CURRICULUM VITAE

Stephen J. Guy

13$^{\text{th}}$ October, 2019

Office Address:	Department of Computer Science and Engineering, University of Minnesota
	4-192 Keller Hall, 200 Union St SE, Minneapolis, MN 55455
Phone:	(612) 625-3368
Email:	sjguy@umn.edu

Education

- Ph.D., Computer Science, University of North Carolina at Chapel Hill, 2012
  Thesis: *Geometric Collision Avoidance for Heterogeneous Crowd Simulation*
  Advisors: Ming Lin and Dinesh Manocha
- M.S., Computer Science, University of North Carolina at Chapel Hill, 2009
- B.S., Computer Engineering, University of Virginia, 2006
  Minor: Physics

Academic Employment

- Associate Professor - University of Minnesota, Twin Cities; 2018 – Present
- Assistant Professor - University of Minnesota, Twin Cities; 2012 – 2018
- Graduate Researcher - University of North Carolina at Chapel Hill; 2006 – 2012
- Undergraduate Researcher - University of Virginia; 2005 – 2006

Awards and Honors

- Charles E. Bowers Faculty Teaching Award (2018)
- Google/United Negro College Fund (UNCF) Fellowship (2010)
- Intel/GEM Fellowship (2009)
- NSF AGEP Fellowship (2007)
- Tau Beta Pi - Engineering Honor Society (2006)
- 1st Place, Fairfax Country Science Fair, Computer Science (2000)

Membership in Professional Societies

ACM, ACM SIGGRAPH, IEEE, IEEE Computer Society, IEEE Robotics and Automation Society,
AI Game Developers Guild, Game Developers Award Voter

Research

External Grants

Awarded (Current):

- *NSF* (EAGER) IIS: Uncertainty-aware Planning for Robot Navigation in Human Environments, PI:
  Stephen J. Guy, *$170,303* (Sept. 2017 – Aug. 2019)

- *NSF* CHS: Small: Transforming the Architectural Design Review Process through Collaborative Embodiment in HMD-based Immersive Virtual Environments, PI: Victoria Interrante; Co-PIs: Stephen J. Guy, Lee Anderson, *$499,410* (Sept. 2015 – Aug. 2018) *2 year no-cost extension through Aug. 2020*

- *NSF* CPS: TTP Option: Synergy: Collaborative Research: Dynamic Methods of Traffic Control that Impact Quality of Life in Smart Cities, PI: Nikolaos Papanikolopoulos; Co-PIs: Brian Scott, John Hourdos, Stephen J. Guy, Mihailo Jovanovic *$1,398,795* (Sept. 2015 – Aug. 2018) *1 year no-cost extension through Aug. 2019*

Awarded (Completed):

- *NSF* I/UCRC Phase I: Robots and Sensors for the Human Well-being, PI: Vassilios Morellas; Co-PIs: Stephen J. Guy, Demoz Gebre-Egziabher, Maria Gini, *$156,920* (Sept. 2014 – Aug. 2019)

Internal Grants

- *MnDrive Exploratory Grant* Spectral-based Nitrogen Detection for Unmanned Arial Vehicles, PI: Stephen J. Guy, *$40,000* (June 2014 – June 2015)

Selected Press Coverage

- *The Gaurdian*, A winning smile avoids showing too many teeth, researchers say, June, 2017
- *Future Tense (Australian Public Radio)*, Crowds and motion [Broadcast: mp3], March, 2015
- *Ars Technica*, Collision avoidance predicts pedestrians' behavior, January, 2015
- *The Boston Globe*, In crowds, human 'particles' follow laws of movement, December, 2014
- *Science News*, Math to match pedestrian behavior is all about timing, December, 2014.
- *Scientific American*, Mathematical Time Law Governs Crowd Flow, November, 2014

Publications

Refereed Journal Articles

Starred* names are researchers from my lab.

J1 Dalton Hildreth*, and Stephen J. Guy. "Coordinating Multi-Agent Navigation by Learning Communication." In *Proceedings of the ACM in Computer Graphics and Interactive Techniques (ACM SIGGRAPH / Eurographics Symposium on Computer Animation (SCA))*, (2019), 2, 2, Article 20, ACM, 10 pages. doi:10.1145/3340261

J2 Ioannis Karamouzas*, Nick Sohre*, Ran Hu*, and Stephen J. Guy. "Crowd Space: A Predictive Crowd Analysis Technique." *ACM Transactions on Graphics (SIGGRAPH Asia)*, (2018), ACM.
doi:10.1145/3272127.3275079
Impact Factor: 4.22.

J3 Sofia Lyford-Pike, Nathaniel E. Helwig, Nick Sohre*, Stephen J. Guy, and Tessa A. Hadlock. "Predicting perceived disfigurement from facial function in patients with unilateral paralysis." *Plastic and Reconstructive Surgery*, 142, 5, 722e-728e., (2018), 7 pages.
doi:10.1097/PRS.0000000000004851
Impact Factor: 3.84.

J4 Bobby Davis*, Nick Sohre*, and Stephen J. Guy. "Multi-World Motion Planning." *IEEE Robotics and Automation Letters (RA-L) / IROS*, (2018), 3, 4 IEEE, 3968–3974.
doi:10.1109/LRA.2018.2858445

J5 Julio Godoy*, Fenix Chen*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. "ALAN: Adaptive Learning for Multi-Agent Navigation". *Autonomous Robots*, 1–20, (2018). doi:10.1007/s10514-018-9719-4
Impact Factor: 2.24.

