Gouging Avoidance in Five-axis Tool Path Generation by a Simultaneous Change of Inclination and Screw Angle

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Abstract: Optimised five axis machining requires CAM algorithms where the tool orientation changes along the tool path track. Optimisation of the tool orientation results in maximal removal rate and minimal scallop height. Gouging avoidance is mostly done by moving the tool away from the work piece. This paper describes the development of a gouging avoidance algorithm by changing the tool orientation (inclination as well as screw angle). In order to know the effect of tool orientation changes, the simultaneous change of inclination and screw angle on the surface quality has been investigated. It is shown that an increase of the inclination angle results in a higher surface roughness, while an increase of the screw angle has the tendency to reduce the surface roughness. Fast changes of the tool orientation (mainly the inclination angle) result in surface deviations, mainly due to the dynamics of the machine tool. Based on the outcome of these experiments, a methodology for gouging avoidance has been implemented.

Keywords: Five-axis milling, surface quality, tool path generation, gouging avoidance