TECHNISCHE UNIVERSITÄT CHEMNITZ

Chemnitz University of Technology
Chair of Digital Signal Processing
and Circuit Technology

Master Thesis

Speed Determination and Delay Compensation for Cargo Trains

Description

One of the research topics at the Professorship DST is computer vision. In that field are many topics for a master thesis possible. This one is taking part in the field of transportation, especially in railway. Within this work the speed of a train needs to be determined. This can be done by observing the tracks and analyze the movement of the parts in the image. The distance of the rail itself can be used for this (standard gauge normalized at 1435mm).

Appropriate machine learning algorithms or triangulation and other calculation methods can be used to calculate the train speed. Multiple calculation methods can be compared and evaluated. The videos required for this must be found through research or can be created synthetically (Unreal Engine, BlenderProc,...) if needed.

The ground truth data is the real speed that should be given for the evaluation of the master thesis. Since there is a delay between the pictures taken from the camera and shown on the screen, the current position shown on the display does not match the real current position. This delay needs to be compensated with an optical zoom, where the zoom-factor is calculated with the respect of the train speed.

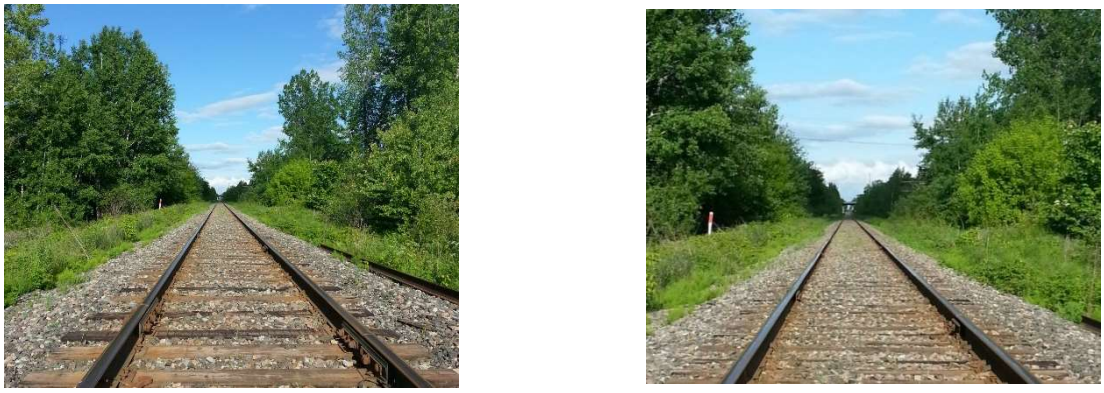

Figure 1: Zoom of the image according to the train speed

The student's work should at least cover the following steps:

- Calculation of the distances
- Determine the speed of the train
- Collect open source dataset/videos or create synthetic dataset
- Zoom of the displayed video according to a given delay
- Discussion and evaluation of speed detection and delay compensation

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Further detail that should be covered:

- Literature research (state of the art, basics)
- The necessary resolution that is needed to determine an accurate speed
- Display of both the original and the zoomed video

Recommended experience

- Understanding of image processing
- Programming in C/C++ or Python
- Librarys: OpenCV, Tensorflow (when using machine learning algorithm for this task)

Literature

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