J6 Ioannis Karamouzas*, Nick Sohre*, Rahul Narain, and Stephen J. Guy. "Implicit Crowds: Optimization Integrator for Robust Crowd Simulation." *ACM Transactions on Graphics (SIGGRAPH)*, 36, 4, Article 136, (2017), ACM, 13 pages. doi:110.1145/3072959.3073705
Impact Factor: 4.10.

J7 Nathaniel E. Helwig, Nick Sohre*, Mark R. Ruprecht, Stephen J. Guy, and Sofia Lyford-Pike. "Dynamic Properties of Successful Smiles." *PLoS ONE*, 12, 6, e0179708, (2017), 17 pages.
doi:10.1371/journal.pone.0179708
Impact Factor: 4.41.

J8 Bobby Davis*, Ioannis Karamouzas*, and Stephen J. Guy. "C-OPT: Coverage-Aware Trajectory Optimization Under Uncertainty." *IEEE Robotics and Automation Letters (RA-L) / ICRA*, 1,2, (2016), IEEE, 1020–1027. doi:10.1109/LRA.2016.2530302

J9 Brian Skinner and Stephen J. Guy. "A Method for Using Player Tracking Data in Basketball to Learn Player Skills and Predict Team Performance." *PloS ONE*, 10, 9, (2015), e0136393, 15 pages.
doi:10.1371/journal.pone.0136393
Impact Factor: 3.24

J10 Ioannis Karamouzas*, Brian Skinner, and Stephen J. Guy. "Universal power law governing pedestrian interactions." *Physical Review Letters (PRL)*, 113, 23, (2014), APS, 238701, 5 pages, 7 pages supplemental material. doi:10.1103/PhysRevLett.113.238701
Editor's Selection, **APS Focus Piece**, and **Cover Image**
Impact Factor: 7.73.

J11 Sujeong Kim, Stephen J. Guy, Wenxi Liu, David Wilkie, Rynson Lau, Ming C. Lin, and Dinesh Manocha. "BRVO: Predicting pedestrian trajectories using velocity-space reasoning." *The International Journal of Robotics Research (IJRR)*, 34, 2, (2014), Sage, 0278364914555543, 17 pages.
doi:10.1177/0278364914555543
Impact Factor: 2.50.

J12 Panayiotis Charalambous, Ioannis Karamouzas*, Stephen J. Guy, and Yiorgos Chrysanthou. "A data-driven framework for visual crowd analysis." *Pacific Graphics / Computer Graphics Forum (CGF)*, 33, 7, (2014), EG, 41–50. doi:10.1111/cgf.12472
Impact Factor: 1.60.

J13 Sujeong Kim, Stephen J. Guy, Karl Hillesland, Basim Zafar, Adnan Gutub, and Dinesh Manocha. "Velocity-Based modeling of physical Interactions in dense crowds." *The Visual Computer*, 31, 5, (2014), Springer Berlin, 541–555. doi:10.1007/s00371-014-0946-1
Impact Factor: 0.91.

J14 David Wolinski, Stephen J. Guy, Anne Hellen Olivier, Ming C. Lin, Dinesh Manocha, and Julien Pettre. "Parameter estimation and comparative evaluation of crowd simulations." *Computer Graphics Forum (Eurographics)*, 33, 2, (May 2014), 303–312. doi:10.1111/cgf.12328
Impact Factor: 1.64.

J15 Stephen J. Guy, Jur van den Berg, Wenxi Liu, Rynson Lau, Ming C. Lin, and Dinesh Manocha. "A statistical similarity measure for aggregate crowd dynamics." *ACM Transactions on Graphics (Siggraph Asia)*, 31, 6, (November 2012), 190, 12 pages. doi:10.1145/2366145.2366209
Impact Factor: 3.49.

J16 Stephen J. Guy, Sean Curtis, Ming C. Lin, and Dinesh Manocha. "Least-effort trajectories lead to emergent crowd behaviors". *Physical Review E*, 85, 1, (January 2012), 016110, 7 pages.
doi:10.1103/PhysRevE.85.016110
Impact Factor: 2.31

J17 Jamie Snape, Jur van den Berg, Stephen J. Guy, and Dinesh Manocha. "The hybrid reciprocal velocity obstacle". *IEEE Transactions on Robotics (T-RO)*, 27, 4, (April 2011), 696–706.
doi:10.1109/TRO.2011.2120810
Impact Factor: 2.57

J18 Russell Gayle, Avneesh Sud, Erik Andersen, Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. "Interactive navigation of heterogeneous agents using adaptive roadmaps." *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, 15, 1, (January 2009), 34 – 48.
doi:10.1109/TVCG.2008.84
Impact Factor: 2.22

Chapters in books (that are not conference proceedings)

B1 Stephen J. Guy, Ioannis Karamouzas*, Ming C. Lin, and Dinesh Manocha, "Anticipatory Local Navigation." In N. Pelechano, J.M. Allbeck, M. Kapadia, N.I. Badler, editors, *Simulating Heterogeneous Crowds with Interactive Behaviors.* CRC Press, 2016, 28 pages.
https://www.amazon.com/dp/B01N5WHV9B

B2 Stephen J. Guy and Ioannis Karamouzas*, "A Guide to Anticipatory Collision Avoidance". In Stephen Rabin, editor, *Game AI Pro: Collected Wisdom of Game AI Professionals.* A. K. Peters, Ltd, 2015, Chapter 19, 195 – 208. http://www.gameaipro.com/GameAIPro2/

B3 Leonid V. Zhigilei, Z. Lin, D. Ivanov, Elodi Levuegle, William Duff, D. Thomas, Carlos Sevilla, and Stephen J. Guy. "Atomic/molecular-level simulations of laser-materials interactions". In *1st int. school on laser surface interactions for new materials production*, July 2008.
doi:10.1007/978-3-642-03307-0_3

Refereed Conference Proceedings

Starred* names are researchers from my lab. <u>Underlined</u> names are the presenting authors.

