Joydeep Biswas

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Current Appointment

Assistant Professor, Computer Science Department, University of Texas at Austin

Adjunct Assistant Professor, College of Information and Computer Sciences, University of Massachusetts Amherst

Education

2014	Ph.D. in Robotics	Carnegie Mellon University
2010	M.S. in Robotics	Carnegie Mellon University
2008	B.Tech. in Engineering Physics	Indian Institute of Technology, Bombay

Achievements and Awards

2019	Student Best Poster Award, Northrop Grumman University Symposium
2019	IJCAI Early Career Spotlight
2019	Amazon Research Award
2018	JP Morgan AI Faculty Research Award
2018	Best Demo Award, AAMAS 2018
2018	5th place, RoboCup 2018 Small Size League, *UMass MinuteBots*, Faculty Team Leader
2017	Lower Bracket 1st place, RoboCup 2017 Small Size League, *UMass MinuteBots*, Faculty Team Leader
2015	Siebel Scholar, Class of 2015
2015	1st place, RoboCup 2015 Small Size League, *CMDragons*, Student Team Leader
2014	2nd place, RoboCup 2014 Small Size League, *CMDragons*, Student Team Leader
2013	2nd place, RoboCup 2013 Small Size League, *CMDragons*, Student Team Leader
2010	2nd place, RoboCup 2010 Small Size League, *CMDragons*, Team Member

Employment History

2019 - Present	Assistant Professor	Computer Science Department, University of Texas at Austin, TX, USA
2019 - Present	Adjunct Assistant Professor	College of Information and Computer Sciences, University of Massachusetts Amherst, MA, USA
2015 - 2019	Assistant Professor	College of Information and Computer Sciences, University of Massachusetts Amherst, MA, USA
2015	Post-Doctoral Fellow	Computer Science Department, Carnegie Mellon University, Pittsburgh, PA, USA
2012	Summer Intern	Google Research, Mountain View, CA, USA
2010	Summer Intern	Intel Research, Pittsburgh, PA, USA

Funding

Federal Funding

NSF Award "*RI: Medium: Introspective Perception and Planning for Long-Term Autonomy*"
Collaborators: Shlomo Zilberstein (UMass)
Role: PI.
Period: July 2020 – June 2023.

NSF Award "*SHF: Small: Interactive Synthesis and Repair For Robot Programs*"
Collaborators: Arjun Guha (UMass)
Role: Co-PI.
Period: June 2020 – May 2023.

DARPA Award "*Advancing Learning via Probabilistic Causal Analysis for Competency Awareness*"
Collaborators: Charles River Analytics, David Jensen (UMass).
Role: Co-PI.
Period: October 2019 – September 2022.

Army Futures Command Robotics Center of Excellence "*Persistent Fully Autonomous Multi-Robot Tactics in Complex Environments*"
Collaborators: Peter Stone, Luis Sentis, Justin Hart
Role: Co-PI.
Period: October 2019 – December 2022.

NSF Award "*S&AS: FND: Reliable Semi-Autonomy with Diminishing Reliance on Humans*"
Collaborators: Shlomo Zilberstein (UMass)
Role: Co-PI.
Period: September 2017 – August 2020.

DARPA Award "*Intelligent Model-Based Adaptation for Mobile Robotics*"
Collaborators: Jonathan Aldrich (CMU), David Garlan (CMU), Manuela Veloso (CMU), Christian Kaestner (CMU), Claire Le Gouess (CMU).
Role: Co-PI.
Period: November 2015 – November 2019.

Competitive Industry Awards

Northrop Grumman Mission Systems' Research in Applications for Learning Machines (REALM) Consortium
Collaborators: Shaoshuai Mou (Purdue), Daniel A. DeLaurentis (Purdue), Bing Liu (UIC)
Role: Co-PI.
Period: January 2019 – December 2021.

JP Morgan AI Research Award, 2019
Role: PI.
Period: September 2019 – August 2020.

Amazon Research Award, 2018
Role: PI.
Period: September 2019 – August 2020.

