Investigation on the influence of image quality in X-ray CT metrology

This paper presents a method for evaluating measuring errors in a CT system using information from quality of reconstruction images. In particular, spatial resolution and pixel noise are considered in this work. Both factors can be theoretically described using formulas, and can be expressed as a combination of scanning setting parameters. A 32 full factorial design of experiment (DOE) was carried out to determine the influence of the two factors on dimensional measurements. For quantification of the influence, an evaluation parameter sphere distance error was selected. Results show that the spatial resolution is a dominant factor. Analysis of the reconstruction images is carried out, showing image artifacts occurring on the spheres visible under large opening angle, which are usually more significant for CT scans at high magnification. Theoretical formulation of pixel noise was validated through the experimentation.

General information
Publication status: Published
Organisations: Department of Mechanical Engineering, Manufacturing Engineering, Physikalisch-Technische Bundesanstalt
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Number of pages: 10
Publication date: 2012
Peer-reviewed: Yes
Keywords: Computed tomography, Image quality, Pixel noise, Spatial resolution, Dimensional CT measurement
Electronic versions:
müller_Wels(2012).pdf
Source: dtu
Source ID: u::4740
Research output: Contribution to conference → Paper – Annual report year: 2012 → Research → peer-review