

Raghav Sood

SENIOR ROBOTICS ENGINEER

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Education

Carnegie Mellon University (CMU)

Pittsburgh, PA

MASTER OF SCIENCE IN MECHANICAL ENGINEERING - RESEARCH IN ROBOTICS (GPA 4.0/4.0)

May 2020

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

Work Experience

Path Robotics

Columbus, OH

SENIOR ROBOTICS ENGINEER

April 2022 - Present

- Led a team of 7 engineers to research and develop motion planning algorithms for ambidextrous industrial robots, improving safety and scalability.
- Developed a versatile C++ motion planning library using optimization-based, sampling-based, and search-based methods, successfully deploying it for automated assembly and welding tasks in diverse applications.
- Implemented uncertainty-aware motion planning methods, reducing robot downtime by minimizing unanticipated collisions.

Path Robotics

Columbus, OH

ROBOTICS ENGINEER

Nov 2020 - April 2022

- Developed core robotics motion planning algorithms for autonomous operation of industrial welding robots.
- Developed an automated regression testing pipeline for the motion planning stack using Robot Framework.

Search Based Planning Laboratory, Robotics Institute, CMU

Pittsburgh, PA

RESEARCH ASSOCIATE

May 2020 - Nov 2020

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

Research Projects

Search-Based Planning for a Snake Robot using Optimization-Based Primitives

Pittsburgh, PA

SEARCH BASED PLANNING LABORATORY, CMU

Feb 2020 - Nov 2020

- Developed a methodology for dynamically generating actions using online optimization to help a 21 DOF snake robot navigate narrow spaces.
- Proposed a technique for lazily generating computationally expensive optimization actions to effectively utilize resources.
- Crafted heuristic that reasons about homotopy classes induced by the obstacles in robots workspace with a Dynamic Thompson Sampling based Multi-Heuristic framework.

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 Global Localization in Multi-Modal Belief Spaces

Pittsburgh, PA

SEARCH BASED PLANNING LABORATORY, CMU

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 a symmetric maze-like environment.

Navigation Framework for an Autonomous Vehicle in Unstructured Environment

Pittsburgh, PA

SEARCH BASED PLANNING LABORATORY, CMU

Apr 2019 - Aug 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.

Skills

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

Frameworks and Tools ROS, PyTorch, Linux, Gazebo, Git, Robot Framework

Math and Physics Geometry, Linear Algebra, Probability, Robot Kinematics, Dynamics

Publications

Search-based Path Planning for a High Dimensional Manipulator in Cluttered Environments Using Optimization-based Primitives

Raghav Sood, Muhammad Suhail Saleem, Maxim Likhachev, et al.

IEEE/RSJ INTERNATIONAL CONFERENCE ON INTELLIGENT ROBOTS AND SYSTEMS (IROS)

2021

Learning to Use Adaptive Motion Primitives in Search-Based Planning for Navigation

Raghav Sood, Shivam Vats, Maxim Likhachev

IEEE/RSJ INTERNATIONAL CONFERENCE ON INTELLIGENT ROBOTS AND SYSTEMS (IROS)

2020