Dhruv Kool Rajamani

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Year	Degree, Examination Board	Course, Institute	CPI/%
2015 - 2019	**Graduation, BTech**	Mechatronics Engineering, Manipal Institute of Technology	$8.83^{/10}$
2012 - 2014	**AISSCE, CBSE Delhi**	Vasant Valley School, Delhi	$95.00^{\%}$

Interests

Legged Locomotion, Central Pattern Generators, Rehabilitative and Assistive Devices, Nonlinear Control

Achievements

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

Experience

- **BioRob** ***(webpage)*** Dr.Auke Jan Ijspeert, Dr.Hamed Razavi, Jonathan Arreguit
  École polytechnique fédérale de Lausanne (EPFL) *January 2018 - Present*
  - **Implementation of Walking Controller COMAN Robot(COmpliant HuMANoid Platform)**:

    To develop a simulation environment of the COMAN Robot and implement various control algorithms for walking, manipulation, levelling, coordinated interactions between multiple COMANs, object tracking and motion planning to validate the experiments conducted on the real robot.

    * Developed a simulator using OROCOS and ROS on Gazebo.
    * Interfaced a walking controller developed by Dr. Hamed Razavi and validated results

    OROCOS-Package Project Page
    ROS-Package Project Page
    This work was supported by the Horizon 2020 Work Programme, an EU-funded research project.
  - **Development of a Neuromechanical framework to study animal locomotion**:

    To develop a neuromechanical model of a tetrapod, design a single controller for swimming and walking and corroborate biological findings on neuromechanical control through lesion studies, evolutionary studies, etc in a simulated environment.

    * Developed a simulator based on ROS with parameters to modify the morphology of a tetrapod.
    * Implemented and analysed a closed loop control using central pattern generators on a centipede.

    This work was supported by the Human Frontier Science Program (HFSP) for the Robotics-Inspired Biology project.
- **Program for Autonomous Robotics Lab** ***(webpage)*** Dr.Sudipto Mukherjee
  Indian Institute of Technology, Delhi *2017 – 2018*
  - **Modelling and Development of a non-holonomically constrained Flexible Manipulator**:

    To design a flexible n-link manipulator which is non-holonomically constrained using a minimal number of actuators to achieve desired motion in 3D space.

    * Modelled a flexible manipulator to retrieve objects up to 2 meters in 3D space.
    * Modelling of dynamics and controller using **Differential Flatness** to achieve Underactuation.
- **Robotics Lab** Dr.Ritwik Chattaraj
  Manipal Institute of Technology, KA *2017*
  - **Modelling and Control of a 3-link inverted pendulum on a cart**:

    To analyse the motion of a 3 link inverted pendulum on a moving base and design an optimal controller for the same.

    * Implemented swing up control with a 2-DOF controller.
    * Nonlinear feedforward controller and AKF based controller.

- **Mars Rover Manipal** ***(webpage)*** Dr.Y S Upadhyaya
  Manipal Institute of Technology, KA *2015 - 2017*
  - **Development of a Mars Rover Prototype**:

    Develop a Mars Rover prototype to compete in the University Rover Challenge, UTAH. The Rover is required to traverse harsh *Martian* like terrain, steep gradients of approximately 1m height, run autonomously and house a high precision robotic arm for various tasks.

    * Participated and stood 8th out of 82 teams at the URC 2017

  - **Design, Modelling and Manufacturing of a 6 DOF Robotic Arm**:

    Design a 6 DOF Robotic Arm with a payload of 10kgs to conduct tasks similar to those performed by the Curiosity Rover, such as screwing/unscrewing, drilling, pick and place, etc.

    * Design and force analysis of a 6-DOF articulated Arm using CATIA and ANSYS respectively
    * Simulation of 6 DOF articulated Arm on Gazebo.
    * Interfacing onboard sensors with ROS to achieve various levels of autonomy.

  - **Design of a Self-Adapting Linear Jawed Gripper for a Mars Rover Prototype**:

    Design a self adapting gripper as an end effector to the robotic arm assembly on the mars rover prototype. The gripper should be able to grasp objects of 8cm width, 10kg weight and have minimal number of actuators.

    * Modelling, Design and Mfg. of a Self-Adapting Linear Jawed Gripper.
    * Comparison of an End Effector with an Industrial Grade Linkage End Effectors.

Presentations

December, 2017 *Bhabha Atomic Research Center*
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. *(Paper Presentation)*

March, 2017 *Manipal Institute of Technology*
Rajamani, D. K., Upadhyaya, Y. S., & Dhankar, K. S. (n.d.). A comparative Analysis of Industrial Grade Parallel Gripper and Linear Grippers. ISAB Industrial Automation and Control Tech Event Day, ISA Bangalore.
- *Best Paper Presentation.*

Technical Skills and Interests

Programming	C++, Python, C#, Matlab, Simulink, Embedded C, LaTeX, Arduino, HTML, CSS
Robotics Software	ROS, OROCOS, GazeboSim
Analysis software	ANSYS Workbench, ADAMS
CAD software	Solidworks, CATIA V6, AutoCAD

Projects

- **Obstacle detection and Path planning for a mobile autonomous robot using computer vision and fuzzy logic**: Implemented a heuristic based fuzzy logic approach for path planning through an unknown environment.
- **Traffic Detection using a Kalman Filter**: MATLAB Project to detect moving vehicles in a video feed from a traffic camera using Kalman filter and Feature detection. *(Prof. Maitri M)*