ABSTRACT

Visual quality control (VQC) plays an important role in ensuring the quality and safety of components in industrial production. This task is increasingly supported by image processing software and in many cases is fully automated. Here, permanently installed camera systems offer high precision, but are complex to install and not very flexible. For this reason, augmented reality on mobile devices is used to support humans in VQC tasks. First, based on the CAD model, the camera pose relative to the inspected object is estimated (6 DoF pose estimation). This information is then used to draw the contours of the construction plan in the camera image. Deviations of the real object from the target state can then be recognized and marked by humans in this augmented view. The inspection process could be accelerated even further by automating defect detection.

In previous research, however, the possibility of CAD-based defect detection with a hand-held camera has hardly been considered. In this thesis, the requirements for such a system are formulated on the basis of a real application scenario and are compared with possible solutions. However, there is a lack of evaluation and training data for the implementation and evaluation of potential solutions. To address this problem, an approach based on the simulation of defects on the 3D model is implemented. Since the camera pose is known from the tracking, deviations in depth and surface normal between the plan and the real object can be rendered from the real camera perspective. The implemented renderer can also be used to generate ground-truth segmentation masks for real image sequences. In addition, a dataset consisting of 3D models and image sequences of the real objects was created as part of this work.

The progress made in the course of the work is summarized. Further improvements of the method and the dataset are considered.