

Masters Thesis Advertisement

Thesis Proposals from the Department of Automatic Control - LTH

VENKATRAMAN RENGANATHAN

Post-doctoral Researcher
Department of Automatic Control
Lund University, Sweden.
Email: venkat@control.lth.se

November 3, 2022

Idea #1: Safe Reinforcement Learning(RL) Via Learning Based MPC



Safe RL: Learning to control the system in a safe way.

MPC: Decide control action given the system model.

Problem Statement

- One of the main difficulties related with RL is safety enforcement, e.g., collision avoidance.
- System model has uncertainty.
- Performance of MPC is highly dependent on the accuracy of the model used for predictions.

Approach

We propose to combine RL and learning based MPC in order to exploit the advantages of both, and therefore, obtain a controller that learns the system uncertainty and is optimal and safe.

Idea #2: Motion planning with risk allocation based RRT*

Problem Statement

- Find a path for a robot from the source to the goal in an environment with obstacles.
- Given a total risk budget for avoiding the obstacles at all time steps, allocate the budget in a non-uniform way while using RRT* algorithm to get optimal path

Risk Allocation Challenge

RRT* : $\begin{cases} \text{sample \& connect,} & \text{DONE} & \checkmark \\ \text{Rewire,} & \text{OPEN} & ? \end{cases}$