C1 <u>Tiannan Chen</u>*, and Stephen J. Guy. "GIGL: A Domain Specific Language for Procedural Content Generation with Grammatical Representations." In AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE), 2018, 9–17.
https://aaai.org/ocs/index.php/AIIDE/AIIDE18/paper/view/18118

C2 <u>Nick Sohre</u>*, Moses Adeagbo, Nathaniel E. Helwig, Sofia Lyford-Pike and Stephen J. Guy. "PVL: A Framework for Navigating the Precision-Variety Trade-off in Automated Animation of Smiles." In *Association for the Advancement of Artificial Intelligence (AAAI)*, 2018. 25% acceptance rate.
https://www.aaai.org/ocs/index.php/AAAI/AAAI18/paper/view/17315

C3 Devin Lange, Francesca Samsel, Ioannis Karamouzas*, Stephen J. Guy, Rodney Dockter, Timothy Kowalewski, and <u>Daniel F. Keefe</u>. "Trajectory Mapper: Interactive Widgets and Artist-Designed Encodings for Visualizing Multivariate Trajectory Data (Short Paper)". In *Eurographics Conference on Visualization (EuroVis)*, 2017.

C4 Bilal Kartal*, <u>Nick Sohre</u>*, and Stephen J. Guy. "Data-Driven Sokoban Puzzle Generation with Monte Carlo Tree Search." In AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE), 2016, 58–64. 28% acceptance rate.
www.aaai.org/ocs/index.php/AIIDE/AIIDE16/paper/view/14006
Best Student Paper Award

C5 <u>Tiannan Chen</u>*, Xiangyun Lei, Hakan Demir, Christopher J. Cramer, Laura Gagliardi, and Stephen J. Guy. "MOF: Creating an Educational Game on Nanotechnology Through Simulation-driven Optimization". In *Motion in Games (MiG)*, 2016, 39–48.
doi:10.1145/2994258.2994267

C6 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. "Moving in a Crowd: Safe and Efficient Navigation among Heterogeneous Agents". In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2016, 294–300. Acceptance Rate: 25%.
www.ijcai.org/Abstract/16/049

C7 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. "Implicit Coordination in Crowded Multi-Agent Navigation". In *Association for the Advancement of Artificial Intelligence (AAAI)*, 2016. Acceptance Rate: 26%.
www.aaai.org/ocs/index.php/AAAI/AAAI16/paper/view/12334

C8 Ioannis Karamouzas*, and Stephen J. Guy. "Prioritized Group Navigation with Formation Velocity Obstacles." In IEEE International Conference on Robotics and Automation (ICRA), 2015, 5983–5989. Acceptance Rate: 41%.
doi:10.1109/ICRA.2015.7140038

C9 Bilal Kartal*, Julio Godoy*, Ioannis Karamouzas*, and Stephen J. Guy. "Stochastic Tree Search for Coverage Planning with Useful Cycles." In IEEE International Conference on Robotics and Automation (ICRA), 2015, 1289–1294. Acceptance Rate: 41%.
doi:10.1109/ICRA.2015.7139357

C10 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. "Adaptive Learning for Multi Agent Navigation". In *Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS)*, 2015, 1577–1585. Acceptance Rate: 25%.

C11 Kyungyoon Kim, Ioannis Karamouzas*, Bret Jackson, Moses Adeagbo*, Stephen J. Guy, Richard Graff, and Daniel F. Keefe. "Bema: A multimodal interface for expert experiential analysis of political assemblies at the pnyx in ancient greece". In *The IEEE Symposium on 3D User Interfaces (3DUI)*, 2015, 19–26.
doi:10.1109/3DUI.2015.7131720

C12 David Wolinski, Stephen J. Guy, Anne-Hélène Olivier, Ming C. Lin, Dinesh Manocha, and Julien Pettré . "Optimization-based pedestrian model calibration for evaluation". In *Transportation Research Procedia (Proceeding of PEDS)*, vol 2, Elsevier, 2014, 228–236.
doi:10.1016/j.trpro.2014.09.041

C13 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. "Anytime navigation with progressive hindsight optimization". In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2014, 730–735. Acceptance Rate: 47%.
doi:10.1109/IROS.2014.6942639

C14 Bilal Kartal*, John Koenig*, and Stephen J. Guy. "User-driven narrative variation in large story domains using monte carlo tree search". In *Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS)*, 2014, 69–76. Acceptance Rate: 24%.

