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### 飞机复杂蒙皮拉形过程有限元分析中的接触搜索算法

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### Finite Element Contact Searching Algorithm of Complex Skin Stretch-Forming Processes

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摘要

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**摘要** 针对飞机复杂蒙皮拉伸成形特点,引入了适合于蒙皮模具的四节点四边形等参单元描述方式,建立了基于非精确交点的线面精确求交算法,采用基于最大梯度法的搜索算法,开发了复杂蒙皮拉形数值模拟系统STRETCHFORM。利用商业软件MARC和PAM STAMP进行了S形蒙皮拉形的模拟计算对比,证明了接触搜索算法的合理性。与全局搜索算法相比,本文算法使搜索效率得到显著提高。

**关键词:** 飞机蒙皮拉形 接触搜索 有限元分析 最大梯度法 四节点四边形单元

**Abstract:** To accomplish the simulation of complex aircraft skin forming processes, four-node quadrilateral isoparametric element model for tool description is derived according to the stretch-forming feature of skin. In order to increase the efficiency of contact and search calculation, maximum gradient search path and precise point of intersection solving method based on imprecise intersected iterative initial value are established. Algorithm is introduced into the finite element simulation system-STRETCHFORM which has been developed for complex skin stretch-forming processes, and simulation for "S" shape skin stretch-forming processes is carried out, it demonstrates the good precision and stability in comparing with the results of MARC and PAM-STAMP by using exactly the same model. By analyzing the time consuming, it shows that contact and search algorithm based on maximum gradient search path owns higher computation efficiency than that of global search one.

**Keywords:** aircraft skin stretch-forming contact and search finite element analysis maximum gradient search method four-node quadrilateral element

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