Teaching Experience

Instructor, CS 393R, Fall 2020: Autonomous Robots
Graduate course, University of Texas at Austin

Instructor, CS 378F, Spring 2020, Spring 2021: F1/10 Autonomous Driving
Undergraduate course, University of Texas at Austin

Instructor, COMPSCI 220, Fall 2017, Fall 2018: Programming Methodology
Undergraduate course, University of Massachusetts Amherst

Instructor, COMPSCI 403, Fall 2016, Spring 2018 : Introduction To Robotics
Undergraduate course, University of Massachusetts Amherst

Instructor, COMPSCI 603, Spring 2016, Spring 2017, Spring 2019 : Robotics
Graduate course, University of Massachusetts Amherst

Instructor, COMPSCI 691BR, Spring 2017 : Building A Robot Soccer Team
Graduate Seminar, University of Massachusetts Amherst

Workshops, Panels, and Talks

Panel Moderator, Ethics Aware Design of AI
2020 Global Analytics Summit: Ethics in AI, Texas McCombs, November 2020

Discussion Panel, Record of Robotics at CMU Part II, A Live Interview with Manuela Veloso.
CMU Record of Robotics Series, October 2020

Last Mile Autonomous Delivery Systems: A Live Webcast Demonstration, and Panel Discussion
UT Good Systems Webinar, September 2020

The Call for an Accelerated Autonomy – Robotics on the Frontlines of a Crisis
Computing In Our New Normal: A UTCS Webinar, May 2020

The Quest for "Always-On" Autonomous Mobile Robots
IJCAI 2019 Early Career Spotlight Talk, August 2019

Panel Chair, Reasoning and Learning in Real-World Systems for Long-Term Autonomy
AAAI 2018 Fall Symposium, October 2018

Deploying Autonomous Service Mobile Robots, And Keeping Them Autonomous
ICRA 2018 Workshop: Long-term Autonomy and Deployment of Intelligent Robots in the Real-world, May 2018

Building Robots For Long-Term Autonomy, And Keeping Them Autonomous
Carnegie Mellon University,March 2018

Deploying Autonomous Service Mobile Robots, And Keeping Them Autonomous
IROS 2017 Workshop: Assistance and Service Robotics in a Human Environment, September 2017

Autonomous Mobile Robot Perception for Changing Environments
ICRA 2016 Workshop: AI for Long-term Autonomy, May 2016

Deploying Autonomous Service Mobile Robots, And Keeping Them Autonomous.
University of New Hampshire Robotics Seminar Series, March 2016

The Quest for Robust, Reliable, Autonomous Mobile Robots.
Williams College Computer Science Department Colloquium, November 2015

The Quest for Robust, Reliable, Autonomous Mobile Robots.
Vecna Robotics, September 2015

The Quest for Robust, Reliable, Autonomous Mobile Robots.
University of Minnesota, Computer Science & Engineering, April 2015

The Quest for Robust, Reliable, Autonomous Mobile Robots.
University of Massachusetts Amherst, School of Computer Science, March 2015

The Quest for Robust, Reliable, Autonomous Mobile Robots.
University of Massachusetts Amherst, School of Computer Science, March 2015

Professional Service

Outreach Activities

- Science on Screen Series at Amherst Cinema, Amherst MA, 31 October 2018: Presented a introduction to "Christine" within the scientific context of actual self-driving cars. *The Radical Future of Self-Driving Cars*.
- SciTech Cafe, Northampton MA, 23 January 2017: Presented a scientific talk to a general public audience. *"Where am I?" and Other Fundamental Questions Robotcs Think Long and Hard to Answer*
- HolyokeCodes, Holyoke MA, 8–12 July 2019: Co-Organized with Arjun Guha, a week-long robotics workshop for high-school students with state-of-the-art soccer-playing robots that we used to compete with at RoboCup. We covered the basic robot sense-plan-act control cycle, computational geometry, and simple adversarial planning. Students implemented building blocks of increasingly complex robot behaviors, leading up to a robot soccer tournament.

