

## 对称结构Stewart机构位置正解的改进粒子群算法

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摘要: 根据杆长约束条件,建立了求6-DOF对称结构Stewart并联机器人机构位置正解的无约束优化模型。针对标准粒子群算法容易陷入局部极值、进化后期收敛速度慢等缺点,提出了一种基于差异度评价指标的改进粒子群算法——自适应变异粒子群算法。为克服随机算法不易求出并联机构全部位置正解的缺点,采用分层搜索自适应变异粒子群算法求并联机构位置正解中的优化问题。数值实例表明,对于对称结构Stewart并联机器人机构位置正解问题,改进粒子群算法能求出全部装配构型,且收敛速度较快、精度较高。 The unconstrained optimization model for the forward positional analysis of a 6-DOF symmetrical Stewart parallel manipulator, which based on the constrained length of the bars, was presented. The standard particle swarm optimization (SPSO) has some demerits, such as relapsing into local extremum and slow convergence velocity in the late evolutionary. The improved PSO, adaptive mutation PSO (AMPSO), based on the new difference index, were proposed to overcome the demerits of the SPSO. Aimed at all forward positional solutions of parallel mechanisms were hard to obtain, stochastic algorithms were used to solve these solutions. Directed towards this weakness, the hierarchical search adaptive mutation PSO (HSAMPSO) was adopted to make the optimal problem for forward positional analysis of parallel mechanisms. Numerical results for the forward position analysis of the symmetrical Stewart parallel manipulator showed that the HSAMPSO could solve all assembly configurations, and possess the performances of rather quick convergence speed and high precision.

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