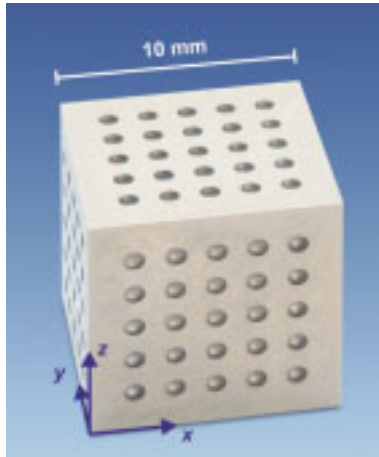


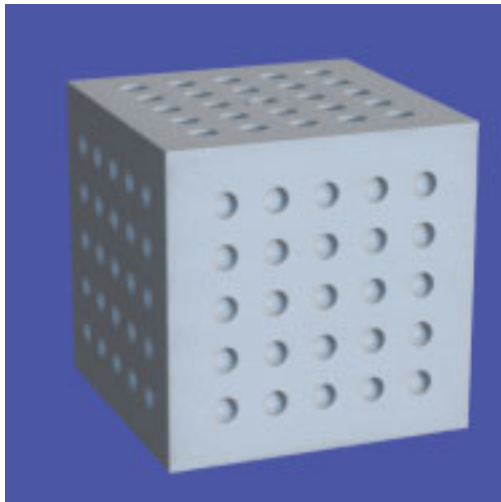
Principle of testing of a micro-computer tomograph (μ CT) with the aid of a cube with spherical micro-calottes

1. Artefact



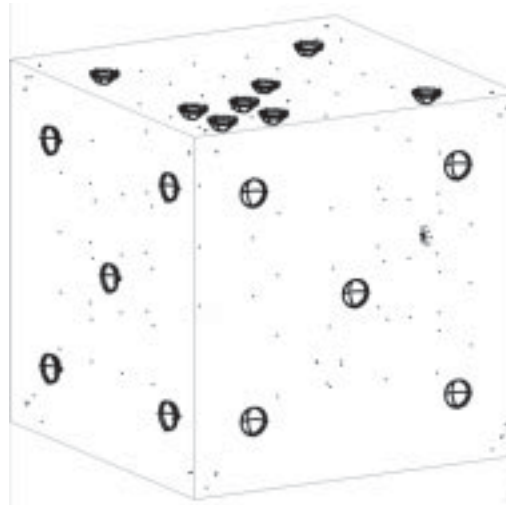
Cube with 3 x 5 x 5 spherical calottes (x,y,z), radius 400 μ m, material: Ti-6Al-4V, manufactured with sink- and wire erosion at IMM-Mainz (www.imm-mainz.de)

2a. μ CT-measurement



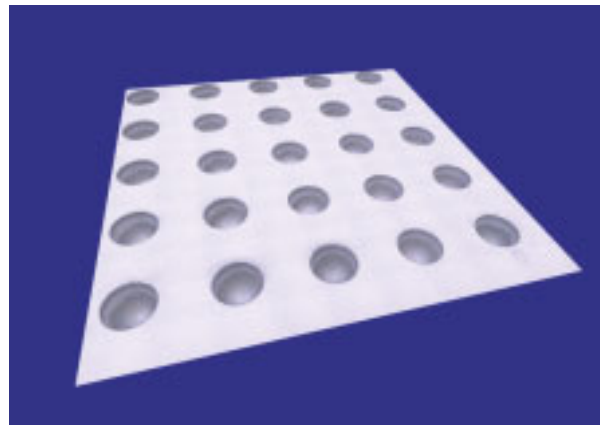
3D- μ CT-measurement at BAM (www.bam.de)
Voxel size (15.7 μ m)², 200 kV, 40 μ A, > 1 000 000 data points

2b. Tactile measurement



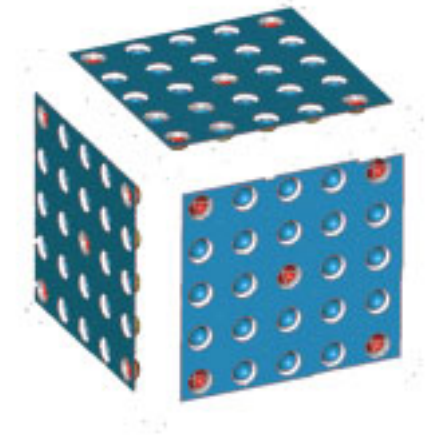
Tactile measurement with UPMC 1200 Carat (www.zeiss.de)
Probe radius 0.3 mm, approx. 13 000 data points

2c. Optical measurement



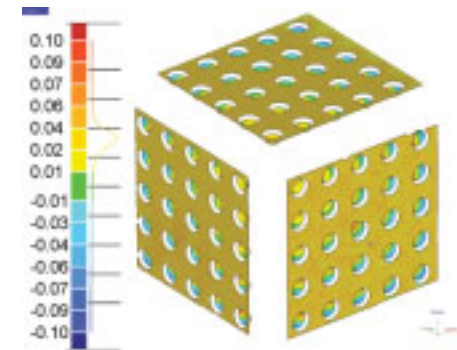
Optical measurement with InfiniteFocus instrument (www.alicon.com)
Objective 10x, stitching modus, > 1 000 000 data points

3. Multisensor data (tactile and optical)



Registration of optical data to tactile data
Software: Geomagic Studio (www.geomagic.com)

4. Nominal-actual comparison of μ CT-data against multi-sensor data



Best fit using 5 calottes (4 corners and centre)
Deviations within sub-voxel range
Software: Geomagic Qualify (www.geomagic.com)

Ball plates as 2^{1/2}-D artefacts for testing of optical and tactile micro-sensors



Ball plate with 6 x 6 steel balls, radius 0.25 mm, distance 1.3 mm, rough surface, balls glued in conical droppings



Ball plate with 6 x 6 steel balls, radius 1 mm, distance 4 mm, smooth surface, balls clamped from bottom side

Additional task-specific artefacts:

Micro-hole standard: diameter 100 μm , depth 2.2 mm

Micro-contour standard, tungsten carbide: structure size 30 μm – 500 μm , measurands radii, distances, steps, angles (45°– 80°), diffuse reflecting surface

Micro-gear standard: Gauge block with mounted ruby spheres of diameter 0.4 mm – 0.7 mm used to substitute involute profiles of module 0.169 mm

Information

Department 5.3

“Coordinate Metrology”

Working Group “Geometrical Standards”

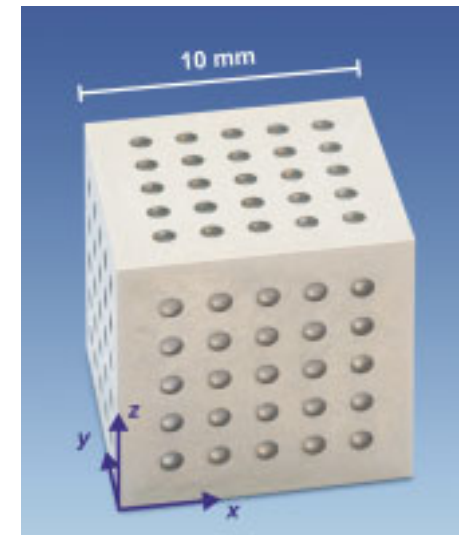
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Artefacts for testing of optical and tactile micro-measuring instruments