Track Chair / Associate Editor

- Associate Editor, Elsevier Robotics and Autonomous Systems: 2019 – present
- RoboCup Executive Committee, Small Size League: 2015 – present
- Robot Exhibitions Co-Chair, International Joint Conference on Artificial Intelligence (IJCAI): 2021
- RoboCup Symposium Co-Chair: 2020-2021
- Robotics Track Co-Chair, International Conference on Autonomous Agents and Multiagent Systems (AAMAS): 2019
- Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): 2016

Senior Program Committee

- AAAI Conference on Artificial Intelligence (AAAI): 2020
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS): 2021
- Autonomous Robots and Multirobot Systems Workshop (ARMS): 2016

Program Committee / Reviewer

- Autonomous Robots and Multirobot Systems Workshop (ARMS): 2020
- AAAI Symposium on Educational Advances in Artificial Intelligence: 2021
- RoboCup Symposium: 2015, 2016, 2017, 2018, 2019
- AAAI Undergraduate Consortium: 2021
- IEEE/SICE International Symposium on System Integration (SII): 2019
- Robotics: Science and Systems (RSS): 2015, 2016, 2019
- International Symposium on Multi-Robot and Multi-Agent Systems (MRS): 2019
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS): 2017, 2018
- International Conference on Automated Planning and Scheduling (ICAPS) : 2016, 2018, 2021
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
- IEEE International Conference on Robotics and Automation (ICRA): 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
- IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN): 2010
- IEEE Conference on Human-Robot Interaction (HRI): 2016
- International Joint Conference on Artificial Intelligence (IJCAI): 2016
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS): 2016

Journal Reviewing

- IEEE Robotics and Automation Letters (RA-L): 2017, 2018, 2019, 2020, 2021
- IEEE Robotics and Automation Magazine (IEEE-RAM): 2013, 2014, 2015, 2016, 2019
- IEEE Transactions on Robotics (T-RO): 2015, 2018, 2019, 2020
- International Journal of Robotics Research (IJRR): 2016, 2017
- International Journal of Social Robotics (SORO): 2018, 2019

Grant Reviewing

NSF Panelist: 2016(x2), 2018, 2019

University Service

College Level

- Faculty Hiring Committee for Whole Communities Whole Health Cluster Hires: 2019–2020
- CNS Fall Lab Working Group in response to COVID restrictions: 2020

Department Level

- Texas Robotics Machine Shop Committee: 2020–2021
- Texas Robotics Space Committee: 2020–2021
- UTCS Turing Scholars Admissions Committee: 2020–2021
- UTCS Diversity, Equity, and Inclusion Committee: 2020–2021
- UTCS Graduate Admissions Committee: 2019–2020
- UMass CICS Honors Program Director: 2018–2019
- UMass CICS Undergraduate Course Assistant Program Director: 2018–2019
- UMass CICS Graduate Admissions Committee: 2015–2016
- UMass CICS Student Activities Committee: 2015–2016
- UMass CICS Data Science Faculty Hiring Committee: 2016–2017
- UMass CICS Student Activities Committee: 2016–2017

Advising and Thesis Committees

PhD Supervisor

- Amanda Adkins, 2020–present
- Joshua Hoffman (Co-advised by Swarat Chaudhuri), 2020–present
- Kavan Sikand, 2019–present
- Emily Pruc, 2018–present
- Sadegh Rabiee, 2016–present

- Jarrett Holtz, 2015–present
- Samer Nashed (Changed advisors in 2019), 2015–2019
- Spencer Lane (Changed advisors in 2019), 2016–2019
- Alyxander Burns (Changed advisors in 2019), 2017–2019

Master's Thesis Supervisor

- David Balaban, 2016 – 2018
  A Real-Time Solver For Time-Optimal Control Of Omnidirectional Robots with Bounded Acceleration