C15 John Koenig*, Ioannis Karamouzas*, and Stephen J. Guy. Object-centric parallel rigid body simulation with timewarp. In *Motion in Games (MiG)*, 2013, 203–212. Acceptance Rate: 42%.
doi:10.1145/2522628.2522652

C16 Sujeong Kim, Stephen J. Guy, and Dinesh Manocha. Velocity-based modeling of physical interactions in multi-agent simulations. In *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*. ACM, 2013, 125–133. Acceptance Rate: 35%.
doi:10.1145/2485895.2485910

C17 Sujeong Kim, Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Interactive simulation of dynamic crowd behaviors using general adaptation syndrome theory. In *Symposium on Interactive 3D Graphics and Games (I3D)*, 2012, 55–62. Acceptance Rate: 40%.
doi:10.1145/2159616.2159626

C18 Sujeong Kim, Stephen J. Guy, Wenxi Liu, and Ming Lin. Predicting pedestrian trajectories using velocity-space reasoning. In *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2012, 609–623.
doi:10.1007/978-3-642-36279-8_37

C19 Jur van den Berg, Jamie Snape, Stephen J. Guy, and Dinesh Manocha. LQG-Obstacles: Feedback control with collision avoidance for mobile robots with motion and sensing uncertainty. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2012, 346–353. Acceptance Rate: 40%.
doi:10.1109/ICRA.2012.6224648

C20 Stephen J. Guy, Sujeong Kim, Ming C. Lin, and Dinesh Manocha. Simulating heterogeneous crowd behaviors using personality trait theory. In *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*. ACM, 2011, 43–52. Acceptance Rate: 39%.
doi:10.1145/2019406.2019413

C21 Jens Schneider, Dina Garatly, Madhusudhanan Srinivasan, Stephen J. Guy, Sean Curtis, Steven Cutchin, Dinesh Manocha, Ming C. Lin, and Alyn Rockwood. Towards a digital makkah – using immersive 3d environments to train and prepare pilgrims. In *Digital Media and its Applications in Cultural Heritage (DMACH)*, 2011.

C22 Jur van den Berg, Jamie Snape, Stephen J. Guy, and Dinesh Manocha. Reciprocal collision avoidance with acceleration-velocity obstacles. In *IEEE International Conference on Robotics and Automation (ICRA)*, 2011, 3475–3482. Acceptance Rate: 49%.
doi:10.1109/ICRA.2011.5980408

C23 Stephen J. Guy, Jatin Chhugani, Sean Curtis, Ming C. Lin, and Dinesh Manocha. PLEdestrians: A least-effort approach to crowd simulation. In *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, ACM, 2010, 119-128. [Back Cover Image], Acceptance Rate: 43%.

C24 Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Modeling collision avoidance behavior for virtual humans. In *Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS)*, 2010, 575–582. Acceptance Rate: 24%.
Best Paper Award Finalist

C25 Jamie Snape, Jur van den Berg, Stephen J. Guy, and Dinesh Manocha. Smooth and collision-free navigation for multiple robots under differential-drive constraints. In *Intelligent Robots and Systems (IROS)*, IEEE, 2010, 4584–4589. Acceptance Rate: 58%.
doi:10.1109/IROS.2010.5652073

C26 Jamie Snape, Stephen J. Guy, Jur van den Berg, and Dinesh Manocha. Smooth coordination and navigation for multiple differential-drive robots. In *International Symposium on Experimental Robotics (ISER)*, 2010, 6 pages.
doi:10.1007/978-3-642-10347-6_9

C27 Stephen J. Guy, Jatin Chhugani, Changkyu Kim, Nadathur Satish, Ming C. Lin, Dinesh Manocha, and Pradeep Dubey. Clearpath: Highly parallel collision avoidance for multi-agent simulation. In *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, ACM, 2009, 177-187. Acceptance Rate: 39%.
CD Cover Image.
doi:10.1145/1599470.1599494

C28 Ming C. Lin, Stephen J. Guy, Rahul Narain, Jason Sewall, Sachin Patil, Jatin Chhugani, Abhinav Golas, Jur Van Den Berg, Sean Curtis, David Wilkie, and Dinesh Manocha. Interactive modeling, simulation and control of large-scale crowds and traffic. In *Motion in Games (MiG)*, 2009, 94–103.
doi:10.1007/978-3-642-10347-6_9

C29 Jamie Snape, Jur van den Berg, Stephen J. Guy, and Dinesh Manocha. Independent navigation of multiple mobile robots with hybrid reciprocal velocity obstacles. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2009, 5917–5922. Acceptance Rate: 54%.

C30 Jur van den Berg, Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Reciprocal n-body collision avoidance. In *Inter. Symp. on Robotics Research (ISRR)*, 2009, 3–19.
doi:10.1007/978-3-642-19457-3_1

C31 Ming Lin, Avneesh Sud, Jur van den Berg, Russell Gayle, Sean Curtis, Hengchin Yeh, Stephen J. Guy, Eric Andersen, Sachin Patil, Jason Sewall, and Dinesh Manocha. Real-time path planning and navigation for multi-agent and crowd simulations. In *Motion in Games (MiG)*, 2008, 23–32.
doi:10.1007/978-3-540-89220-5_3

C32 Avneesh Sud, Russell Gayle, Eric Andersen, Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Real-time navigation of independent agents using adaptive roadmaps. In *Symposium on Virtual reality software and technology (VRST)*, 2007, 99–106. Acceptance Rate: 21%.
Best Paper Award.
doi:10.1145/1315184.1315201

Peer reviewed Posters, Workshop Presentations

W1 Nick Sohre*, Charlie Mackin*, Victoria Interrante, and Stephen J. Guy. "Evaluating Collision Avoidance Effects on Discomfort in Virtual Environments". In *Workshop on Virtual Humans and Crowds in Immersive Environments (VHCIE)*, Mar 2017, 5 pages.

