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Quality inspection of machined metal parts using an image fusion technique

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Abstract

Suppliers of metallic components with high-precision surfaces are facing a trend towards zero-defect tolerance regarding their finishing. Because of the lack of standardization and the difficulty of the task, this inspection is generally done manually. This work aims to detect defects on machined metal parts even if their orientation and shape are very similar to the surface finishing. A machine vision system, performing the detection of flaws on textured surfaces is fully described. One of its main devices, the lighting system, has been carefully designed to ensure the imaging of defects. Hence, multiple images are acquired under different lighting conditions, processed separately, and merged into one. Features extracted from this fused image and the former processing steps establish the feature space for a supervised learning classifier based on artificial neural networks. Results of the automated inspection show that the system works effectively with a low value of false rejections, which makes it suitable for industrial applications.

Keywords: Machine vision; Metal surface inspection; Image fusion; Automated surface inspection system

1. Introduction

Surface inspection of metals is used to ensure that parts or products meet minimum quality and safety requirements. These requirements may vary depending on the application, with aerospace and automotive industries being the most demanding ones. Components for these industries normally

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