Undergraduate Honors Thesis Supervisor

- Edward Schneeweiss, 2015 – 2019
  Joint Perception and Planning for Obstacle Avoidance over Non-Planar Terrain
- Kyle Vedder, 2015 – 2019
  X: Anytime Multiagent Path Planning With Bounded Search*
- George Larionov, 2015 – 2016
  Human-robot Interaction: Integrating Speech Recognition with a Mobile Robot System

PhD Committee Member

- Minkyu Kim. Supervisor: Luis Sentis
- Abhinav Verma. Supervisor: Swarat Chaudhuri
- Kyle Hollins Wray. Supervisor: Shlomo Zilberstein
- Justin Svegliato. Supervisor: Shlomo Zilberstein
- Tiffany Liu. Supervisor: Roderic Grupen
- Takeshi Takahashi. Supervisor: Roderic Grupen
- Mike Lanighan. Supervisor: Roderic Grupen
- Keen Sung. Supervisor: Brian Levine
- (Thesis Opponent) [1], Nils Bore. Supervisor: John Folkesson

Undergraduate Honors Thesis Committee Member

- Stefan Kussmaul. Supervisor: Roderic Grupen
- Karl Schmeckpepper. Supervisor: Roderic Grupen

[1] A PhD thesis dissertation in the Swedish doctoral system is formally presented by an external examiner, called the *thesis opponent*. A thesis opponent places the work of the PhD thesis in context with the state of the art, presents the findings of the thesis, and leads a discussion with questions.

Publications

Conference Papers

[1] Connor Basich et al. "Learning to Optimize Autonomy in Competence-Aware Systems." In: *Proceedings of the 2020 international conference on Autonomous agents and multi-agent systems*. International Foundation for Autonomous Agents and Multiagent Systems. 2020, pp. 123–131. DOI: 10.5555/3398761.3398781. URL: https://joydeepb.com/Publications/aamas2020_cas.pdf.

[2] Jarrett Holtz, Arjun Guha, and Joydeep Biswas. "Robot Action Selection Learning via Layered Dimension Informed Program Synthesis." In: *Conference on Robot Learning*. 2020. URL: https://joydeepb.com/Publications/corl2020_ldips.pdf.

[3] Sadegh Rabiee and Joydeep Biswas. "IV-SLAM: Introspective Vision for Simultaneous Localization and Mapping." In: *Conference on Robot Learning*. 2020. URL: https://joydeepb.com/Publications/corl2020_ivslam.pdf.

[4] Joseph Spitzer, Joydeep Biswas, and Arjun Guha. "Making High-Performance Robots Safe and Easy to Use for an Introduction to Computing." In: *Educational Advances in Artificial Intelligence*. 2020. URL: https://joydeepb.com/Publications/eaai2020_jsbots.pdf.

[5] Joydeep Biswas. "The Quest For "Always-On" Autonomous Mobile Robots." In: *Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI-19*. International Joint Conferences on Artificial Intelligence Organization, July 2019, pp. 6388–6392. DOI: 10.24963/ijcai.2019/893. URL: https://joydeepb.com/Publications/ijcai2019_early_career_spotlight.pdf.

[6] Sadegh Rabiee and Joydeep Biswas. "A Friction-Based Kinematic Model for Skid-Steer Wheeled Mobile Robots." In: *Robotics and Automation (ICRA), IEEE International Conference on*. IEEE. 2019, pp. 8563–8569. DOI: 10.1109/ICRA.2019.8794216. URL: https://joydeepb.com/Publications/icra2019_skid_steer.pdf.

[7] Sadegh Rabiee and Joydeep Biswas. "IVOA: Introspective Vision for Obstacle Avoidance." In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2019, pp. 1230–1235. URL: https://joydeepb.com/Publications/iros2019_ivoa.pdf.

[8] Justin Svegliato et al. "Belief Space Metareasoning for Exception Recovery." In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2019, pp. 1224–1229. DOI: 10.1109/IROS40897.2019.8967676. URL: https://joydeepb.com/Publications/iros2019_belief.pdf.

[9] Kyle Vedder and Joydeep Biswas. "X*: Anytime Multiagent Path Planning With Bounded Search." In: *Proc. of the 18th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*. 2019, pp. 2247–2249. ISBN: 9781450363099. URL: https://joydeepb.com/Publications/aamas2019_xastar.pdf.

