



Master/Bachelor Thesis - Semester Project

Obstacle Climbing Control of a Snake-like Rover Robot based on Reinforcement Learning

Background

On one hand, the advantage of a snake-like robot imitating the locomotion of real snakes is that it can move well in unstructured environments, like narrow pipes, rough or soft ground, and even in water. On the other hand, rover-type robots hold the superiority of crossing the fracture surface and overcome rough roads. Hence, we design a snake-like rover robot to combine the advantages of both types of robot, like shown in Figure 1. A video of the robot can be found at [here](#).

The robot will be used in an environment, which imitate a searching scene with different heights of walls and gaps. Thus, it is difficult to control the robot to adapt the situations itself. We consider reinforcement learning based methods have some kind of advantages to optimize the locomotion process against the traditional model-based methods.

Your Tasks

In this thesis, your task will be building the control strategies to make the robot climb over per-designed obstacles adaptively. To be specific:

1. You will first build up a traditional model-based controller to climb over known obstacles.
2. You will first build up a RL-based controller to climb over unknown obstacles.
3. You will optimize the performance of the RL controller in terms of some core performance, e.g. energy efficiency, speed, stability, etc.

Requirement

- Six month working time
- Interested in autonomous driving and robotics locomotion control
- Interested in machine learning (reinforcement learning)

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Figure 1 Snake-Rover Robot