Sumanth Tangirala

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RESEARCH INTERESTS

My research interests are at the intersection of robotics, machine learning, and human-robot interaction. I focus on developing planning algorithms for robotic navigation in dynamic, unstructured environments. Additionally, I am interested in safe, verifiable planning and social navigation for safe human-robot interactions.

EDUCATION

Rutgers, the State University of New Jersey - New Brunswick — NJ, USA

Ph.D. in Computer Science, NSF-NRT Fellow - SOCRATES program — 2024–Present

- Advisor: Kostas E. Bekris

Master of Science (M.S.) in Computer Science, GPA: 3.97/4 — 2022–2024

- Specialized in Robotics with a thesis on Kinodynamic Planning for high-velocity mobile robots

Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT) — Gandhinagar, India

B.Tech. in Information and Communication Technology, GPA: 8.57/10 — 2016–2020

PUBLICATIONS

Under Review

[5] Aravind Sivaramakrishnan, Sumanth Tangirala, Dhruv Metha Ramesh, Edgar Granados, and Kostas E. Bekris, "`KRAFT`: Sampling-Based Kinodynamic Replanning and Feedback Control over Approximate, Identified Models of Vehicular Systems".

Conference Papers

[4] Kostas E. Bekris, Joe Doerr, Patrick Meng, Sumanth Tangirala, "The State of Robot Motion Generation", in *International Symposium of Robotics Research (ISRR), 2024.*

[3] Aravind Sivaramakrishnan, Sumanth Tangirala, Edgar Granados, Noah Carver, and Kostas E. Bekris, "Roadmaps with Gaps over Controllers: Achieving Efficiency in Planning under Dynamics", in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024.*

[2] Ewerton R. Vieira*, Aravind Sivaramakrishnan*, Sumanth Tangirala, Edgar Granados, Konstantin Mischaikow, and Kostas E. Bekris, "`MORALS`: Analysis of High-Dimensional Robot Controllers via Topological Tools in a Latent Space", in *IEEE International Conference on Robotics and Automation (ICRA), 2024.*

[1] Tushar Gadhiya, Sumanth Tangirala, and Anil K. Roy, "Stacked Autoencoder Based Feature Extraction and Superpixel Generation for Multifrequency PolSAR Image Classification", in *Pattern Recognition and Machine Intelligence: 8th International Conference, PReMI 2019.*

EXPERIENCE

Software Engineer — Jan 2020 - June 2022

Tekion Corporation — *Bangalore, India*

- Developed critical modules of the Dealership Management System (DMS) product like a customizable Kanban Repair Order Dashboard, Vehicle History, and Fee Management; led frontend efforts, collaborating with teams firm-wide to implement multi-lingual support across the product, enabling global expansion.
- Trained dozens of interns and junior developers in ReactJS and ReduxJS Frontend technologies, significantly improving team capabilities, and mentored teams of interns to develop critical internal tools and features.

Research Intern May 2019 - Aug 2019
Indian Space Research Organization (ISRO) *Ahmedabad, India*

- Analyzed and extracted features from Dual-Polarised PolSAR satellite image data for land cover classification by employing Pauli, Yamaguchi, and Huynen decomposition algorithms.
- Trained an RNN-LSTM model to leverage the extracted features for discrimination of Ground Nut and Cotton Fields from other land cover classes with an accuracy of 91.2%.

RELEVANT SKILLS

Programming Languages: Python, C, C++, JavaScript, MATLAB, Bash

Machine Learning Tools: PyTorch, StableBaselines3, OpenCV, TensorFlow, Scikit-Learn

Robotics Tools: Robot Operating System (ROS), MuJoCo, IsaacGym, Gazebo, MuSHR Robot Platform

Miscellaneous Tools: CUDA, NodeJS, REST APIs, ReactJS, ReduxJS

COURSEWORK

Advanced Robotics, Computational Robotics, Computer Vision, GPU Programming - CUDA, Linear Programming, Natural Language Processing, Brain-Inspired Computing, Artificial Intelligence, Operating Systems Theory

PROJECTS

Obstacle Navigation with Unitree Go1 Robot Using Deep Reinforcement Learning Code

- Developed a deep reinforcement learning model to train a robot dog (quadruped) for autonomous navigation through environments with dynamic obstacles, using the IsaacGym simulation platform.
- Employed Proximal Policy Optimization (PPO) and Curriculum Training to engineer a multi-layered policy to perform low-level and high-level motion planning.

GPU Parallelization of Fuzzy SLIC Super-Pixel Segmentation using CUDA Code

- Engineered a CUDA-based parallelization strategy for the Fuzzy Simple Linear Iterative Clustering (SLIC) algorithm, achieving a 200x acceleration in super-pixel image segmentation for images.

Just-Walk-Out Contactless Shopping

- Designed an IoT-based automated shopping system that allows customers to shop without using traditional checkout processes, inspired by Amazon Go technology.
- Implemented customer identification systems using NFC wristbands and RFID sensors and developed inventory tracking using LIDAR and pressure sensors.
- Implemented a Zigbee network for real-time communication between aisle and central hub processors for item tracking and billing.

ACADEMIC AWARDS

- NSF-NRT Fellowship, SOCRATES Program 2024 - 2026
  Funded for two years to conduct interdisciplinary research in socially cognizant robotics
- Outstanding Project Award & Outstanding Publication Award 2024
  Awarded by Dept. of CS, Rutgers University for work during the MSCS program
- Prime Minister's Merit Scholarship 2017-2020
  Awarded by the Indian Prime Minister's office for exceptional academic performance

PROFESSIONAL ACTIVITIES

Conference Reviewing

- IEEE International Conference on Robotics and Automation (ICRA) - 2024
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) - 2024