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Workshop »Digital Data creates value – recognising and exploiting opportunities«

Deep-learning-based in-process inspection of injection molded parts in the automotive industry

Dr. Daniel Garten[1], Dr. Katharina Anding[2]

[1]Society for Production Engineering and Development Schmalkalden (GFE e. V.), Schmalkalden, Germany; [2]University of Technology, Ilmenau, Germany

d.garten@gfe-net.de

This paper presents intelligent quality assurance solutions for the automated detection of different defect classes in an industrial manufacturing processes based on image acquisition, intelligent digital image processing and artificial intelligence methods. Automated quality assurance methods for plastic injection molding of components in automotive manufacturing based on robotics-assisted color imaging and artificial intelligence (AI) are demonstrated.

The realization of an adapted image processing and pattern recognition chain as well as adapted powerful artificial intelligence algorithm with high generalization and abstraction capabilities based on the acquired image information is essential. The essential steps to solve these tasks are presented and the different aspects of an adapted image acquisition, an AI-based classification routine design as well as the validation of the classification performance and possible optimization are discussed in detail as well. Details from the robot-based test object handling are also presented. The acquisition of the training data and the training of the underlying convolutional neural network is also highlighted. After different optimization steps a recognition rate of more than 95 % was achieved for the detection of all relevant defects in plastic injection molding under practical conditions.
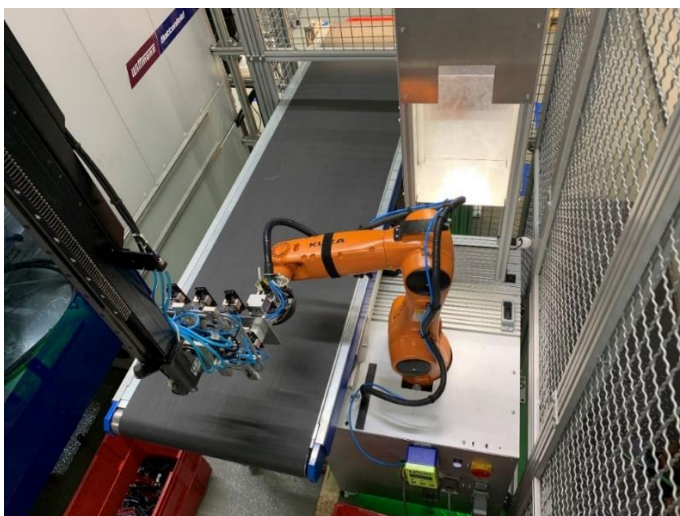
Figure: Articulated arm robot for part removal and positioning as well as the optical inspection cell (right in the picture)