[10] David Balaban, Alexander Fischer, and Joydeep Biswas. "A Real-Time Solver For Time-Optimal Control Of Omnidirectional Robots with Bounded Acceleration." In: 2018, pp. 8027–8032. DOI: 10.1109/IROS.2018.8594306. URL: https://joydeepb.com/Publications/iros2018_tsocs.pdf.

[11] Jarrett Holtz, Arjun Guha, and Joydeep Biswas. "Interactive Robot Transition Repair With SMT." In: *International Joint Conference on Artificial Intelligence (IJCAI)*. 2018, pp. 4905–4911. DOI: 10.24963/ijcai.2018/681. URL: https://joydeepb.com/Publications/ijcai2018_srtr.pdf.

[12] Samer Nashed and Joydeep Biswas. "Human-in-the-Loop SLAM." In: *AAAI Conference on Artificial Intelligence*. 2018, pp. 1503–1510. URL: https://joydeepb.com/Publications/aaai2018_hitl-slam.pdf.

[13] Samer Nashed, David Ilstrup, and Joydeep Biswas. "Localization under Topological Uncertainty for Lane Identification of Autonomous Vehicles." In: *Robotics and Automation (ICRA), IEEE International Conference on*. 2018, pp. 6000–6005. URL: https://joydeepb.com/Publications/icra2018_lutu.pdf.

[14] Sourish Ghosh and Joydeep Biswas. "Joint Perception And Planning For Efficient Obstacle Avoidance Using Stereo Vision." In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2017, pp. 1026–1031. URL: https://joydeepb.com/Publications/jpp.pdf.

[15] Jarrett Holtz and Joydeep Biswas. "Automatic Extrinsic Calibration of Depth Sensors with Ambigious Environments and Restricted Motion." In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2017, pp. 2235–2240. URL: https://joydeepb.com/Publications/delta_calibration.pdf.

[16] Juan Pablo Mendoza et al. "Selectively Reactive Coordination for a Team of Robot Soccer Champions." In: *AAAI Conference on Artificial Intelligence*. 2016, pp. 3354–3360. URL: https://joydeepb.com/Publications/aaai2016selectively.pdf.

[17] Samer Nashed and Joydeep Biswas. "Curating Long-Term Vector Maps." In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2016, pp. 4643–4648. DOI: 10.1109/IROS.2016.7759683. URL: https://joydeepb.com/Publications/iros2016_ltvm.pdf.

[18] Priyam Parashar et al. "Learning Context-Based Outcomes for Mobile Robots in Unstructured Indoor Environments." In: *2015 IEEE 14th International Conference on Machine Learning and Applications (ICMLA)*. 2015, pp. 703–706. DOI: 10.1109/ICMLA.2015.222. URL: https://joydeepb.com/Publications/icmla2015learning.pdf.

[19] Manuela Veloso et al. "CoBots: Robust symbiotic autonomous mobile service robots." In: *Proceedings of the 24th International Conference on Artificial Intelligence*. AAAI Press. 2015, pp. 4423–4429. URL: https://joydeepb.com/Publications/ijcai2015_cobots.pdf.

[20] Alfredo Weitzenfeld et al. "RoboCup Small-Size League: Past, Present and Future." In: *RoboCup 2014: Robot World Cup XVIII*. Springer International Publishing, 2015, pp. 611–623. URL: https://joydeepb.com/Publications/robocup2014_ssl.pdf.

[21] Danny Zhu, Joydeep Biswas, and Manuela Veloso. "AutoRef: Towards Real-Robot Soccer Complete Automated Refereeing." In: *RoboCup 2014: Robot World Cup XVIII*. Springer International Publishing, 2015, pp. 419–430. URL: https://joydeepb.com/Publications/robocup2014_autoref.pdf.

