

Raghav Sood

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EDUCATION

Carnegie Mellon University (CMU)

Master of Science in Mechanical Engineering - Research

Pittsburgh, PA

May 2020

GPA: 4.0/4.0

Courses: Adaptive Control and RL, Planning in Robotics, Computer Vision, SLAM, Deep Learning, Multivariable Control

Delhi Technological University (DTU)

Bachelor of Technology in Mechanical Engineering (First Class with Distinction)

New Delhi, India

May 2018

WORK EXPERIENCE

Search Based Planning Laboratory, Robotics Institute, CMU

Pittsburgh, PA

Research Associate

May 2020 – Present

- Developing a motion planning framework for real-time planning of flexible robots with high degrees of freedom.
- Created a homotopy guidance algorithm to accelerate higher dimensional search by 4x compared to baseline.

RESEARCH PROJECTS

Intelligently Activating Adaptive Motion Primitives using Deep Learning

Pittsburgh, PA

Search Based Planning Laboratory, CMU

May 2019 – Feb 2020

- Crafted a Deep Learning based algorithm to efficiently employ adaptive motion primitives during a heuristic search.
- Built a unified domain independent planning framework on ROS and tested it on navigation and manipulation tasks.
- Attained an average speedup of 2.5 times compared to baseline planner.

Motion Planning for an Autonomous Blimp Drone for Inspection Tasks

Pittsburgh, PA

CERLAB, CMU

Sep 2018 – May 2019

- Designed and manufactured a blimp drone in a team of 4 to inspect cargo containers for cracks.
- Employed and tuned Model Predictive Controller for autonomous operation of drone using ROS platform.
- Developed a lattice-based multi-goal weighted A* planner achieving real-time performance on inspection tasks.

ACADEMIC PROJECTS (CMU)

Model Based Reinforcement Learning in Handful of Trials

April 2020 – May 2020

- Implemented MBRL algorithm to improve sample efficiency using probabilistic ensembles with trajectory sampling.
- Achieved better performance than soft actor critic (SAC) method with high sample efficiency (50% of SAC).

Motion Planning for Global Localization in Multi-Modal Belief Spaces

Oct 2019 – Nov 2019

- Lead a team of 3 to design a motion planning algorithm to disambiguate a multi-modal robot state during localization.
- Demonstrated algorithm working on a non-holonomic ground robot in symmetric maze-like environment.

Navigation Framework for an Autonomous Vehicle in Unstructured Environment

April 2019 – May 2019

- Developed a motion planning framework to navigate an autonomous vehicle in a dynamic environment.
- Combined a lattice-based ARA* motion planner with trajectory prediction to handle dynamic obstacles in real time.

LQR Controller Design for an Autonomous Ground Vehicle

Nov 2018

- Applied Linear Quadratic Regulator controller to control an autonomous ground robot based on bicycle model.
- Achieved best lap time (61s) in robot buggy racing competition.

SKILLS

CS Framework and Tools: ROS, PyTorch, Linux, Gazebo, OpenAI Gym, Git

Programming Languages: Advanced: C, C++, Python, MATLAB | Intermediate: Markdown, HTML/CSS

PUBLICATIONS

Raghav Sood, Shivam Vats, Maxim Likhachev, “**Learning to Use Adaptive Motion Primitives in Search-Based Planning for Navigation**”, under review for IROS 2020.