feniello, H. Dang, and S. Birchfield. Robotic Task Demonstration Interface, filed May 2014. Application #20150331415.
13. H. Kikkeri, S. Birchfield, and M. Jalobeanu. Ground Truth Estimation for Autonomous Navigation, filed Jan. 2014. Application #20150185027.
14. B. Peasley and S. Birchfield. Fast Solving for Loop Closure Using a Relative State Space, filed May 2014, issued Aug. 2019. U.S. Patent 10,388,041.
15. B. Peasley and S. Birchfield. Fast Solving for Loop Closure Using a Relative State Space, filed May 2014, issued Aug. 2017. U.S. Patent 9,741,140.
16. N. Kanhere, S. Birchfield, and W. Sarasua. Vision-Based Real-Time Traffic Monitoring, provisional filed Dec. 2007, filed Dec. 2008, issued Feb. 2013. U.S. Patent 8,379,926. E.P. Patent 2,243,125.
17. S. Birchfield and D. Gillmor. Acoustic Source Localization System and Method, filed Aug. 2001, issued May 2006. U.S. Patent 7,039,198.
18. S. Rosenschein, A. Garakani, S. Birchfield, and D. Gillmor. Audio and Video Notetaker, filed Aug. 2001.
19. S. Birchfield and D. Gillmor. Improved Acoustic Localization Techniques, filed July 2001.
20. S. Birchfield, M. Ruzon, D. Gillmor, and S. Rosenschein. Framework for Object Tracking Using Audio-Visual Data, filed Dec. 2001.

HONORS AND AWARDS

Clemson University Research Scholarship and Artistic Award (URSAAA), 2018.

National Science Foundation Graduate Fellowship, 1993-1996.

First place in American Association of Artificial Intelligence (AAAI) Mobile Robotics Contest, 1994.

GRADUATE STUDENT ADVISING

Postdocs: N. Kanhere, 2009-2010.

Ph.D. Graduates: B. Peasley (Dec. 2013), N. Pradhan (coadvised with Dr. T. Burg, Aug. 2013), X. Huang (Aug. 2013), B. Willimon (coadvised with Dr. I. Walker, May 2013), V. Murali (Aug. 2011), Z. Chen (Aug. 2010), S. Pundlik (Aug. 2009), G. Zeng (Dec. 2008), N. Kanhere (Aug. 2008).

Masters Thesis Graduates: R. Suresh (Dec. 2012), S. Ficht (May 2012), J. Dinger (Aug. 2011), Y. Li (Aug. 2011), K. Sundararajan (May 2011), A. Apte (Aug. 2010), V. Gidla (May 2010), B. Willimon (Dec. 2009), P. Chockalingam (Aug. 2009), N. Pradeep (Aug. 2009), T. Patil (Aug. 2009), J. Ingersoll (Aug. 2008), V. Murali (Aug. 2008), C. Dunkel (Aug. 2008), N. Rane (May 2007), P. Oswal (Aug. 2006), J. Reneau (May 2006), X. Wang (May 2006), B. Natarajan (Dec. 2005), S. Pundlik (Dec. 2005), S. Rangarajan (Dec. 2005), N. Kanhere (Aug. 2005), R. Gangishetty (Aug. 2005), G. Zeng (May 2005).

SPONSORED RESEARCH

1. Co-PI, Automated Traffic Surveillance from an Aerial Camera Array, University of Tennessee Southeastern Transportation Center, 2014.

