Doctoral thesis in Cluster C "Materials and Process Engineering":

Konzepte und Implementierungen für die prozessnahe Integration optischer Sensoren

Concepts and implementation for a close-to-production integration of optical sensors

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Abstract:

Industrial production, especially the production of quality goods and equipment is in Germany an important factor for economic success on the world market in order to maintain its competitiveness in the international comparison. To maintain the competitiveness it is necessary to generate constantly better products. This implies both innovation in product development and improvement of product quality. In order to produce the required quality with high reliability, arrangements to monitor the production and manufacturing of the goods are essential. Therefore short test intervals as close as possible to the production station are necessary.

Optical sensor systems are suitable for rapid and non-destructive inspection of objects. Nevertheless, their distribution is still relatively low and generally the full potential of these measurement systems for the monitoring of the production is not completely exploited. Even though the rapid and non-contact measurement of optical systems enable them to monitor the production results but In general, a reliable measurement is only possible in a very accurate specified measurement environment by reason that influences from the production environment influences measured signals.

A production-oriented implementation of a continuous monitoring with optical sensors is therefore to this day only possible in special cases. To solve this problem, a theoretical approach is developed, to estimate the errors of a measurement that result from disturbances from the production environment. Therefore a simulation model is developed, to model the measurement signal of an optical measurement system. It is possible to model the influences of the production environment and the measurement object. With this simulation model it is possible to estimate the reliability of a measurement in a given production environment and to assess critical influencing variables. Finally, two examples of a procedure to implement a process-oriented monitoring are presented.