



CNN-based Depth Map Enhancement using Uncertainty Information

Proposal for a Master thesis topic (DE/EN)

The reconstruction of depth information from one image pair is a classical task in photogrammetry as well as in computer vision and the minimal case of the well-known structure from motion problem. It refers to the concept that 3D structures can be recovered from the projected 2D motion field of a scene acquired with a moving sensor. A special case of this task is dense stereo matching. It not only determines depth for significant feature points, but for every or at least a majority of pixels within a stereo image pair. However, these correspondences cannot always be determined unambiguously, leading to incorrect assignments in the resulting depth map.

In consequence, various methods exist to assess the uncertainty of depth estimations, which is commonly used in a post-processing step to filter out estimates that have a high probability of being incorrect. While this procedure reduces the error contained in a depth map, it also decreases its density. Thus, in the scope of this work, a Convolutional Neural Network is to be designed and trained, which predicts an improved dense depth map based on the original depth estimations of an arbitrary dense stereo matching technique and the corresponding uncertainty information.

For the design of the network architecture, well-known and commonly employed architectures are to be investigated and examined with regard to their suitability for the specified task. Based on the architecture selected, adjustments are subsequently to be made in order to maximise the prediction accuracy with respect to the type of data provided to the network as input. The data which is needed for the evaluation as well as for training the network will be provided.

This thesis will be supervised by Max Mehltrittter, M.Sc.