W2 Nick Sohre* and Stephen J. Guy. "A Data Driven Method for Variation in Animated Smiles". In *Motion in Games*, Oct 2016, 2 pages.
Best Poster Runner Up.

W3 Ran Hu*, Moses Adeagbo*, Victoria Interrante, and Stephen J. Guy. "Virtual Human Head Turning During Collision Avoidance in Crowd Simulation". In *Workshop on Virtual Humans and Crowds in Immersive Environments (VHCIE)*, Mar 2016, 2 pages.

W4 David Cherry* and Stephen J. Guy. "RVO collision avoidance in Unity 3D". In *TAPIA Conference*, Feb 2014.
Best Poster Finalist.

W5 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. e-ucb for action selection in multi agent navigation. In *Machine Learning in Planning and Control of Robot Motion Workshop*, 2014.

W6 Julio Godoy*, Ioannis Karamouzas*, Stephen J. Guy, and Maria Gini. Online learning for multi-agent local navigation. In *AAMAS Workshop on Cognitive Agents for Virtual Environments (CAVE)*, May 2013.

W7 Ioannis Karamouzas* and Stephen J. Guy. Prioritized formations for multi-agent group navigation. In *Symposium on Computer Animation (SCA)*, 2013.

W8 Bilal Kartal*, John Koenig*, and Stephen J. Guy. Generating believable stories in large domains. In *Intelligence and Interactive Digital Entertainment Conference (Workshop on Intelligent Narrative Technologies 6)*, 2013.

W9 Jamie Snape, Stephen J Guy, Ming C Lin, and Dinesh Manocha. Local and global planning for collision-free navigation in video games. In *Planning in Games Workshop*, page 7, 2013.

W10 Jamie Snape, Stephen J. Guy, Jur van den Berg, Ming Lin, and Dinesh Manocha. Reciprocal collision avoidance and multi-agent navigation for video games. In *AAAI workshop on Multiagent Pathfinding (WoMP)*, 2012.

W11 Sean Curtis, Stephen J. Guy, Basim Zafar, and <u>Dinesh Manocha</u>. Virtual Tawaf: A case study in simulating the behavior of dense, heterogeneous crowds. In *1st IEEE Workshop on Modeling, Simulation and Visual Analysis of Large Crowds*, 2011.

W12 <u>Stephen J. Guy</u>, Jur van den Berg, Ming C. Lin, and Dinesh Manocha. Geometric methods for multi-agent collision avoidance. In *Symposium on Computational Geometry (SoCG)*, 2010.

W13 Jamie Snape, <u>Stephen J. Guy</u>, Jur van den Berg, Sachin Patil, Ming C. Lin, and Dinesh Manocha. Independent navigation of multiple robots and virtual agents. In *Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 1645–1646, 2010.

W14 <u>Stephen J. Guy</u>. Massively large crowd simulations on multi-core cpus. In *HPCA's Second Workshop on Emerging Applications and Many-core Architecture (EAMA)*, Feb 2009.

W15 Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Collision-free path computation for human-like agents. In *Workshop on Modeling, Simulation and Optimization of Bipedal Walking at Humanoids*, 2009.

W16 <u>Jur van den Berg</u>, Stephen J. Guy, Ming C. Lin, and Dinesh Manocha. Reciprocal n-body collision avoidance. In *RSS workshop on Autonomous Flying Vehicles: Fundamentals and Application*, 2009.

Software and Other Products

S1 **TTC Collision Avoidance Library**, Co-Maintainer and Co-Author
Python and C++ implementation of our TTC-based local navigation approach. The code has been downloaded over 300 times and accompanying paper downloaded over 2,000 times.
http://motion.cs.umn.edu/PowerLaw

S2 **ORCA / RVO2 Collision Avoidance Library**, Co-Maintainer and Co-Author
Developer for RVO2 collision avoidance library. This library has over 2,500 downloads, and has been licensed by various major game studios for use in many commercial games. A partial list of products which have adopted the approach for their work include: Middle-Earth:Shadow of Mordor, Warhammer 40,000:SpaceMarine, and Warframe.
http://gamma.cs.unc.edu/RVO2/

S3 **HerdEm**, Co-Author
Mobile sheep herding game for iPhone, Android, and Web.
http://gamma.cs.unc.edu/HERDEM/

Tutorials

- *Simulating heterogeneous crowds with interactive behaviors* with Normand Badler, Mubbasir Kapadia, Jan Allbeck, Yiorgos Chrysanthou, and Nuria Pelechano, Eurographics 2014, Strasbourg, France, April, 2014. doi:10.2312/egt.20141016

Presentations

Invited Plenary Talks

- *Psycho-physical Crowds*, ACM Siggraph Motion in Games (MiG), Dublin, Ireland, November, 2013.

Invited Speaker at Conferences and Workshops

- *Forced-Based Anticipatory Collision Avoidance in Crowd Simulations* with Ioannis Karamouzas, Game Developers Conference (GDC) 2015, San Francisco, March, 2015.

- *Adopting Pedestrian Navigation Techniques for Multi-Agent Coordination*, International Workshop on Multi-Agent Systems and Collaborative Technologies (I-MASC), Minneapolis, Minnesota, May 2014

- *Crowd Simulation in Games*, East Coast Game Conference (ECGC), Raleigh, NC, April, 2010.

