机械科学

五轴联动数控加工的刀具路径优化方法研究

赵鹏1;**楼佩煌**1;**刘明灯**2;**胡荣华**1

1.南京航空航天大学,南京,210016
2.南京四开电子企业有限公司,南京,210007

摘要：
为解决五轴联动加工复杂曲面过程中的刀具路径不连续问题,提出了五轴数控的刀具路径优化方法。通过五轴NC代码的坐标变换还原有效切削路径,对切削路径进行误差约束下的非均匀有理B样条(NURBS)曲线拟合。对旋转轴路径采用五次样条曲线进行插值,建立切削路径和旋转轴路径的参数映射关系,通过机床逆运动变换求解C2连续的平动轴路径。实验表明,经过该方法优化后,切削路径和各驱动轴运动路径具有良好的平滑性,显著提高了五轴加工曲面精度和表面质量。

关键词：
数控;五轴加工;曲线拟合;刀具路径

Research on Tool Path Optimization Method for 5-axis CNC Machining

Zhao Peng1;Lou Peihuang1;Liu Mingdeng2;Hu Ronghua1

1.Nanjing University of Aeronautics and Astronautics,Nanjing,210016
2.Nanjing SKY electronics enterprise Co.,Ltd.,Nanjing,210007

Abstract:
A tool path optimization system for 5-axis machining was proposed to solve the tool path discontinuity problem in free-form spline machining.The NC codes
coordinate conversion was implemented to compute the relative cutting path curve between tool center and work piece.The cutting path optimization based on NURBS curve
fitting was proposed to resume contouring continuity.The quintic spline interpolation was
 implemented to smooth the rotary axes motion and synchronize its parameter to cutting path curve, C2 continuity linear axes motion path can be achieved by the inverse kinematics transformation.The experiments present that the contouring path and physical axes motion get
good smoothness to satisfy the high performance requirements in free-form surface
5-axis machining.

Keywords: CNC;5-axis machining;curve fitting;tool pathzz')" href="#"> CNC;5-axis machining;curve fitting;tool path

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