

Sensing roughness and polish direction - DTU Orbit (09/11/2017)

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As a part of the work carried out in a project supported by the Danish Council for Technology and Innovation, we have investigated the option of smoothing standard CNC-machined surfaces. In the process of constructing optical prototypes, involving custom-designed optics, the development cost and time consumption can become prohibitive in a research budget. Machining the optical surfaces directly is expensive and time consuming. Alternatively, a more standardized and cheaper machining method can be used, calling for the object to be manually polished. During the polishing process, the operator needs information about the RMS-value of the surface roughness and the current direction of the scratches introduced by the polishing process. The RMS-value indicates to the operator how far he is from the final finish, and the scratch orientation is often specified by the customer in order to avoid complications during the casting process. In this work we present a method for measuring the RMS-values of the surface roughness while simultaneously determining the polishing direction. We are mainly interested in the RMS-values in the range from 0 – 100 nm, which corresponds to the finish categories of A1, A2 and A3 (Finishing guide, Bales). Based on simple intensity measurements, we estimate the RMS-value of the surface roughness, and by using a sectioned annularly shaped photo-detector to collect the scattered light, we can determine the direction of polishing and distinguish light scattered from random structures and light scattered from scratches.

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