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Abstract
This study develops a low-cost micro-CMM system incorporating a nanoscale touch trigger probe and a novel three-axis optical encoder based upon modified commercial DVD pickup heads. The measurement performance of the proposed system is enhanced through the use of a rigid aluminum double-arch-bridge structure to support the touch trigger module and a unique cross-form suspension system to mount the touch trigger probe. The measurement performance is further improved by constructing the three-axis optical encoder in such a way that all three axes pass through the probe tip, thereby suppressing the Abbe error. The experimental results indicate that the micro-CMM has a working volume of (20mm)3 and a positioning accuracy of 0.12 μm. Furthermore, the pre-travel distance of the touch trigger probe in the X-Y plane is found to vary by no more than 96 nm, while that in the X-Z plane varies by no more than 44 nm.
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