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ACCEPTED MANUSCRIPT

A New Threshold Selection Method for X-ray Computed Tomography for Dimensional Metrology

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Highlights

- A new method of air and material separation for X-ray tomography for industrial dimensional metrology application was proposed;
- Factors influencing on the accuracy of reconstruction has been included on a calibration process;
- It was verified on five different tomographs for industrial application;
- Significant improvement in the accuracy of measurement was observed.

Abstract: The article presents a new method of air and material separation for X-ray tomography for engineering applications. It consists of executing additional calibration measurements and determining certain correction for air-material threshold values on the greyscale of the volumetric file obtained as a result of a tomographic measurement. Usability and effectiveness of this method has been experimentally verified on five different tomographs for industrial application. The proposed method performs better than existing well-known, automated algorithm ISO50% when measuring the volume as well as linear dimensions of workpieces made of different materials. Experiments shown considerable improvements of measurements for the tested conditions.

Keywords: measurement, X-ray tomography, air-material threshold

1. Introduction

Industrial computed tomography, which originates from medical tomography, is becoming a more common measurement technique in engineering applications. By applying higher energies and higher intensity of X-ray radiation it is possible to inspect complex machine parts made of materials with X-rays attenuation coefficient higher than human tissues. Tomography for engineering applications enables measurements unattainable by other metrological devices, e.g. non-destructive testing of the objects made of different materials such as metals, ceramics, plastics [1]. Investigation of internal structures allows detecting discontinuities in the objects. They are in the form of inclusions of other materials or voids in the form of porosity [2, 3]. It is possible to perform measurements of geometrically complex parts, to compare the point cloud achieved from the measurements with a CAD model or to create one in the process of so-called

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