

4-PTT并联机构位置正解与工作空间分析

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关键词: 并联机构 位置分析 工作空间

摘要: 提出了一种能够实现空间三维平动和绕 Z 轴转动的4-PTT并联机构。运用解析几何中的坐标变换与投影理论, 求得了该机构位置反解的显式表达式, 给出了求解位置正解的方法, 并进行了数值验证; 采用极坐标搜索法确定了该并联机构的工作空间边界点, 并利用Matlab和LabVIEW软件编程, 分析了定姿态下工作空间的边界以及三维立体形状。研究表明该机构的工作空间具有边界光滑、体积大、无空洞以及截面形状规则等优点, 适用于工业装配机器人、虚拟轴并联机床、多维减震平台等领域。 An original 4-PTT parallel mechanism with three dimensional translations and rotational motion about Z axis was presented. Its positional inverse expressions were established using the conversion of coordinates and projection in analytic geometry, and the method of the forward solution of the mechanism and corresponding numerical examples were given. Subsequently, the workspace of standing pose was analyzed by programming with Matlab and LabVIEW. The analytical results indicate that the workspace of the 4-PTT parallel mechanism has advantages of smooth boundary, big volume, no cavity and regular cross section in the fields of industrial robots, micromanipulators, virtual axis machine tools, damping platform, rehabilitation robot and etc.

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