

Evaluation of an object detection network on a simulator



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Background

Ground-truth data is inevitable for most of the learning methods in autonomous driving context which is used to train networks showing the correct output. However, obtaining ground-truth data is expensive and time consuming, since human experts are involved in the process of labeling. In the object detection problem that we are mainly interested in, a majority of networks utilize supervised learning approaches, which require the correct data to learn predicting where a specific object is located on the scene. Class and position information of an object is required to train such a network for the object detection problem.



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Description

One of the easiest ways of obtaining ground-truth data is using simulators in which the type of objects and their positions are already known. The real-world scenarios contain more complex scenes in terms of number and variety of objects than simulators contain. However, simulators are usually a good starting point to develop and evaluate different neural network architectures since collecting data and labels is cheaper and simulation do not harm hardware during testing. TORCS [1] is one of the open source car simulators that is also used in artificial intelligence research.

We are looking for a student with programming knowledge and motivation to implement deep neural networks. The implemented object detection network is going to be trained and tested on a car/road simulator. The expected outcome of this thesis is a simulation environment for evaluating object detection networks as well as achievements of a network, which is trained with simulator data, on real-world data.

Tasks

This student project consists of the following tasks:

- Literature review and comparison of car simulators (2 weeks)
- Selecting a simulator considering the object detection problem (1-3 weeks)
- Implementing an interface between the neural network and the simulator (2-4 weeks)
- Implementing/adapting Faster-RCNN [2] method for the simulator (4-6 weeks)
- Comparison with selected algorithms and with the real-world data (3-4 weeks)
- Documentation (2-4 weeks)

References

1. <http://torcs.sourceforge.net/>
2. Ren, S., He, K., Girshick, R., & Sun, J. (2015). Faster r-cnn: Towards real-time object detection with region proposal networks. In Advances in neural information processing systems (pp. 91-99).

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Advisor:

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Research project:

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Type:

Master Thesis

Research area:

Machine Learning, Object Detection, Learning on Simulators

Programming language:

Python

Required skills:

Programming and entry level neural network development

Language:

English

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