UNIVERSITI TEKNOLOGI MARA

NON-CONTACT APPROACH OF ROUNDNESS INSPECTION FOR MACHINED PARTS

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The geometrical tolerance verification of machined part is a process composed of a set of inspection procedures and rules that are complex, tedious and slow. The methods and instruments used to inspect geometrical tolerance of the parts are quite conventional and require a high skill and knowledge to assess the quality of the machined parts. For this reason, this research develop a method to effectively perform the inspection process by recommending non-contact approach using machine vision and new simple mathematical models that can be used for the creation of an inspection system to assist in the verification of an important form tolerance of machined parts. The main goal of this research is to develop method and procedure of roundness measurement that are simple to implement but at the same time is fast and effective to provide reliable technique that help the metrologist to make evaluation for the inspected parts. Two samples of cylindrical machined parts are selected to be measured by this non-contact approach. A test-rig set-up which consists of main components such as workholding fixture, CCD camera, lighting device and motor was developed in order to carry out this study. This research proposes new procedure in image processing by using WiT software. In addition, a new mathematical model for evaluation of roundness error is proposed according to the analogy given by Minimum Zone Circle (MZC) method. The proposed approach and mathematical models were analyzed using several set of number of part images. The results showed that the non-contact inspection system for roundness error were effective and reliable enough to assess this form tolerance. This concept of measurement can be further improved to obtain better accuracy of the roundness error assessment. In summary, this research suggests a new method for geometrical tolerance inspection for machined parts by using machine vision. This system provides flexibility in term of the inspection set-up and is potentially applied for in-line and hundred percent (100%) inspection of the cylindrical machined parts.

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