Master thesis: Machine learning using synthetic data for dynamic quality inspection

The Volvo Group is one of the world’s leading manufacturers of trucks, buses, construction equipment and marine and industrial engines under the leading brands Volvo, Renault Trucks, Mack, UD Trucks, Eicher, SDLG, Terex Trucks, Prevost, Nova Bus, UD Bus, Sunwin Bus and Volvo Penta.

Volvo Group Trucks Operations encompasses the production of state-of-the-art products for the truck brands of the Volvo Group, as well as Volvo Group engines and transmissions, through an international world class industrial environment.

With Volvo Group Trucks Operations you will be part of a global and diverse team of highly skilled professionals working with energy, passion and respect for the individual to become the world leader in sustainable transport solutions.

Background of thesis project
At the final assembly line in our manufacturing plants mounting details are provided as a “kit” to each mounting station. The reason for this is that there is no space for storage of materials at each assembly station. Therefor material are placed in a storage rack a bit away from the assembly station but still in the vicinity. The required components for the specific product variant are picked by hand from smaller bins and placed in a box that is manually transported to the assembly station where components are mounted on the engine variant. To increase quality we want to use “generic cameras” in the ceiling together with a machine learning algorithms based on CNN (Convolutional Neural Network) where the CNN is trained using synthetic data, i.e. CAD-models of the components. If it is possible to use these technologies (generic cameras, CNNs trained on synthetic data) it would be very valuable for the Volvo Group.

Suitable background
Students with a background in machine learning and/or computer vision.

Thesis project task
For a selection of various components, use their CAD data to train a CNN. Define camera type, number of cameras, positions etc. for a physical installation. Make a SW system that can identify whether or not the details are mounted and if they are in the correct position.

This project requires both good theoretical skills as well as the ability to make the system “come real”.

This thesis will be a part of the research projects Unification and Caramba where both Chalmers and Örebro University are involved.
This document describes a Master Thesis to be performed at Group Trucks Operations, GTO, Göteborg, during 2019.

**Methodology**

- Study earlier thesis work and literature for training of CNNs.
- Train a network with the decided components
- Design and calculate a camera system set-up at the main assembly line in Skövde
- Develop algorithms for robust component detection (preferable on a general level)
- Make a system implementation for the quality inspection
- Run demonstration to validate the result

**Thesis Level**

Master

**Language**

Thesis is to be written in English.

**Starting date**

January 2018

**Number of students**

Two (2)

**Tutor**

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