

Sapan Agrawal

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EDUCATION

Worcester Polytechnic Institute

Master of Science in Robotics Engineering

Courses: Motion Planning, Deep Learning, Computer Vision, Robot Controls, Robot Navigation

Degree received on 05/20/2021, GPA: 3.89

Worcester, MA

08/19/2019 – 08/31/2021

Visvesvaraya National Institute of Technology

Bachelor of Technology in Mechanical Engineering

Degree received on 09/15/2018, GPA 7.8/10.0 (3.22/4.00)

Nagpur, India

08/18/2014 – 05/07/2018

TECHNICAL SKILLS

Languages: C++, Python, Kotlin, MATLAB

Platforms: Tensorflow, PyTorch, CARLA, ROS, Gazebo, MoveIt, RBDL, Drake, TrajOpt, WebRTC

Hardware: UR5e, Panda, Fanuc Manipulators, dVRK, Husky, TurtleBot, Humanoids, Hebi motors

EXPERIENCE

Caterpillar Inc

Autonomy Engineer, Autonomy & Automation Group

San Francisco, CA

12/05/2022 - Present

- **Platform Team:** Responsible for R & D of scalable and modular planning systems for mining & construction heavy machinery.
- Developed Motion Planning Evaluation Framework for quantifying planner performance under various scenarios using new metrics.
- Developing Graph Search Suite to support 793F haul truck and other autonomy applications requiring search based planning methods.
- **Application Team:** Responsible for implementing planning stack for Autonomous CTL Undercarriage Endurance Test. Autonomous machine running 16 hrs per workday in loop through concrete, metal strips, gravel, etc enabled in-house customer to study machine wear and tear to improve machine quality, reduce warranty claims and validate new and existing supplier claims.
- **Research:** Developing framework for scalable cost-function learning using Inverse Reinforcement Learning for generating operator-like navigation plans.

Neato Robotics Inc

Robotics Software Engineer managed by Mr. Sarath Suvarna

San Jose, CA

06/28/2021 - 11/18/2022

- **Features Lead:** Responsible for R&D to production of Automode feature, managing a team of 2 SWE & 2 Embedded QA members.
- **Features Team:** Responsible for developing the robot navigation stack for Multi-Zone Cleaning feature.
- **Navigation Team:** Responsible for resolving any navigation failures due to bad path planning. Added visualization features & improved simulator to aid debugging planning/mapping issues. Implemented an incremental search algorithm for avoiding dynamic obstacles in environment. Contributed to the team in improving navigation stack, achieving 98.6 % autonomy.

Honda Research Institute (HRI)

Robotics Research Intern supervised by Dr. Soshi Iba

San Jose, CA

01/18/2021 - 05/07/2021

- **Intention Estimation for Robot Teleoperation:** Developed Inverse Reinforcement Learning (IRL) based probabilistic method for estimating and automating intended tasks of the teleoperator in shared autonomy in ROS framework.

Amazon Robotics

Adv. Robotics R&D Intern managed by Mr. Felipe Polido

North Reading, MA

08/10/2020 - 12/18/2020

- Worked as a Systems Engineer with the Manipulation team, integrating and testing software for tote consolidation across hardware and simulation platforms.

NASA Jet Propulsion Lab (JPL)

Pasadena, CA

JVSRP Intern supervised by Mr. Rohan Thakker, Dr. Hiro Ono & Mr. Kalind Carpenter 05/18/2020 - 08/07/2020

- Worked with EELS software team in developing grasping based new planning & control framework for snake robot climbing in crevasse for Enceladus exploration [EELS Link].

Carnegie Mellon University

Pittsburgh, PA

Research Scholar supervised by LTC Steve Crews, & Dr. Matthew Travers

06/10/2018 - 06/28/2019

- **Motion Planning and Controls for a hybrid walking robot:** Implemented A* algorithm in C++ to select between rolling and walking gait while optimizing the cost of transportation. Developed iLQR-MPC based unified motion and footstep planning algorithm for bipedal locomotion [Flyped Link].

PROJECTS

- **Deep Prediction for Self-driving vehicles:** Implemented Social-GAN, a deep learning model to predict motion behaviors of the traffic actors using the Argoverse Motion Forecasting dataset. [Code].
- **Social Robot Navigation:** Integrating social force model into real-time adaptive motion planning (RAMP) framework using Recurrent Neural Network based DQN [Link] .
- **Curiosity driven exploration for navigation in MineRL environment** with sparse rewards in Pytorch framework [Poster].
- **Motion Planning for Autonomous System using Hybrid A*:** Developed a navigation stack using Hybrid A* in C++ on Husky robot in unknown environment using local Occupancy map and PID Controller in ROS-Gazebo [Code].
- **Personalization for assisted driving vehicle in CARLA Simulator:** Developed a driver-in-loop hardware framework and personalized an assistive driving system in Carla Simulator. Implemented and tested Lateral & Longitudinal PID Controller, Stanley Controller and MPC controller [Code].
- **Impedance Controller for MTM of dVRK:** Implemented and compared task-space impedance controller and Computed Torque Controller in python for 7 DoF MTM and KUKA LBR in AMBF Simulator using RBDL. [Code]
- **Multi-Snake Modular Robot, Undergraduate Thesis:** Developed a bio-inspired modular self-assembling robot capable of changing its morphology to adapt to unforeseen environmental challenges [Link] [ICRA 2018 Poster].

PUBLICATIONS

- **Towards Proprioceptive Climbing in Ocean Worlds using a Snake Robot: A Grasping Perspective.** Rohan Thakker¹, Benjamin Blacklock¹, Sapan Agrawal¹, et.al. to be published.
- **Unified Foothold Selection and Motion Planning for Legged Systems in Real-Time.** Crews Steven¹, Sapan Agrawal², and Travers Matthew³, in the proceedings of the International Conference on Humanoid Robots (Humanoids) 2019.

PATENTS

- **Device for navigation assistance in dark or no visibility ambience.** Granted Indian Patent Number 535176, filed on April 20 2018.
- **Humanoid Robot.** Granted Indian Patent Number 517158, filed on May 05 2017.
- **Robotic Cleaning System for internal cleaning of unit.** Granted Indian Patent Number 313857, filed on Nov 03 2017.