

عنوان مقاله:

Geometric Simulation of Surface Topography in Unstable Boring Process Using 3D ACIS Modeler

محل انتشار:

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خلاصه مقاله:

The topography of machined surfaces in deep boring operations, using high Length-to-Diameter (L:D) ratio boring bars, are primarily influenced by the undesirable periodic grooves that are generated due to the presence of high amplitude chatter vibrations. In this paper, a novel geometric simulation model is developed inside the environment of 3D ACIS modeler, which is a powerful Boundary Representation (B-rep) solid modeling software. The presented geometric model for simulation of boring operations includes the kinematics and dynamics of cutting process as well as the geometry of cutting insert. It accurately computes the removed chip area required for the calculation of dynamic cutting force during the chip formation process. The structural dynamics of boring bar and the resultant cutting coefficient of workpiece material are obtained by conducting experimental modal analysis tests and mechanistic identification experiments, respectively. The cutting experiment is performed at the vicinity of stability boundaries during unstable boring of Aluminum 6063-T6 workpiece by using a slender steel boring bar with L:D ratio of 8. The topography of workpiece surface is analyzed using the Scanning Electron Microscope (SEM) imaging method. It is also predicted by the developed geometric simulation model. The result of ACIS simulation is proved to be in good agreement with the experimental data obtained from surface imaging.

کلمات کلیدی:

Boring operations, Geometric simulation, 3D ACIS modeler, Surface topography, Chatter

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