Dhruv K Rajamani

dhruvkoolrajamani@gmail.com

/dkr /DhruvKoolRajamani https://dhruvkoolrajamani.gitlab.io/ +91-880-064-6969

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

Interests

Rehabilitative and Assistive Devices, Nonlinear Control, Legged Locomotion, Mobile Robots, Robot Dynamics

Achievements

- Best Rover team from Asia; 8th out of 82 teams at the University Rover Challenge, Utah, 2017. (*link*)
- Offered INSIPIRE scholarship by DST, Government of India for top 1% score in AISSCE 2014 – Declined
- Best paper presentation at the iACT-2017 conference, ISA Bangalore.

Internships

BioRob (link) Prof. Auke Jan Ijspeert, Dr.Hamed Razavi

École polytechnique fédérale de Lausanne *January 2018 - Present*

Development of a Simulation Platform for the COMAN Robot(COmpliant HuMANoid robot) [1]:

Simulate systemic integrations of human-robot interactions amongst humans and compliant robots

* Developed simulators for OROCOS-RTT and ROS along with the appropriate analysis tools. (Simulation Packages)
* Tested continuum of gaits (stepping, active balance, and walking) with a single controller. (Video)

Outcome: Worked with various robotics frameworks (ROS, OROCOS, YARP), performed gait analysis.

Development of a Neuromechanical framework to study animal locomotion [2]:

Develop a simulator featuring appropriate analysis tools to conduct gait analysis of modular tetrapoda models

* Developed a simulator and controller using Central Pattern Generators (CPGs) to conduct lesion studies on tetrapods.

Outcome: Implemented a novel closed loop controller for modular tetrapods (single controller for varying body parts).

Autonomous Robotics Lab (link) Dr.Sudipto Mukherjee

Indian Institute of Technology, Delhi *2017 – 2018*

Development of an 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.

Experience

BioRobotics Group (link) Manipal Institute of Technology, KA

Co-Founder *2018 - Present*

The group is a community of scholars from EPFL and Manipal, collaborating on projects on bioinspired robotics.

Neuromechanical model of a Humanoid:

Leading a team of 8 researchers in developing a neuromechanical controller for the COMAN using CPGs.

ROS Package for the Pleurobot:

Leading a team of 6 researchers in developing a ROS Package for the Pluerobot (BioRob, EPFL) with CPGs.

Tutorials for ROS and Robotics:

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

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

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

Teaching Assistant Manipal Institute of Technology, KA
MTE-3003, MTE-2211 *2018 - Present*

Robot Dynamics and Control (MTE-3003):

Teaching Junior and Senior Underraduates Robot Dynamics through ROS and evaluating final research project.

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

CAD & Kinematics Lab (MTE-2211):

Teaching and evaluating 3D kinematic models on CATIA V6.

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 prototype that can traverse harsh Martian like terrain and steep gradients.

* Participated in the University Rover Challenge, UT - 2017 and stood 8th. (URC-2017)
* Presented the Rover at various conferences. (Critical Design Review) [2]

Robotic Arm Lead:

Superevised a team of 6 interdisciplinary researchers to develop an detachable 6DOF Manipulator module for the Rover.

* The arm has a 6kg payload and a 1.5m reach.
* Self adapting gripper to perform screwing, grasping, retreiving, etc tasks, published. [1, 3-4]

Projects

- Obstacle detection and Path planning for an autonomous robot using computer vision and fuzzy logic. [3]
- Traffic Detection using a Kalman Filter and Feature detection. [4]
- LQR based control of a 3-link Linear Inverted Pendulum on a cart (LIP). [5]

Technical Skills

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

Publications & Presentations

1. **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]
2. **Rajamani, D. K.**, et al. **Design Overview of a Planetary Exploration Rover for Unstructured Terrain.** 3rd International and 18th National Conference on Machines & Mechanisms.
3. **Rajamani, D. K.**, et. all. **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.**, et. all. **A comparative Analysis ofIndustrial Grade Parallel Gripper and Linear Grippers.** ISAB Industrial Automationand Control TechEvent Day, ISA Bangalore. (Best Paper Award)

Relevant Courses Covered

Please refer to this course curriculum for reference. (Mechatronics Course Plan)
Robot Dynamics and Control (MTE-4007), Robotic Path Planning (MTE-4008), Artificial Intelligence (MTE-4027), Machine Vision and Image Processing (MTE-4006), Machine Learning (MTE-4025), Robotics Lab (MTE-3212)

[3] C++, Python, MATLAB
[4] MATLAB
[5] ROS (C++, Python), MATLAB