

An online surface topography simulation model for single-point diamond turning considering relative tool-workpiece vibration and swelling effect

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This paper presents an online simulation model for surface topography generation in single-point diamond turning process. During turning process, the relative tool-workpiece vibration in Z direction was monitored by acquiring the feedback position signal from the internal linear encoder, then a volumetric surface roughness model considering tool geometry, cutting parameters and relative vibration was developed. In addition, a deep learning model was adopted to account for the effects of plastic side flow and material spring back on the surface profile. By combining the two models above, an integrated online surface topography simulation model was constructed and its feasibility and prediction accuracy was verified by turning experiments. The modelling method presented in this work provided an important means for online surface quality monitoring in single-point diamond turning process.
