

基于可操作性的串联机器人相对传动比优化Relative Proportion of Serial Robot Transmission Ratios Optimization Based on Manipulability

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关键词: 机器人 雅可比矩阵 可操作性 条件数 传动比

摘要: 将串联机器人各关节传动链传动比的确定分解为相对传动比确定和绝对传动比确定, 并从可操作性角度重点研究了前者。分析了条件数可操作性指标的实质, 把相对传动比的确定归结为基于驱动空间的可操作性优化; 给出了基于驱动空间全域可操作性的相对传动比优化模型; 提出了考虑各动力元件速度驱动能力差异和末端位姿速度作业要求的优化模型中雅可比矩阵的获得方法。在此基础上对所设计的6自由度机器人的传动系统进行了相对传动比优化, 提高了基于驱动空间的全域可操作性。Two steps are involved to determine transmission ratios of serial robot, i.e. relative proportion of transmission ratios determination and absolute transmission ratios determination, and the former is stressed from viewpoint of manipulability. Based on analyzing the essence of manipulability index related with condition number, the determination of relative proportion of transmission ratios was formulated as optimization of manipulability related to driving space. An optimization model on the basis of global manipulability related to driving space was given to determinate relative proportion of transmission ratios. A method to obtain Jacobi matrix in the optimization model was proposed with consideration of the difference of power elements' velocity driving capability and end effector' pose velocity of job requirement. At last, an optimization process was conducted to determine relative proportion of transmission ratios of a 6-DOF serial robot, and its global manipulability related to driving space was increased.

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