Institute of Machine Tools and Manufacturing

Improving Geometric Calibration Methods for Multi-Axis Production Machines

**Motivation**

Today's state of the art in production machine testing and calibrating demands
- lot of time
- many measurement set ups with different measurement devices (e.g. laser interferometer with different optics or cross grid systems)

**Objectives and Challenges**

Determining and separating geometric errors of multi-axis production machines with reduced time and costs:
- 3D-ball plate: checking of component as well as orientation errors of linear axes and their interdependencies
  \[ U(k=2) < 4 \, \mu m \]
- R-Test: identification of single errors at 5-axis machine tools with quantification of the resulting uncertainty
  \[ U(k=2) < 2.8 \, \mu m \]

**Application Area**

- Calibration of machining centers, turning centers and grinding centers
- Compensation of evaluated errors in the numerical control

**Conclusion and Outlook**

Systematic planning and improving of calibration procedure:
- Geometric behavior of machine tool after calibration can be predicted
- Methods can be applied to robots or parallel kinematics

**Applying Industry / Research**

- Machine tool manufacturers and users
- Control manufacturers

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