Invited Panelist at Conferences

- *Critical Thinking in Video Games*, GlitchCon, Minneapolis, Minnesota, March, 2015

Colloquia and other Invited Talks

External:

- *Modern Challenges in Motion Planning*, Lockheed Martin Robotics Seminar, University of Maryland, College Park, Maryland, December 2018

- *Capturing Social Intelligence: Simulating Humans for Robots, Games, and Medicine*, George Mason University GRAND seminar, Fairfax, Virginia, March 2017

- *Practical Multi-Agent Motion Planning*, UC Berkeley Electrical Engineering and Computer Sciences (EECS) talk, Berkeley, California, March 2015

- *Practical Multi-Agent Motion Planning*, University of North Carolina at Chapel Hill Department Colloquium, Chapel Hill, North Carolina, February 2015

- *From Data to Action: A data-driven approach to simulating, analyzing and evaluating human crowd behaviors.*, Department of Computer & Information Science & Engineering Colloquium at the University of Florida, Gainesville, Florida, September 2014

- *From Data to Crowds: Capturing Human Behaviors to Create Virtual Crowds*, Macalester College Mathematics, Statistics, and Computer Science department Seminar Series, St. Paul, Minnesota, September 2014

- *Crowd Simulations: Past, Present & Future*, INRIA, Rennes, France, February 2013

- *Crowd Simulation for Human Trajectory Analysis*, 3M Computational Intelligence Colloquium, St. Paul, Minnesota, August 2013

Internal:

- *50 Years of Computing at Minnesota*, UMN College of Science & Engineering Alumni 50 Year Reunion Keynote, Minneapolis, Minnesota, May 2019

- *Artificial Social Intelligence: Understanding Humans for Robots, Games, & Medicine*, UMN Big Data REU Seminar, Minneapolis, Minnesota, June 2018

- *Capturing Social Intelligence: A Computational Perspective of Human Navigation and Facial Expressions*, Interdisciplinary Center for Neurobehavioral Development (CNBD) at the University of Minnesota, Minneapolis, Minnesota, November 2016

- *AI for Humans: How computers can intelligently understand*, Master of Science in Software Engineering (MSSE) at the University of Minnesota, Minneapolis, Minnesota, September 2016

- *Multi-Agent Motion Planning*, University of Minnesota Computer Science Department Colloquium, Minneapolis, Minnesota, September 2014

- *From Data to Crowds: Capturing Human Behaviors to Create Virtual Crowds*, (MSSE) at the University of Minnesota, Minneapolis, Minnesota, September 2014

- *What Human Crowds can teach Robots and Video Games*, Alumni Lunch and Learn at the University of Minnesota, Minneapolis, Minnesota, April 2013

- *Simulating Human Crowds*, University of Minnesota Computer Science Department Colloquium, Minneapolis, Minnesota, January 2013

- *Motion Planning for Human Trajectory Analysis*, Digital Technology Center (DTC) at the University of Minnesota, Minneapolis, Minnesota, January 2013

- *Predictive Path Planning for Humans and Robots*, Master of Science in Software Engineering (MSSE) at the University of Minnesota, Minneapolis, Minnesota, September 2012

Teaching and Curriculum Development

Courses Taught

University of Minnesota:
　　CSCI 5611 - Animation and Planning in Games - Spring, 2019
　　CSCI 1133 - Introduction to Programming Concepts - Spring, 2019
　　CSCI 5607 - Fundamentals of Computer Graphics - Fall, 2018
　　CSCI 5611 - Animation and Planning in Games - Spring, 2018
　　CSCI 5607 - Fundamentals of Computer Graphics - Fall, 2017
　　CSCI 5611 - Animation and Planning in Games - Spring, 2017
　　CSCI 1133H - Introduction to Programming Concepts (Honors) - Fall, 2016
　　CSCI 8980 - Experimental Game Technologies - Spring, 2016
　　CSCI 5611 - Animation and Planning in Games - Fall, 2015
　　CSCI 5607 - Fundamentals of Computer Graphics I - Fall, 2014
　　CSCI 1133 - Introduction to Programming Concepts - Spring, 2014
　　CSCI 5980 - Animation and Planning in Games - Fall, 2013
　　CSCI 5980 - Special Topics: Motion in Games - Fall, 2012

University of North Carolina:
　　Comp 575 - Introduction to Computer Graphics (UNC) - Fall, 2010

Curriculum Development

- I developed and introduced a new course, *CSCI 5611 - Animation and Planning in Games*, which has become a regularly taught course in the CS department.

- Member of team which revised *CSCI 3081 - Program Design and Development* to move towards a standardized structure of lectures, assessment, and learning activities to be shared across sections.

