

Type: Masterarbeit / Semesterarbeit

Contents: experimentell / theoretisch /

Beschreibung:

Title: Safe Trajectory Generation and Quantification for Robotic Arm Manipulators



We are seeking a highly motivated student to develop a novel algorithm for generating a trajectory using Neural Networks for the robot which is safe from the environmental factors. Additionally, quantification of the safety of the trajectories can further help to improve the reliability of predictions.

Project Focus:

This project builds upon the foundation of Neural Networks and aims to develop the trajectories which:

1. Are safe from external factors
2. Can have quantified safety

Furthermore, it would be part of the project to:

- **Smooth and Non-Jerky Trajectory:** The generated trajectories should be smooth and also potentially a non-jerky control should be feasible.
- **Dynamic Obstacle Dodging:** The trajectory generated should account for real-time movements of obstacles and update the safe trajectory in real-time.
- **Ensure safety of entire robot:** The generated trajectory should ensure safety of the entire robot.
- **Compare against SOTA Trajectory Generators:** There are some works done for generating safe trajectories without using NN. So benchmark against them for safety, reliability, real-time capability, smoothness etc.

Desired Skills: Background in machine learning and deep learning. Basic understanding of trajectory generation. Experience with ML libraries (e.g., Python, TensorFlow, PyTorch). Basics of English is required as thesis would be in English.

Project Benefits:

- Hands-on experience in working with Real ABB Hand Manipulator Robot.
- Opportunity to work on cutting-edge research at the intersection of physics and machine learning.
- Hands-on experience in developing and implementing advanced neural network models.
- Develop strong technical skills in machine learning and scientific computing.