# 五面加工混联机床概念设计 Conceptual Design of a Novel Hybrid Machine Tool with Five-face Machining Capability

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关键词： 混联机床 3-PRS主轴部件 X-Y并联驱动平台 五面加工

摘 要： 提出一种五面加工的六轴混联机床的设计方案。以典型刀具和工件加工时的相对运动要求为输入，得到刀具和工件的位姿关系矩阵，用机床的串并联运动功能模型实现了刀具和工件的位姿关系。六轴混联方案中，主轴部件一侧采用可实现Z轴移动和A及B摆动轴进给的少自由度3-PRS并联机构，工作台一侧采用X-Y并联驱动和C轴数控转台的串联机构。安装在3-PRS并联机构动平台上的主轴部件通过倾斜布局、合理构件（组件）设计使刀具的摆动范围达到了±45°；并对3-PRS并联机构进行了运动、刚度和工作空间分析。分析了X-Y并联平台与X轴滑台和Y轴滑台之间4条导轨副的受力状态。 A conceptual design of a novel six-axis hybrid machine tool with five-face machining capability was proposed. Based on the relative motions between the typical cutter and workpiece, the transformation matrix between the cutter and the workpiece was obtained. The transformation matrix was realized by the hybrid kinematics model of the machine tool. In this conceptual design, the few degree-of-freedom 3-PRS parallel mechanism was adopted at the spindle component to realize the linear Z-axis motions and rotary A and B-axis swinging motions, and the X-Y parallel driven mechanism and the C-axis NC rotation workbench were employed at the worktable side. The spindle component driven by 3-PRS parallel mechanism has the capability to swing ±45° by lean layout and designing component reasonably. The kinematics, rigidity and the workspace of the 3-PRS parallel mechanism were analyzed. Also the force bearing of the X-Y parallel platform and the 4 guides of the X- and Y-axis sliding tables was investigated.

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