Sai Hemachandra Vemprala

Contact Information	ENPH Rm 421, 180 Spence St College Station, TX - 77840	*Voice:* (612) 840-6192 *E-mail:* svemprala[at]tamu(dot)edu

Research Interests

Ground/aerial robotics: localization, sensor fusion, planning, computer vision, deep learning, reinforcement learning.

Education

Texas A&M University, College Station, Texas, USA

Ph.D. Candidate (expected graduation date: May 2019)

- Thesis Topic: "Collaborative Localization and Path Planning for Micro Aerial Vehicle Swarms"
- Advisor: Dr. Srikanth Saripalli

Arizona State University, Tempe, Arizona, USA

Ph.D. Student (2014-2016: Transferred to Texas A&M University in Jan 2017)

- Advisor: Dr. Srikanth Saripalli

M.S., Electrical Engineering, Dec 2013

- Thesis Topic: "Incorporating Supervisory Human Inputs into Autonomous Robot Navigation"
- Advisor: Dr. Srikanth Saripalli

Jawaharlal Nehru Technological University, Hyderabad, Telangana, India

B.Tech., Electrical and Electronics Engineering, Jul 2011

Technical Skills

- Languages: C, C++, Python, MATLAB, C#/.NET; familiar with Julia, JavaScript
- Applications: ROS, Gazebo, V-REP, OpenCV, SimuLink, Unreal Engine; familiar with CUDA, Tensorflow, Darknet, Keras; Pandas, Dask, Scikit
- Operating systems : Windows, Linux, Android

Experience

Texas A&M University, College Station, Texas, USA

Research Assistant **Jan 2017 - present**

- Primary research focusing on vision based collaborative localization and navigation algorithms for swarms of unmanned aerial vehicles.
- Led a team for the DAC 2018 System Design Contest on deep learning based object detection on an embedded platform (NVIDIA Jetson TX2). Achieved a top 5 finish among 61 participant teams.
- Developing a computer vision based real-time cancer tumor tracking system using X-ray fluoroscopy images in collaboration with Mayo Clinic Arizona.
- Developing a drone detection framework using depth images through deep learning.

Arizona State University, Tempe, Arizona, USA

Research Assistant **Jan 2013 - Dec 2016**

- Primary research focused on autonomous navigation of unmanned vehicles, GPS denied localization for micro aerial vehicles.
- Worked on research aimed at achieving a quantitative definition and implementation of graceful motion in humanoid robots.
- Hands-on experience in sensor fusion, ROS based middleware development, embedded systems, various commercial UAV platforms

Millennium Engineering, NASA Ames Research Center, Mountain View, California, USA

Graduate Intern **May - Aug, 2016**

- Developed the software architecture for sensing and communication onboard a quadrotor UAV and developed a framework for estimation and navigation in GPS denied subterranean environments.
- Part of a team working on developing a 6DOF Simulink model for simulation of a fixed wing UAV.
- Implemented attitude stabilization on open source autopilot hardware for an experimental unmanned aircraft.

Koolock Inc., NASA Ames Research Center, Mountain View, California, USA

Software Engineer **May - Aug, 2016**

- Developed image processing software for analyzing multispectral satellite images.

Indigo Drones, San Jose, Costa Rica

Autonomous Systems Engineer **Apr - Dec, 2015**

- Mission planning, sensor fusion and data analysis for UAVs and imaging sensors in agricultural health monitoring applications.

Arizona State University, Tempe, Arizona, USA

Research Aide, Extreme Environments Robotics Laboratory **May 2012 - Dec 2013**

- Developed ground station software and embedded firmware for the Micro Submersible Lake Exploration Device (MSLED) that was successfully deployed at Lake Whillans, Antarctica. MSLED played a key role in discovery of life forms under Antarctica for the first time.
- Led a team that designed a volcanic monitoring system through sensor fusion and developed data transmission protocols for reporting volcanic and seismic activity. Instruments were deployed at various volcanic locations worldwide such as in Nicaragua, Sicily, Iceland, etc.

Intel Corporation, Santa Clara, California, USA

Graduate Technical Intern **Jun - Dec, 2013**

- Designed embedded firmware for the biometric headset BioSport.
- Involved in hardware design, sensor fusion and signal processing algorithms for Biosport.

Guru Nanak Engineering College, Hyderabad, India

Undergraduate Researcher **Jun 2009 - Jan 2011**

- Developed novel power flow calculation and power system optimization algorithms for semi large to large scale distribution systems.
- Developed optimal capacitor placement approaches and system restoration approaches with algorithms such as genetic and ant colony optimization algorithms.

Journal Papers

A.E. Behar, D.D. Chen, C. Ho, ... , J.M. Crowell. 'MSLED: The micro subglacial lake exploration device.' Underwater Technology, vol. 33, Issue 1, pp. 3-17. DOI: 10.3723/ut.33.0033

Conference Papers

S. Vemprala, S. Saripalli, C. Vargas, M. Bues, Y. Hu, J. Shen, "Real time Tumor Tracking for Pencil Beam Scanning Proton Therapy", 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2018), Madrid, Spain, 2018, pp. 4434-4440.

