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Approach in the Integrated Structure–Control Optimization of a 3RRR Parallel Robot

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Abstract

In this paper, an optimization methodology for the structure and control optimization of a 3RRR planar parallel robot is presented. The proposal consists of three stages in cascade: firstly, we optimize the geometry for a maximum workspace. Secondly, the kinematics is used to optimize dexterity for a set of desired paths inside the workspace that is found in the first stage, and, finally, a set of dynamic control gains are optimized for trajectories given by the same paths. The methodology permits to reduce the computational cost for the geometry optimization stages, while optimizing the control gains using high precision numerical simulation using SimWise 4D commercial software, with a reduced number of evaluations of candidate solutions, and as consequence, a reduced computational time. The results demonstrate that the final structure–control optimized design accurately follows the desired trajectories.

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