Course Evaluations

Recent Evaluations (Score range 1-6):

Course	When	Num. of Students	Well Prepared	Clear Presentation	Provided Feedback	Treated Me Respectfully	Recommend Instructor?
CSCI 5611	Spring 2019	76	5.9	5.6	5.5	5.8	100%
CSCI 1133	Spring 2019	167	5.8	5.7	5.4	5.8	93%
CSCI 5611	Spring 2018	59	5.9	5.6	5.7	6.0	100%
CSCI 5607	Fall 2017	53	5.9	5.6	5.6	5.9	100%
CSCI 5611	Spring 2017	42	5.9	5.9	5.7	5.9	100%
CSCI 1133H	Fall 2016	38	5.7	5.6	5.0	5.8	92%
CSCI 8980	Spring 2016	19	5.9	5.8	5.6	5.9	94%
CSCI 5611	Fall 2015	53	5.9	5.8	5.6	5.9	100%
CSCI 5607	Fall 2014	35	5.8	5.5	5.6	5.9	95%
CSCI 1133	Spring 2014	200	5.6	5.5	5.3	5.7	98%

Older Evaluations:

- CSCI 5980 - Fall 2013 (26 Students), Instructor Rating: 5.7/6, Overall Course Rating: 5.9/6

- CSCI 5980 - Fall 2012 (15 Students), Instructor Rating: 5.8/6, Overall Course Rating: 5.9/6
- Comp 575 - Fall 2010 [UNC] (20 Students), Instructor Rating: 4.3/5, Overall Course Rating: 4.6/5

Advising and Mentoring

Undergraduate Student Activities

Undergraduate researchers:

- Zoë Wentzel, Lab Participant, 2019 – Present
- Ioana Munteanu, Undergraduate Research Scholar and Lab Participant, 2019 – Present
- Elsa Forberger, Lab Participant, 2019 – Present
- Tien Dinh, UROP and Lab Participant, 2018 – Present
- Mina Kian, Lab Participant, 2018 – Present
- Marta Markowicz, Undergraduate Research Scholar and Lab Participant, 2017 – Present
- Justine "Charlie" Mackin, Lab Participant, 2017
- Daniel Olson, Lab Participant, 2016
- Devin Lange, UROP and Lab Participant, 2012 – 2016
- Moses Adeagbo, Lab Participant, 2014 - 2016
- Jane Benson, Directed Research, 2015 - 2016
- Philip Homan, Directed Research, 2014
- Kurtis Holme, Directed Research, 2013

Undergraduate summa theses or honors projects directed:

- Thomas Hvizdos, "A Monte Carlo Tree Search Based Approach to Producing Stories with Excitement Curves", *Summa Cum Laude thesis*, 2016
- Nathaniel Buck, "Procedural Content Generation in Strategy/Role-Playing Games", *Summa Cum Laude thesis*, 2013

Summer Researchers:

- Isabella Chaffee, Carleton College, Summer 2019
- Oluwakayode "Ben" Akinjo, University of Wisconsin–Madison, Summer 2017
- Malik Majette, North Carolina State University (NC State), Summer 2016
- Martine Cartier, Carleton College, Summer 2015
- Rochelle Widmer, Gustavus Adolphus College, Summer 2015
- David Cherry, Morehouse College, Summer 2013
- Jassiem Iffil, Morehouse College, Summer 2013

High School Research Mentees:

- Ashwin Chetty, Woodbury High School, Summer 2014
- Rustam Kosherbay, Breck High School, Summer 2013

Graduate Student Activities

Graduated Ph.D. Students:

- Bilal Kartal, 2016 (Current Job – Borealis AI, Canada)
  Thesis: *Stochastic Tree Search for Highly Coordinated Planning*

- Julio Godoy, 2016 (First Job – Assistant Professor, University of Concepción, Chile)
  Thesis: *Online Action Selection Methods for Multi-Agent Navigation*
  Co-advisor: Maria Gini

Current Ph.D. Students:

- Bobby Davis, 6th year (passed WPE and Oral Prelim)
- Nick Sohre, 6th year (passed WPE and Oral Prelim)

- Tiannan Chen, 6th year (passed WPE and Oral Prelim)
- Zahra Forootaninia, 4th year (co-advised with Dr. Rahul Narain)
- Moses Adeagbo, 3rd year

Master's Student Advisees (Graduated):

- Dalton Hildreth, 2019 (Plan A Masters), Frist Job: Research Assistant, U. of Washington
- Danhua Zhang, 2019 (Plan A Masters), Frist Job: Research Assistant, U. of Minnesota
- Yali Dong, 2019 (Data Science M.S.), Frist Job: Microsoft
- John Koenig, 2016, Current Job: Postmates
- Ran Hu, 2016, Current Job: Facebook
- Jessica McMillan, 2015, First Job: Adobe Systems

Master's Student Advisees (Current):

- Xuefei Li, Plan B Masters

Ph.D. Committee Member (current):

- Dan Orban
- Zahra Forootaninia
- Matt Overby
- Jie Li
- Volcano Kim
- Zhihang Deng

Ph.D. Committee Member (graduated):

- Michael Tetzlaff, Spring 2019
- Michael Ludwig, Summer 2018
- Sujeong Kim (UNC - Chapel Hill), Fall 2015
- Nicholas Walczak, Summer 2016

Post-doctoral Fellows Supervised

Former Postdoctoral Researchers:
Ioannis Karamouzas, 2012 - 2016 (Currently, Assistant Professor at Clemson University)

Service and Public Outreach

Professional Contributions

Editorial Boards (Journals)

Associate Editor, IEEE Robotics and Automation Letters (RA-L), 2015 – Present
Associate Editor, Computer Animation and Virtual Words (CAVW), 2017 – Present

Senior Program Committees (Conferences)

International Joint Conference on Artificial Intelligence (IJCAI): 2017, 2019
Autonomous Agent and Multi-Agent Systems (AAMAS) - Robotics Track: 2016, 2018