A. Carrio, S. Vemprala, A. Ripoll, S. Saripalli, P. Campoy, "Drone Detection using Depth Maps", 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2018), Madrid, Spain, 2018, pp. 1034-1037.

S. Vemprala, S. Saripalli, "Collaborative Uncertainty-aware Navigation for Vision based Multirotor Swarms", Proceedings of the AHS International 74th Annual Forum, Phoenix, USA, 2017, pp. 1774-1783.

S. Vemprala and S. Saripalli, "Monocular Vision based Collaborative Localization for Swarms of Micro Aerial Vehicles", 18th IEEE International Conference on Unmanned Aerial Systems (ICUAS 2018), Dallas, USA, 2018, pp. 315-323.

S. Vemprala and S. Saripalli, "Vision based Collaborative Path Planning for Micro Aerial Vehicles", 2018 IEEE International Conference on Robotics and Automation (ICRA), Brisbane, Australia, 2018, pp. 1-7.

S. Vemprala and S. Saripalli, "Vision based Collaborative Localization for Swarms of Aerial Vehicles", Proceedings of the AHS International 73rd Annual Forum, Dallas, USA, 2017, pp. 2980-2985.

S. Vemprala and S. Saripalli, "Vision based collaborative localization for multirotor vehicles," 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, South Korea, 2016, pp. 1653-1658.

A. Mora, S. Vemprala, A. Carrio and S. Saripalli, "Flight performance assessment of land surveying trajectories for multiple UAV platforms," 2015 Workshop on Research, Education and Development of Unmanned Aerial Systems (RED-UAS), Cancun, 2015, pp. 1-7.

P. R. Babu, M. P. R. Vanamali, M. P. V. V. R. Kumar and V. S. Hemachandra, "Network reconfiguration in distribution systems using L-E method," 2010 Annual IEEE India Conference (INDICON), Kolkata, 2010, pp. 1-4.

P. R. Babu, M. P. V. V. R. Kumar, V. S. Hemachandra and M. P. R. Vanamali, "A novel power flow solution methodology for radial distribution systems," 2010 IEEE Region 8 International Conference on Computational Technologies in Electrical and Electronics Engineering (SIBIRCON), Listvyanka, 2010, pp. 507-512.

Other papers, presentations

S. Vemprala, "Sampling based Path Planning for Unmanned Aerial Vehicles", Workshop on Complex Collaborative Systems, IROS 2017.

S. Vemprala, S. Saripalli, "Vision based MAV Swarms in a Photorealistic Simulation Framework", 1st International Symposium on Aerial Robotics, 2017.

S. Vemprala, I. Shelanskey, M. Ragan, L. Gharavi, S. Saripalli, "Ars Robotica: A Movement Framework for Robots in Theater", Workshop on Artistically Skilled Robots, IROS 2016.

L. Gharavi, S. Saripalli, S. Vemprala, M. Ragan and I. Shelanskey. "Ars Robotica", Exemplar Project presentation at the 2015 a2ru National Conference, 2015.

S. Vemprala and S. Saripalli. "Autonomous exploration and navigation strategies for MAVs." American Helicopter Society International - 6th AHS International Specialists' Meeting on Unmanned Rotorcraft Systems, 2015.

Misc. Experience

Reviewed submissions for:

- Journal of Intelligent Robotics and Systems (JINT)
- IEEE Transactions on Cybernetics
- IEEE Robotics and Automation Letters (RA-L)
- IEEE International Conference on Robotics and Automation (ICRA)

- IEEE International Conference on Intelligent Robots and Systems (IROS)

Awards

Winner of the 2018 TAMU Data Science contest

- Developed predictive models for taxi revenue over time and location using public taxi ride data from the city of Chicago. ARIMA based forecasting and a recurrent neural network with LSTM units were implemented to generate accurate predictions.

DAC System Design Contest 2018 - Top 5 finish

- Led a team of graduate students in designing a deep learning pipeline that can classify and detect objects in a custom dataset, while running at a speed of >20 FPS on an NVIDIA Jetson TX2. We implemented an optimized Tiny YOLO v2 model that achieved 21 FPS during inference with $> 80\%$ IoU on validation. Our team achieved a top 5 finish among 60 teams worldwide.

Patents

As a co-inventor, part of the Intel New Devices team:
Indira Negi et al, "System and method for data transmission and power supply capability over an audio jack for mobile devices",Intel Corp., US Patent 10,165,355 (issued 12/25/2018)

Indira Negi et al, "System and method for device action and configuration based on user context detection from sensors in peripheral devices", Intel Corp., US Patent 10,117,005 (issued 10/30/2018)

References

Dr. Srikanth Saripalli
Associate Professor
Department of Mechanical Engineering
Texas A&M University
Email: srikanth.saripalli@tamu.edu

Dr. Andres Mora
Robotics and Systems Engineering Lead
Millennium Engineering and Integration Company
NASA Ames Research Center
Email: amora@meicompany.com