Identification of Configuration Space Singularities with Local Real Algebraic Geometry

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Abstract : We address the question of identifying the configuration space singularities of linkages, i.e., points where the configuration space is not locally a submanifold of Euclidean space. Because the configuration space cannot be smoothly parameterized at such points, these singularity types have a significantly negative impact on the kinematics of the linkage. It is known that Jacobian methods do not provide sufficient conditions for the existence of CS-singularities. Herein, we present several additional algebraic criteria that provide the sufficient conditions. Further, we use those criteria to analyze certain classes of planar linkages. These examples will also show how the presented criteria can be checked using algorithmic methods.

Keywords : linkages, configuration space-singularities, real algebraic geometry, analytic geometry
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