Dhruv Thanki

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EDUCATION

University of Delaware **Sep. 2019 – May 2021**
Thesis Track, Master of Science in Robotics *Newark, Delaware*

LDRP Institute of Technology and Research **Sep. 2015 – May 2019**
Bachelor of Engineering in Mechanical Engineering *Gandhinagar, Gujarat, India*

RELEVANT COURSEWORK

- Convex Optimization
- Linear System Theory
- Nonlinear Control
- State Estimation
- Linear Feedback
- Computer Vision
- Intro to Robotics
- Autonomous Driving

EXPERIENCE

University of Delaware **Jan. 2020 – Present**
Graduate Student Researcher | Advised by: Dr.Ioannis Poulakakis *Newark, Delaware*

- Switching Primitive based motion planning for Digit robot in a static environment using CBF's.
- Linear Inverted Pendulum (LIP) based approach for motion planning for Digit robot.
- Designed a QP based Operational Space Controller (OSC) for the Digit robot model in MuJoCo to track a desired set of Joint Space trajectories.
- Generated dynamic walking and turning primitives for the Digit and Cassie robot using Direct Collocation.

Space Application Center - Indian Space Research Organization (ISRO) **Jan. 2019 – June 2019**
Robotics Intern | Advised by: Neeraj Mathur and Anurag Verma *Ahmedabad, Gujarat, India*

- Formulated a closed form solution to the inverse kinematics for a 6-DOF Walk-and-Roll rover leg. (Department:MESA, Group:OPMG, Division:OMDD).

PROJECTS

Optimization based Path Planning. | *Predictive Control, Trust-Region Based Optimization* **May 2021**

- Implemented MPC based path planning with obstacle avoidance using the kinematic model of a TurtleBot.
- Trust Region based SCP formulation for the Quadratic Program.

Turning Primitives for a Simple 3D-Biped | *Poincare Maps, Controlled Symmetries, Equivariance* **August 2020**

- Generated turning primitives with a desired heading angle for simple 3D biped with an under-actuated foot.
- Prensented intuitive insights into the presence of the controlled symmetries and how to exploit them.
- Prensented an exhaustive literature review for different levels of model extraction ranging from LIP to 3LP and many more.

Trajectory Planning and Inverse Kinematics | *Vrep* **May 2020**

- Implemented the Jacobian pseudo-inverse method for trajectory planning while satisfying constraints for obstacle avoidance and joint torque limits.
- Verified the algorithm on a model of the LBR iiwa 7 R800 robot arm in CoppeliaSim simulator.

Feedback Control for Dynamic Bipedal Walking | *Hybrid Zero Dynamics* **January 2020**

- Mathematically modelled a planar 5-link bipedal robot with underactuated foot using Lagrangian formulation.
- Implemeted the method of virtual constraints and optimized the trajectory for the actuated DOF to obtain a limit cycle corresponding to a stable walking gait.
- Carried out Poincare analysis to validate the stability of the zero dynamics.

AWL-Bot: DRUSE | *Mechanism Design, Micro-Controller* **August 2019**

- Qualified amongst top 30 out of 200 robotics teams in the Challenge in the West – India zone for the development of a Surveillance Robot. [Provisional Patent Filed] (DRUSE: DRDO Robotics And Unmanned Systems Exposition.)
- Designed the flight module where the BLDC motors are mounted on links that are actuated using a gear train. These links open and move out of the robot as the upper hemisphere is raised using a rack and pinion mechanism.
- Presented the project to the various Faculties and Engineers at DRDO.

TECHNICAL SKILLS

Languages: Python, C/C++, MATLAB
Technologies/Frameworks: MuJoCo, CoppeliaSim, OpenCV, OpenGL, Eigen, CMake, Git, Drake, Docker
Enthusiastic About: Street Photography, Rock music

EXTRACURRICULAR

Graduate Student Government Committee | *Events' Committee member* **Fall 2019 – Fall 2020**

Indian Graduate Student Association | *Volunteer* **Fall 2020 – Fall 2021**