[22] Joydeep Biswas and Manuela Veloso. "Episodic Non-Markov localization: reasoning about short-term and long-term features." In: *Robotics and Automation (ICRA), 2014 IEEE International Conference on*. IEEE. 2014, pp. 3969–3974. DOI: 10.1109/ICRA.2014.6907435. URL: https://joydeepb.com/Publications/icra2014_enml.pdf.

[23] Joydeep Biswas and Manuela Veloso. "Model-Instance Object Mapping." In: *RoboCup 2014: Robot World Cup XVIII*. Springer International Publishing, 2014, pp. 525–536. URL: https://joydeepb.com/Publications/robocup2014_object_maps.pdf.

[24] Joydeep Biswas and Manuela Veloso. "Multi-sensor mobile robot localization for diverse environments." In: *RoboCup 2013: Robot World Cup XVII*. Springer Berlin Heidelberg, 2014, pp. 468–479. URL: https://joydeepb.com/Publications/13robocup_multisensor.pdf.

[25] Joydeep Biswas et al. “Opponent-driven planning and execution for pass, attack, and defense in a multi-robot soccer team.” In: *Proceedings of the 2014 international conference on Autonomous agents and multi-agent systems*. International Foundation for Autonomous Agents and Multiagent Systems. 2014, pp. 493–500. URL: https://joydeepb.com/Publications/aamas2014_cmdragons.pdf.

[26] Stefan Zickler et al. “Five Years of SSL-Vision–Impact and Development.” In: *RoboCup 2013: Robot World Cup XVII*. Springer Berlin Heidelberg, 2014, pp. 656–663. URL: https://joydeepb.com/Publications/robocup2013_ssl-vision.pdf.

[27] Benjamin Choi et al. “Fast human detection for indoor mobile robots using depth images.” In: *Robotics and Automation (ICRA), 2013 IEEE International Conference on*. IEEE. 2013, pp. 1108–1113. DOI: 10.1109/ICRA.2013.6630711. URL: https://joydeepb.com/Publications/icra2013_human_detection.pdf.

[28] Joydeep Biswas and Manuela Veloso. “Depth camera based indoor mobile robot localization and navigation.” In: *Robotics and Automation (ICRA), 2012 IEEE International Conference on*. IEEE. 2012, pp. 1697–1702. DOI: 10.1109/ICRA.2012.6224766. URL: https://joydeepb.com/Publications/icra2012_kinectLocalization.pdf.

[29] Joydeep Biswas and Manuela Veloso. “Planar polygon extraction and merging from depth images.” In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2012, pp. 3859–3864. DOI: 10.1109/IROS.2012.6385841. URL: https://joydeepb.com/Publications/iros2012_planes.pdf.

[30] Brian Coltin et al. “Effective semi-autonomous telepresence.” In: *RoboCup 2011: Robot Soccer World Cup XV*. Springer Berlin Heidelberg, 2012, pp. 365–376. URL: https://joydeepb.com/Publications/11robocup-telepresence.pdf.

[31] Manuela Veloso et al. “CoBots: Collaborative robots servicing multi-floor buildings.” In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2012, pp. 5446–5447. DOI: 10.1109/IROS.2012.6386300. URL: https://joydeepb.com/Publications/iros2012_cobots.pdf.

[32] Joydeep Biswas, Brian Coltin, and Manuela Veloso. “Corrective gradient refinement for mobile robot localization.” In: *Intelligent Robots and Systems (IROS), IEEE/RSJ International Conference on*. IEEE. 2011, pp. 73–78. DOI: 10.1109/IROS.2011.6094625. URL: https://joydeepb.com/Publications/iros2011_cgr.pdf.

[33] Joydeep Biswas and Manuela Veloso. “Wifi localization and navigation for autonomous indoor mobile robots.” In: *Robotics and Automation (ICRA), 2010 IEEE International Conference on*. IEEE. 2010, pp. 4379–4384. DOI: 10.1109/ROBOT.2010.5509842. URL: https://joydeepb.com/Publications/icra2010_wifi.pdf.

