LUND UNIVERSITY
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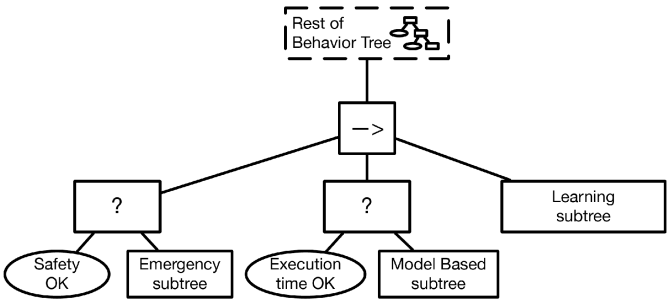
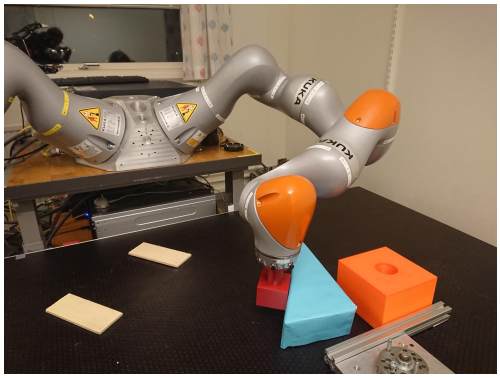
Master Thesis: Safe Learning of Robot Behaviors defined by Black-Box Policies (e.g. Neural Nets)



[1]



Reinforcement Learning methods allow to master complex tasks. However, the learning process can be dangerous for the learning system and especially when using black-box policies such as neural nets, it can be difficult to predict the behavior. This is one reason why modern policies such as neural nets are not well adopted in industry. One way to deal with this is to guard the robot while it is governed by the black-box policy. For example when doing a complex assembly task with a robot arm, one can define a space in which it can freely act. If this space is violated, the robot would abort and default to some recovery behavior. An example of this can be found in [1] where a safe pendulum swing-up behavior was learned.

Your Tasks

This thesis aims at exploring how the learning process and the subsequent execution of policies can be safe-guarded in the context of behavior trees and robot manipulators.

At first you search and discuss related work in the field. You will use a structure that ensures that safety constraints are adhered and incorporate it into the learning process. The approach would be evaluated with a set of learning problems that include different safety constraints.

Requirements

- Knowledge in Python and C++
- Independent, diligent and structured way of working
- (Optional) A course that covered Reinforcement Learning (e.g. EDAN95)
- (Optional) Experience with Linux & ROS

Start Date

- As soon as possible

What we offer

- State-of-the-art Research
- Option to publish the results
- Regular supervision
- Freedom to explore interesting topics
- Freedom to schedule your time

Key Words

- Safe RL, Safety
- Robotics, Simulation
- Reinforcement Learning

[1] "Adding Neural Network Controllers to Behavior Trees without Destroying Performance Guarantees" https://arxiv.org/pdf/1809.10283.pdf

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