Program Committees or Associate Editor (Conferences)

Association for the Advancement of Artificial Intelligence (AAAI): 2016, 2017, 2018, 2019
Computer Animation and Social Agents (CASA): 2017, 2018, 2019
Motion in Games (MiG): 2012, 2014, 2015, 2016, 2017, 2018, 2019
Workshop on the Algorithmic Foundations of Robotics (WAFR): 2014, 2016, 2018

Artificial Intelligence and Interactive Digital Entertainment (AIIDE): 2017, 2018
Eurographics (EG): 2017
Pacific Graphics (PG): 2015, 2016
International Joint Conference on Artificial Intelligence (IJCAI), 2016
Autonomous Agent and Multi-Agent Systems (AAMAS): 2014, 2015, 2016
Intelligent Robots and Systems (IROS): 2013, 2014, 2015
Robotics Science and Systems (RSS): 2014, 2015
Virtual Reality Software and Technology (VRST): 2014

Program Committees (Workshops)

Workshop on Virtual Humans and Crowds for Immersive Environments (at IEEE VR): 2016, 2017, 2018, 2019

Program Committees (Doctoral Consortiums)

Autonomous Agent and Multi-Agent Systems, Doctoral Consortium (AAMAS-DC), 2016, 2018
Artificial Intelligence and Interactive Digital Entertainment, Doctoral Consortium (AIIDE-DC): 2017
International Joint Conference on Artificial Intelligence, Doctoral Consortium (IJCAI-DC), 2016, 2018

Referee or Peer Reviewer (Journals)

Nature Physics, ACM Transactions on Graphics, IEEE Transactions on Robotics, IEEE Computer Graphics & Applications, Computer Graphics Forum, Journal of Parallel and Distributed Computing, Autonomous Robots, Intelligenza Artificiale, Robotica, Graphical Models, IEEE Systems, Man, and Cybernetics - Part B Cybernetics, IEEE Computers and Electrical Engineering

Referee or Peer Reviewer (Conferences)

Siggraph, Siggraph Asia, Robotics: Science and Systems (RSS), Autonomous Agents and Multiagent Systems (AAMAS), Pacific Graphics (PG), International Conference on Robotics and Automation (ICRA), Intelligent Robots and Systems (IROS), Computer Animation and Virtual Worlds (CAVW), Eurographics

Session Chair or Co-Chair at Conferences

Intelligent Robots and Systems (IROS), 2015

Department and University Service

Departmental Service

Univ. of Minnesota - Committee Leadership:
Chair, Curriculum Committee, 2018 – Present

Univ. of Minnesota - Regular Committees:
Curriculum Committee, 2016–Present
Mentoring Committee (Evan Suma Rosenberg), 2018–Present
Teaching Faculty Evaluation Committee, 2018–Present
Department Administrator Hiring Committee, 2017
Instructor Evaluation Committee, 2017
Advisory Committee, 2015–2017
Ph.D./Graduate Student Committee, 2014–2016
Computing Committee, 2015–2016

      Departmental Steering Committee, 2013–2014
      Admissions Committee, 2012–2013

Univ. of Minnesota - Other Service:

      Doctoral Dissertation Fellowship (DDF) Departmental Screening Committee, 2019
      Best Dissertation Award Departmental Screening Committee, 2019
      Teaching Load Committee, 2018–Present
      Department Administrator Hiring Committee, 2017
      NCWIT Diversity Committee, 2016–2017

UNC Chapel Hill - Leadership:

      President - UNC Computer Science Student Association, 2008 – 2009

University Service

      Faculty Mentor, President's Distinguished Faculty Mentor Program
- Ian Marquez, 2013 – 2015
- Crystal Luo, 2017 – 2019

UNC Chapel Hill:

      Senator - UNC Graduate and Progressional Student Association, 2008 – 2009

Outreach and Community Service

Board Membership

- Vice Chairman of the Founding Board, Glitch NPO a 501(c)(3) organization, 2018 - Present

Advising

- Advisory Board Member, Glitch Gaming, 2015 - Present

- Faculty Advisor, Video Game Development Club, 2014 - Present

Outreach Activities

- Mentor for underrepresented students through Institute for African-American Mentoring in Computing Sciences (iAAMCS) and Distributed Research Experience for Undergraduates (DREU), 2013 – Present [3 Women and 3 African American mentees]

- Mentor for local high-school summer research programs, 2013 – Present [2 high-school mentees]

- Co-Organized (with Maria Gini) a Coding Summer Camp targeted a underrepresented minorities, 2016

- Led classes at Venture Academy middle school on CS and algorithms for video games, September, 2015

Expert Judging and Voting

- Judge, United States Congressional App Challenge (Minnesota's Second District), 2016

- Voter, Game Developers Choice Award, 2015 – Present

Mentoring Panels

- Insight into Academic Careers, *North Star Stem Alliance*, Minneapolis, Minnesota, April, 2015

- Undergraduate Research: Making the Most of a Summer Experience, *TAPIA Conference*, Seattle, Washington, 2014

- Research Mentoring Panel, *Advancing Robotics Technology for Social Impact (ARTSI)*, Baltimore, Maryland, 2013

Program Committees - Outreach

ACM Richard Tapia Celebration of Diversity in Computing (TAPIA) - Workshop Program Committee: 2018
ACM Richard Tapia Celebration of Diversity in Computing (TAPIA) - Panel Program Committee: 2018