Master's Thesis

Deep Reinforcement Learning based Autonomous Parking with Donkey Cars

Donkey Car (https://www.donkeycar.com) is an opensource DIY self-driving platform for small scale racing cars equipped with a Raspberry Pi and a wide-angle Raspberry Pi camera. It allows driving your car with your phone or laptop and recording images, steering angles and throttles. Recorded data can then be used to train neural nets for autonomous driving in different environments.

In addition, a Unity-based simulation environment is available that allows for (pre-)training in that environment before transferring models into real-world situations. We will be able to provide the student with a Unity license that allows creating own tracks / driving environments.

Developing a deep reinforcement learning based model for autonomous parking in a restricted environment (approx. 3 x 3-meter restricted parking area) will be the main task of this master's thesis. The challenge will be to park the racing car in one of the designated spots of the parking area, avoiding any collisions with obstacles on the way to the spot and performing that task in a broad range of scenarios. Currently, our racing car is equipped with a front-facing camera only. That might not be sufficient to solve the requested task and it might be necessary to add other sensors to the device or to switch to a birds-eye view using a camera mounted on a rack above the parking area. We won't pose restrictions in that regard. More importantly, we are interested in a machine learning model that can automatically learn to park based on its own experience of driving, navigating the parking area and avoiding collisions via reinforcement learning.

Advisors

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