Optimum Seeking of Redundant Actuators for M-RCM 3-UPU Parallel Mechanism

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Abstract

This paper focuses on a 2R1T 3-UPU (U for universal joint and P for prismatic joint) parallel mechanism (PM) with two rotational and one translational (2R1T) degrees of freedom (DOFs) and the ability of multiple remote centers of motion (M-RCM). The singularity analysis based on the indexes of motion/force transmissibility and constraint shows that this PM has transmission singularity, constraint singularity, mixed singularity and limb singularity. To solve these singular problems, the quantifiable redundancy transmission index (RTI) and the redundancy constraint index (RCI) are proposed for optimum seeking of redundant actuators for this PM. Then the appropriate redundant actuators are selected and the working scheme for redundant actuators near the corresponding singular configuration are given to help the PM go through the singularity.

Full Text

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