Dhruv Kool Rajamani

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Education

Worcester Polytechnic Institute, $3.88/^{4.0}$ — Worcester, MA
Master of Science in Robotics Engineering — *Aug. 2019 – May 2021*

Manipal Institute of Technology, $8.7/^{10}$ — Karnataka, India
Bachelor of Technology in Mechatronics Engineering, Minor in Robotics and Automation — *Aug. 2015 – May 2019*

Experience

Amazon Robotics | Advanced Robotics Co-op — *Jan 2021 - Jul 2021*

- **Robotic Grasping and Picking**: Designing high level manipulation algorithms for industrial robotic arms to improve picking objects in clutter.

Automation and Interventional Medicine Lab, WPI | Research Assistant — *Sep 2019 - Jul 2021*

- **MRI Robot for Stereotactic Surgeries** *(Thesis)*: 3D Slicer extension to control a neurosurgery robot for DBS. Implementing deep-learning based neural network to segment burr holes in and 3D reconstruction of MRI Images.
- **RL Toolkit for Medical Robots**: Designed a RL toolkit using OpenAI gym and the Asynchronous Multibody Framework (AMBF). Published at IEEE-ROMAN on Collaborative suturing using Q-learning on the dVRK.
- **Human Intent Detection**: Multimodal sensor fusion to capture human intent to control a hand exoskeleton using object detection, pose detection, and marker tracking. Adaptive impedance controller to compensate for stiffness.

Delsys Inc. | R-D Engineering Intern — *May 2020 - Aug 2020*

- **Real-Time Communications Middleware**: Designed a Real time Communications Middleware using protobufs and zeromq in dotnet core, C++ and Python to integrate Delsys Medical Devices and API with 3^{rd} party sensors.
- **Signals Processing Toolbox**: Developed a toolbox to perform realtime signal processing in time and frequency domains - LTI filters, FIR, buffering.

Maidbot | Robotics Software Engineer Co-op — *Feb 2019 - Jun 2019*

- **Sensor fusion**: Integrated TOF sensors over optimized I2C using a DMA Controller for real time systems to populate dense pointclouds for SLAM. Integrated with ROS, Gazebo and docker to visualize coverage map using octomap.
- **Fleet Management and Maintenance**: Maintained a fleet of 200+ *Rosie*'s by writing firmware updates in embedded C. Docker based linux (yocto) OS deployments with ROS for the fleet.

Biorobotics Lab, EPFL | Research Assistant — *May 2018 - Jul 2018*

- **COMAN Humanoid Robot Simulation**: Designed two different Gazebo based simulation frameworks using OROCOS-RTT and ROS. Tested a continuum of gaits and interactions of compliant robots. (Video)

Projects

Augmented End to End Speech Net | *Python, Tensorflow* — *Paper, Git*

- Encoder-Decoder neural network to modulate speech for patients suffering from high frequency hearing loss.

Mars Rover Prototype | *Solidworks, Ansys, OpenCV* — *Mars Rover Manipal*

- Developed an autonomous Rover capable of traversing harsh terrain, with a 6 DOF robotic arm and end effector

Underactuated Flexible Manipulator | *Matlab, Python* — *video, Git 1, Git 2*

- Trajectory tracking of a n-link manipulator using Differential Flatness, Linear Quadratic Regulator, PID.

AIM Lab Website | *C#, dotnet, Postgres SQL, Linux, Markdown* — *Website*

- Designed the AIM Lab Website with custom Markdown Rendering for all pages.

Skills

Languages: C++ 11, C, Python, C#, Simulink & MATLAB, JS, LaTeX, Bash

Software: VTK, 3D Slicer, Tensorflow, ROS, Gazebo, Docker, Git, OpenAI gym, OpenCV, PlatformIO, MBED, Qt, CMake

Protocols and Messaging: Protobuf, ZeroMQ, DDS, I^2C, CAN, SPI, UART, UDP, TCP, Websockets, gRPC, IPC

OS for development: Linux (Ubuntu, Yocto), Windows (Desktop, IOT)

Achievements

- Graduate tuition sponsored by **National Institutes of Health (NIH)** #5R01CA166379.
- Awarded **$10,000** for runners up in the Real-Time Sensor Fusion Challenge. (MRADIChallenge)
- Best Rover team in Asia; 8th out of 82 teams at URC, Utah, 2017. (*link*)

Publications

[1] Varier, V., **Rajamani, D. K.**, et. al. *AMBF-RL: A real-time simulation based Reinforcement Learning toolkit for Medical Robotics.* IEEE International Conference on Robotics and Automation (ICRA) 2021 *submitted*

[2] Varier, V., **Rajamani, D. K.**, et. al. *Collaborative Suturing: A Reinforcement Learning Approach to Automate Hand-off Task in Suturing for Surgical Robots.* The 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN 2020), Naples, Italy.

[3] **Rajamani, D. K.**, et. al. *Design Overview of a Planetary Exploration Rover for Unstructured Terrain.* 3rd International and 18th National Conference on Machines & Mechanisms (iNAComm 2017), Bhabha Atomic Research Center (BARC), Mumbai, India.

[4] **Rajamani, D. K.**, et. al. *Design and development of a linear jawed gripper for unstructured environments.* Manipal Journal of Science and Technology, 3, no. 1 (June 2018). (Link)