Dhruv Kool Rajamani

dhruv@maidbot.com

/dkr /DhruvKoolRajamani https://dhruvkoolrajamani.gitlab.io/ +1 (512)694-8759

2015 - 2019	**BTech.** in Mechatronics Engineering, Manipal Institute of Technology, KA	**8.83**/10
2012 - 2014	**AISSCE** from Vasant Valley School, Delhi	**95.00**%

Experience

Maidbot Inc. (link)

Austin, TX

Robotics Software Engineer — *February 2019 - Present*

Maidbot designs fleets of fully autonomous industrial cleaning robots called *Rosie*.

Developing software and firmware:

* Building software tools for planning, control, and simulations.
* Building debugging and flashing tools for onboard sensors and embedded devices.

3D Localisation for *Rosie* using TOF sensors:

Incorporating time of flight sensors to allow 3D localisation and in turn improve planning.

BioRobotics Group, Manipal (link)

Manipal Institute of Technology, KA

Co-Founder — *August 2018 - Present*

Neuromechanical and neuromuscular controllers for a Humanoid:

Developing controllers for COMAN* using Central Pattern Generators (CPG) and virtual muscles.

Tutorials for ROS and Robotics:

Created tutorials to teach ROS, and Gazebo using a linear inverted pendulum model.

Mars Rover Manipal (link)

Manipal Institute of Technology, KA

Robotic Arm Lead, Research Lead, Mechanical Member — *2015 - 2017*

Development of a Mars Rover Prototype:

Developed a Mars Rover for the URC, UT - 2017 and stood 8th. (URC-2017).

* Designed the suspension, robotic arm, autonomous system & control architecture.
* Presented the Rover at various conferences. (Critical Design Review) [1]

Robotic Arm Lead:

Supervised a team of 6 researchers to develop a compliant 6DOF Manipulator for the Rover.

* The arm has a 6kg payload and a 1.5m reach.
* Self adapting gripper to perform screwing, grasping, retrieving, etc tasks. [2–4]

Research Internships

BIOROB (link)

Prof. Auke Jan Ijspeert, Dr.Hamed Razavi

cole polytechnique fdrale de Lausanne — *May 2018 - July 2018*

Simulation Platform for the COMAN Robot †:

Simulate systemic integrations of complex interactions with compliant robots.

* Developed simulators with OROCOS-RTT and ROS. (Simulation Packages)
* Tested continuum of gaits (Video) and simulated the robot carrying a stretcher.

Neuromechanical framework to study animal locomotion ‡:

Simulator to conduct gait analysis of modular tetrapoda models with analysis tools.

* Developed a simulator for lesion studies on tetrapods and designed a CPG based controller.

Outcome: Worked with various robotics frameworks, performed gait analysis, designed a single controller for modular tetrapods. Implemented real time analysis tools and graphs: PyQt, NetworkX, matplotlib with custom GUI.

*COmpliant HuMANoid robot

†This work is supported by the Horizon 2020 Work Programme. (https://cogimon.eu/)

‡This work is supported by the Human Frontier Science Program (HFSP). (Gain access to this repo)

Autonomous Robotics Lab (link)

Dr.Sudipto Mukherjee

Indian Institute of Technology, Delhi — *May 2017 Jan 2018*

Underactuated Flexible Manipulator using Differential Flatness:

Design a flexible manipulator on MATLAB with just 2 non-colinear forces acting as input.

* Implemented a flat controller for a planar manipulator with trajectory tracking. (video)

Outcome: Conducted extensive research on differentially flat orthotic and prosthetic devices.

Teaching Experience

Teaching Assistant

Manipal Institute of Technology, KA

MTE-3003, MTE-2211 — *Jan 2017 - Nov 2018*

Robot Dynamics and Control (MTE-3003):

Taught senior undergraduates (class of 35 students) ROS and evaluated final research project.

* Modified the course plan to teach robot dynamics through simulations. (Lab repo)

CAD & Kinematics Lab (MTE-2211):

Taught and evaluated 3D kinematic models of 81 students.

Projects

- Obstacle detection and path planning using computer vision and fuzzy logic.
- Traffic Detection using a Kalman Filter.
- LQR based control of a 3-link Linear Inverted Pendulum on a cart (LIP).

Achievements

- Top 5% in a batch of 81 students.
- Best Rover team in Asia; 8th out of 82 teams at University Rover Challenge (URC), Utah, 2017. (*link*)
- Best paper presentation at the iACT-2017 conference, ISA Bangalore.

Technical Skills and Courses

Programming	C/C++, Python, C#, MATLAB, Simulink, Embedded C, Arduino, AVR, HTML, CSS, JS, LaTeX
Robotics Software	ROS, OROCOS, GazeboSim, MOVEit
CAD & CAM	ANSYS Mechanical Workbench, ADAMS, Soliworks, CATIA V6, AutoCAD, Blender

Please refer to my course curriculum for reference. (Mechatronics Course Plan)

Publications and Presentations

[1] **Rajamani, D. K.**, Pitchika E. D., Dhankar K. S., Shorewala S., Bansal D., & Upadhyaya Y. S.(n.d.). *Design Overview of a Planetary Exploration Rover for Unstructured Terrain.* 3rd International and 18th National Conference on Machines & Mechanisms.

[2] **Rajamani, D. K.** , Pitchika E. D., Dhankar K. S., & Upadhyaya Y. S. *Design and development of a linear jawed gripper for unstructured environments.* Manipal Journal of Science and Technology 3, no. 1 (June 2018).

[3] **Rajamani, D. K.** , Pitchika E. D., Dhankar K. S., & Upadhyaya Y. S. *Design and Development of a Linear Jawed Gripper for Unstructured Environments.* International Conference on Applied Sciences, Engineering & Technology. (ISBN: 978-93-5279-058-6)

[4] **Rajamani, D. K.**, & Dhankar, K. S., Upadhyaya & Y. S.(n.d.). *A comparative Analysis ofIndustrial Grade Parallel Gripper and Linear Grippers.* ISAB Industrial Automationand Control TechEvent Day, ISA Bangalore.