

Estimation of Trailer Space Occupation From Stereo Images

Proposal for a Master thesis topic

The timely, efficient, and safe transport of goods plays a vital role in the economy. A prominent example is the road transport of solid cargo using trailers towed by trucks. To efficiently use the available transport capacity, the automatic estimation of the geometry of loaded goods and the space they occupy is desired. To achieve this task, we propose to mount stereo cameras at the end of the trailer. This thesis aims to automatically estimate the occupation status of the trailer in 2D and 3D using stereo images.

Space occupation refers to the area or volume covered by the loaded cargo in 2D or 3D as illustrated in Figure 1. In 2D, a floor map shows the occupied regions of the trailer, regardless of their height and volume. In 3D, a 3D grid map shows the 3D volumes occupied by the loaded goods.

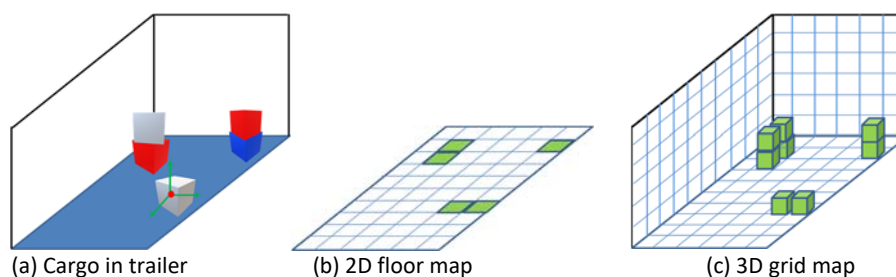


Figure 1. Occupation status of the trailer in 2D and 3D. The green grid in 2D (b) and 3D (c) indicates the occupation of the current 2D or 3D grid.

To simplify the investigation, we assume the following:

- Known trailer geometry
- Known sensor calibration
- Known cargo shape
- Stable lighting

Development takes place on a dataset of images of loaded cargo with known 2D floor map and 3D grid map. A 3D scene inside the trailer should be reconstructed via known 3D reconstruction algorithms. Based on the reconstruction, the core method of estimating the occupied space can be developed. The method developed in this thesis is then evaluated on test datasets with ground truth space occupation.