Inverse Reinforcement Learning (Bachelor/Master)

Inverse Reinforcement Learning (IRL) is an approach of imitation learning with the core idea of extracting a reward function given observed, optimal behavior [1]. The underlying motivation of IRL is that a reward function is a very compact and informative representation of expert behavior and usually can generalize well to new situations. The design of a reward function by hand is also often very cumbersome and it is difficult to tune the feature parameter.

Researchers developed in the last decade a wide variety of algorithms to solve the IRL problem. An overview of different techniques can be found in the paper [2]. IRL also has been successfully applied to different robotics systems (e.g., quadruped locomotion, autonomous helicopter aerobatics).

We would like to extend previous work on IRL to tackle two kind of open research problems in robotics: 1. The integration of contacts in the reward function, such that it is possible to robustly learn manipulation tasks from demonstration. 2. The investigation of time-dependent features for sequential tasks. The idea behind this is to have different reward functions at different phases of a task.

Depending on your prior knowledge and interests there are different thesis topics available. A good starting point would be to implement an existing IRL algorithm. Further parts of the thesis could be to integrate one of the previous mentioned extensions into this algorithm, to evaluate the algorithm on different benchmark scenarios or to apply IRL on a real robot.

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1.1 References
Contact: If you are interested in the topic please contact the advisor directly via email.