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多曲面岛屿五轴螺旋刀位轨迹规划

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Spiral Cutter Path Planning for 5-axis Machining of Multi-patch Island

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摘要 针对复杂拓扑关系的多曲面岛屿加工，以叶片阻尼台为研究对象，提出基于清根刀心轨迹的五轴球头刀螺旋刀位轨迹生成算法。首先建立局部坐标系，定义并确定中轴线，然后按层逐点创建投影射线，利用实体求交构造初始刀心螺旋轨迹；通过变步长迭代算法修正，使得刀心点距实体最短距离在加工精度范围内等于刀具半径。最后根据实体结构控制刀轴矢量，规划出无干涉的螺旋刀位轨迹。算例表明，本文算法统一了阻尼台加工与清根加工，避免了复杂偏置曲面片的构造，保证在加工过程中没有冗余进退刀的同时刀具不会过切叶身曲面，实现了阻尼台多曲面岛屿五轴球头刀高效精密加工。

关键词： 多曲面岛屿 铣刀 刀位轨迹 阻尼台 中轴线

Abstract： Aiming at 5-axis ball   end milling of multi-patch island with complex topology and regarding the snubber of blade as the research object, a novel spiral cutter path planning method based on the clean   up path is presented. Firstly, according to the model, the local coordinate is constructed and then the medial axis is defined. Secondly, using the intersection algorithm between the projection line and the solid, the initial spiral path of the tool center is generated. Then, the initial path is modified by the iterative calculation with the variable step, so that the shortest distance of the tool center from the solid becomes equivalent to the tool radius within the machining accuracy. Finally, the tool axis is controlled and then the gouging-free spiral cutter path unites the snubber machining and the clean-up machining is planned. Example and experiment show that the algorithm is feasible and the tool cannot gouge the blade surface without redundant cutter retraction.

Keywords： multi-patch island   milling cutters   cutter path planning   snubber   medial axis

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