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### 基于网格化曲面的自适应自动铺放轨迹算法

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#### Algorithm of Adaptive Path Planning for Automated Placement on Meshed Surface

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摘要

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#### 摘要

基于轨迹的可铺放性要求分析了铺放过程中预浸料产生畸变的原因及影响轨迹可铺放性的因素。根据测地线定义构造了一种基于网格化曲面的测地线新算法,具有高效率、高精度等特点;在此基础上综合考虑预浸料的可铺放性和构件强度分布要求,提出了具有曲面自适应功能的铺放轨迹算法,可根据预浸料带宽计算得到铺放轨迹容许的最大测地曲率,并将其运用于铺放轨迹设计,使轨迹能够保证预浸料良好可铺放性的同时又满足构件的强度分布要求。最后通过数据库SQL Server和VC++针对某型号S型进气道进行铺放轨迹设计,在CATIA中将计算获取的离散轨迹点拟合成曲线并进行了实际的铺放试验,验证了测地线生成算法和铺放轨迹生成算法的正确性和有效性。

关键词: 复合材料 自动铺放 轨迹规划 网格化曲面 测地线

#### Abstract:

This paper analyzes the causes of prepreg distortion and discusses its influence for the requirement of trajectory placement ability. A new algorithm of geodesic generation based on meshed surfaces is proposed according to the definition of geodesic, which possesses features of efficiency and high accuracy, etc. Both the manufacturability of the prepreg and its distribution of strength in a product are considered in the algorithm of path planning, providing it with the ability of adapting to surfaces. The algorithm first figures out the maximum geodesic curvature allowed for the central path, and applies it to the design of trajectory. The trajectory obtained both has good ability of placement and can satisfy the demands of strength distribution in a product. Finally, the path planning aiming at one type of S-inlet with database of SQL Server and VC++ is carried out. The disperse trajectory points are then fitted to be a curve in CATIA to verify the validity and effectiveness of the algorithm of geodesic generation and trajectory placement generation.

Keywords: composite automated placement path planning meshed surface geodesic

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