Sudharshan Suresh

PERSONAL	www.cs.cmu.edu/~sudhars1 / suddhu@cmu.edu / LinkedIn / Scholar

EDUCATION

Robotics Institute, Carnegie Mellon University   2019 - present
Ph.D. in Robotics
Advisor: Prof. Michael Kaess
Interests: Localization and mapping; Tactile perception; Computer vision

Robotics Institute, Carnegie Mellon University   2017 - 2019
M.S. in Robotics
GPA: 4.09, Advisor: Prof. Michael Kaess
Thesis: Localization and Active Exploration in Indoor Underwater Environments

National Institute of Technology, Tiruchirappalli, India   2013 - 2017
B.Tech (Hons) in Instrumentation and Control Engineering
GPA: 9.45/10

PUBLICATIONS

PREPRINTS

[1] S. Suresh, Z. Si, J. Mangelson, W. Yuan, and M. Kaess, "Efficient shape mapping through dense touch and vision," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, May 2022, submitted.* (arXiv / video)

JOURNAL PUBLICATIONS

[2] S. Suresh, E. Westman, and M. Kaess, "Through-water stereo SLAM with refraction correction for AUV localization," *IEEE Robotics and Automation Letters (RA-L)*, vol. 4, no. 2, pp. 2377-3766, presented at ICRA 2019, Apr. 2019. (pdf / poster / video)

[3] R. K. Sarvadevabhatla, S. Suresh, and R. Venkatesh Babu, "Object category understanding via eye fixations on freehand sketches," *IEEE Transactions on Image Processing*, vol. 26, no. 5, pp. 2508-2518, May 2017. (pdf / website)

PEER-REVIEWED PUBLICATIONS

[4] S. Suresh, M. Bauza, K.-T. Yu, J. Mangelson, A. Rodriguez, and M. Kaess, "Tactile SLAM: Real-time inference of shape and pose from planar pushing," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, Xi'an, China, May 2021, **Best paper award in service robotics finalist** * (arXiv / website / video)

[5] M. Hsiao, J.G. Mangelson, S. Suresh, C. Debrunner, and M. Kaess, "ARAS: ambiguity-aware robust active SLAM based on multi-hypothesis state and map estimations," In *Proc. IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, Oct. 2020. (pdf)

[6] S. Suresh, P Sodhi, J. G. Mangelson, D. Wettergreen, and M. Kaess, "Active SLAM using 3D submap saliency for underwater volumetric exploration," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, Paris, France, pp. 3132-3138, May 2020. (pdf / video / presentation)

WORKSHOPS/OTHER PUBLICATIONS

[7] S. Suresh, J. G. Mangelson, and M. Kaess, "Incremental shape and pose estimation from planar pushing using contact implicit surfaces," In *ICRA 2020 workshop - ViTac 2020: Closing the Perception-Action Loop with Vision and Tactile Sensing*, May 2020.* (pdf / presentation)

[8] J. Hsiung, A. Tallaksen, L. Papincak, S. Suresh, H. Jones, W. Whittaker, and M. Kaess, "Localized imaging and mapping for underwater fuel storage basins," In *Proceedings of the Symposium on Waste Management*, Phoenix, Arizona, Mar. 2018. (pdf / presentation)

* Current representative publications

[9] E. Fang, <u>S. Suresh</u> and W. Whittaker, "Camera-only kinematics for small lunar rovers," In *Annual Meeting of the Lunar Exploration Analysis Group*, Columbia, Maryland, Vol. 1960, Nov 2016.   (poster)

[10] <u>S. Suresh</u>, E. Fang and W. Whittaker, "Optical kinematic state estimation of planetary rovers using downward-facing monocular fisheye camera," *RISS Working Papers Journal*, Nov 2016.   (pdf / video / poster)

EXPERIENCE	Graduate Research Assistant, Carnegie Mellon University 2017 - present

EXPERIENCE

Graduate Research Assistant, Carnegie Mellon University   2017 - present
Ph.D. research in the Robot Perception Lab, on vision and tactile perception for robot manipulation. Currently working on mapping and localizing objects via tactile interaction. Previously developed algorithms for active exploration and stereo visual SLAM in underwater environments.

Undergraduate Research Scholar, Carnegie Mellon University   Summer 2016
RI summer scholar working with Red Whittaker on visual state-estimation via self-perception for planetary rovers.

Undergraduate Research Scholar, Indian Institute of Science   Summer 2015
Work with R. Venkatesh Babu and R. K. Sarvadevabhatla on freehand sketch understanding through eye-gaze fixations.

AWARDS AND HONORS

Hima and Jive Fellowship in Computer Science for International Students, 2020
RECAL Alumni Award and Sri. Avinash Memorial Award, 2017 (*gold-medalist in undergraduate major*)
OPJEMS Scholar, 2017 (*100 undergraduates across India*)
S. N. Bose and Robotics Institute Summer Scholar, 2016
Cargill Global Scholar, 2015 - 2017 (*10 undergraduate sophomores across India*)

SERVICE

Reviewer, IROS {2020, 2021}, ICRA 2021, RA-L 2020
Organizing committee, 2021 Debates on the Future of Robotics Research (ICRA Virtual Workshop)
Admissions committee, CMU RI Summer Scholars program (2018-2020)
Mentorship: CMU AI undergraduate mentorship program (2019), NIT Trichy Jiteshraj Scholarship (2018)

TEACHING

Teaching Assistant, 16-833: Robot Localization and Mapping   Fall 2019, Spring 2020
Project mentoring, office hours, grading, presented lectures on occupancy mapping[†] and sparse visual SLAM techniques.

SELECT COURSEWORK

Graduate: Convex optimization (10-725), kinematics, dynamics and control (16-711), geometry-based methods in vision (16-822), planning and decision-making in robotics (16-782), robot localization and mapping (16-833), introduction to machine learning (10-701), computer vision (16-720), mathematical fundamentals for robotics (16-811)

Undergraduate: Data structures and algorithms, computer networks, neural networks and fuzzy logic, image processing, basics of programming, control systems, robotics, signals and systems, circuit theory, embedded systems, linear integrated circuits, sensors and transducers, material science, numerical methods

INDEPENDENT PROJECTS

DeepGeo: Photo localization with deep neural network (10-701)   (arXiv / github)
A deep network that beats humans at GeoGuessr—trained on our *50States10K* dataset.

Task and motion planning for robotic food preparation (16-782)   (report)
Hierarchical task and motion planning for a 6-DOF robot arm—to prepare yogurt parfaits!

Thin structure reconstruction via 3D lines and points (16-822)   (poster)
We combine edge data and sparse features in the SfM pipeline to recover thin objects in a scene.

Factor graph optimization for dynamic parameter estimation (16-711)   (report)
We implement a method for estimation of MAV poses and dynamic parameters during flight.