2. Principal Investigator, II-NEW: Robot Arms for Interactive Perception of Highly Non-Rigid Objects, National Science Foundation (NSF), 2013-2014.
3. Co-PI, Automatic Visual Inspector, BMW Mfg. Corporation, 2012-2013.
4. Co-PI, Investigation into Real-time Segmentation and Labeling of Rotator Cuff Ultrasound, Clemson University Cyberinstitute Seed Grant Initiative, 2011-2012.
5. Co-PI, Cyberinfrastructure Empowering Future Transportation Systems, Clemson University Cyberinstitute Seed Grant Initiative, 2011-2012.
6. Principal Investigator, RI: Small: Interactive Perception for Manipulating Non-Rigid Objects, National Science Foundation (NSF), 2010-2013.
7. Principal Investigator, Computer Vision Traffic Sensor for Fixed and Pan-Tilt-Zoom Cameras, Transportation Research Board IDEA National Cooperative Highway Research Program, NCHRP-140, 2009-2010.
8. Principal Investigator, Computer Vision-Based Vehicle Tracking System, Omnibond Systems, 2008.
9. Principal Investigator, Automated Traffic Surveillance Using Low-Angle Cameras, South Carolina State University Transportation Center, 2005-2006.
10. Principal Investigator, Vision-Based Robotic Toolkit for Navigating Indoor Environments, National Institute for Medical Informatics Ph.D. Fellowship, 2005-2009.
11. Co-PI, DBI: Feature Recognition Software for Minirhizotron Image Processing, National Science Foundation (NSF) 2005-2008.
12. Principal Investigator, Tracking Vehicles with a Low-Angle Camera, Clemson Research Grant Committee, 2005.

OPEN-SOURCE SOFTWARE

1. Blepo C++ computer vision library. <http://www.ces.clemson.edu/~stb/blepo>
2. Kanade-Lucas-Tomasi feature tracker. <http://www.ces.clemson.edu/~stb/klt>
3. Rootfly: Software for Minirhizotron Image Analysis. <http://www.ces.clemson.edu/~stb/rootfly>

TEACHING

Clemson University, ECE 329, Computer Systems Structures, 2005-2008.
 Clemson University, ECE 417/617, Elements of Software Engineering, 2004-2012.
 Clemson University, ECE 429/629, Organization of Computers, 2003-2009.
 Clemson University, ECE 847, Digital Image Processing, 2004-2015.
 Clemson University, ECE 877, Computer Vision, 2005-2012.
 Clemson University, ECE 904, Computer Vision Seminar, 2003-2012.
 Stanford University, CS223B, Introduction to Computer Vision, 2002 (co-taught with C. Bregler)

UNIVERSITY AND PUBLIC SERVICE

Chair, ECE Graduate Committee, 2009-2013.
 Department representative, Dean's Faculty Advisory Council, 2004-2005.
 Chair, Digital Signal Processing Committee, 2005-2006.
 Co-Chair, Ph.D. Qualifying Exam Software Committee, 2005-2013.
 Member, Intelligent Systems Committee, 2003-2013.
 Member, Computer Systems Architecture Committee, 2003-2013.
 Member, Digital Signal Processing Committee, 2003-2013.
 Member, Department Chair Search Committee, 2005-2007.
 Member, Computer Engineering Faculty Search Committee, 2005-2006.
 Member, Assessment Subcommittee of Undergraduate Program Committee, 2005-2008.
 Co-advisor, IEEE Southeastcon Robotics Hardware Design Team, 2007- 2012.
 (Won 3rd place out of 40 teams at the IEEE Southeastcon competition in Richmond, VA, Mar. 2007).
 CES Faculty Telephone Recruiting Campaign, 2005-2007.
 Presented robotics lab tour to Youth Learning Institute Summer Camp, July 2011.
 Organized robotics lab tour to elementary schoolchildren, July 2011.

OTHER

Video of traffic monitoring software (jointly with Dr. K.-C. Wang) shown as part of the U. S. Ignite launch at the Eisenhower Executive Office Building of the White House, Washington DC, June 2012
 Invited to demo traffic monitoring system at the NCHRP study performed by Texas Transportation Institute, 2012

Invited to demo traffic monitoring system at the Motorcycle Highway Travel Monitoring and Operations
Demonstration at the FHWA Turner-Fairbanks Highway Research Center, May 2008

Invited to present traffic monitoring system at FHWA Motorcycle Travel Symposium in Washington, DC, Oct. 2007

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