[34] Stephanie Rosenthal, Joydeep Biswas, and Manuela Veloso. “An effective personal mobile robot agent through symbiotic human-robot interaction.” In: *Proceedings of the 9th International Conference on Autonomous Agents and Multiagent Systems: volume 1-Volume 1*. International Foundation for Autonomous Agents and Multiagent Systems. 2010, pp. 915–922. URL: https://joydeepb.com/Publications/Rosenthal_AAMAS2010.pdf.

[35] Brian C Becker et al. “Active guidance for laser retinal surgery with a handheld instrument.” In: *Engineering in Medicine and Biology Society, 2009. EMBC 2009. Annual International Conference of the IEEE*. IEEE. 2009, pp. 5587–5590. DOI: 10.1109/IEMBS.2009.5333489. URL: https://joydeepb.com/Publications/Becker_et_al_Micron.pdf.

Journal Articles

[36] Kyle Vedder and Joydeep Biswas. "X*: Anytime Multi-Agent Path Finding For Sparse Domains Using Iterative Repairs." In: *Artificial Intelligence* 291 (2021), p. 103417. DOI: 10.1016/j.artint.2020.103417. URL: https://joydeepb.com/Publications/aij_xstar.pdf.

[37] Keen Yuun Sung et al. "Server-side Traffic Analysis Reveals Mobile Location Information over the Internet." In: *IEEE Transactions on Mobile Computing* (2018). DOI: 10.1109/TMC.2018.2857777. URL: https://joydeepb.com/Publications/tmc2018_sung.pdf.

[38] Joydeep Biswas and Manuela M. Veloso. "Episodic non-Markov localization." In: *Robotics and Autonomous Systems* 87 (2017), pp. 162–176. ISSN: 0921-8890. DOI: 10.1016/j.robot.2016.09.005. URL: https://joydeepb.com/Publications/ras_episodic_nonmarkov_localization.pdf.

[39] Joydeep Biswas and Manuela Veloso. "The 1,000-km Challenge: Insights and Quantitative and Qualitative Results." In: *IEEE Intelligent Systems* 31.3 (2016), pp. 86–96. DOI: 10.1109/MIS.2016.53. URL: https://joydeepb.com/Publications/intelligent_systems2016_1000km.pdf.

[40] Joydeep Biswas and Manuela M Veloso. "Localization and navigation of the CoBots over long-term deployments." In: *The International Journal of Robotics Research* 32.14 (2013), pp. 1679–1694. DOI: 10.1177/0278364913503892. URL: https://joydeepb.com/Publications/ijrr_longterm_autonomy_cobot.pdf.

Other Publications

[41] Jenna Claire Hammond, Joydeep Biswas, and Arjun Guha. *Automatic Failure Recovery for End-User Programs on Service Mobile Robots*. arXiv Preprint arXiv:1909.02778. 2019. URL: https://joydeepb.com/Publications/arxiv_rtpl.pdf.

[42] Jarrett Holtz, Arjun Guha, and Joydeep Biswas. *SMT-based Robot Transition Repair*. arXiv Preprint arXiv:2001.04397. 2019. URL: https://joydeepb.com/Publications/arxiv_srtr.pdf.

[43] Jarrett Holtz, Arjun Guha, and Joydeep Biswas. *Demo: Interactive Robot Transition Repair*. International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS) Demonstration track. 2018. URL: https://joydeepb.com/Publications/aamas2018_srtrdemo.pdf.

[44] Spencer Lane, Kyle Vedder, and Joydeep Biswas. *Augmenting Planning Graphs in 2-Dimensional Dynamic Environments With Obstacle Scaffolds*. PlanRob Workshop, International Conference on Automated Planning and Scheduling. 2017. URL: https://joydeepb.com/Publications/planrob2017_scaffold.pdf.

PhD Thesis

[45] Joydeep Biswas. "Vector Map-Based, Non-Markov Localization for Long-Term Deployment of Autonomous Mobile Robots." Carnegie Mellon University, Dec. 2014. URL: https://joydeepb.com/Publications/joydeepb_thesis.pdf.