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A manifold approach to generating iso-scallop trajectories in three-axis machining. (English)

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Summary: A novel approach of iso-scallop trajectory generation for smooth manifold surfaces has been developed. Firstly, by defining homeomorphism mapping relations and differentiable structures, the smooth manifold surface is mapped into several Euclidean planes, thus its trajectory generation can be decomposed into planar curve-filling tasks. Secondly, in the generation of direction-parallel trajectories, the calculation of the cutting interval and the curvature is given, depending on the generation of the first curve in the projection view. Thirdly, after automatic adherences of inverse projection curves, the filled curves are mapped into the original surface inversely to form trajectories. Although the required trajectories are iso-scallop, the trajectory intervals are variable according to the curvature changes at the projection point, which is advantageous to improving the trajectory quality. The proposed approach has appealing merits of dimensionality reduction, which decreases the algorithm complexity. Finally, numerical and machining examples are given to illustrate its feasibility and validity.

MSC:

70B15 Kinematics of mechanisms and robots

Keywords:

smooth manifold surface; iso-scallop trajectory; three-axis machining; homeomorphism mapping; regularity

Full Text: [DOI](#)

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