Spatial Mechanism Analysis and Synthesis by Dual Special Unitary Matrices

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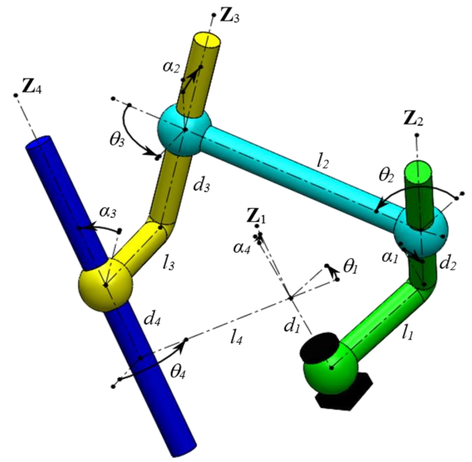
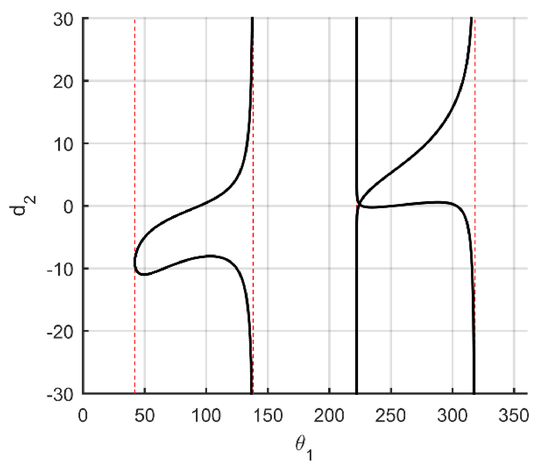
Introduction

The goal of this work is to formulate spatial mechanism analysis and design problems via a method suited to employ the tools of numerical algebraic geometry. This work illustrates their use by analyzing the spatial RCCC and RRRCC linkages. The specialization to pure rotations using special unitary matrices is also presented and used in the analysis of the spherical four-bar and Watt I linkages. The motion curves generated in this work are validated by comparison to other published work.

RCCC Linkage

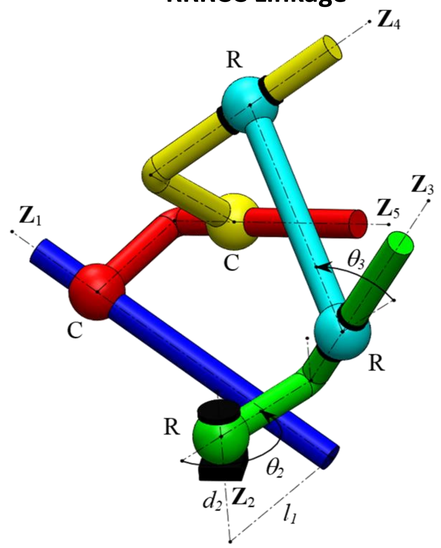


RCCC linkage schematic diagram

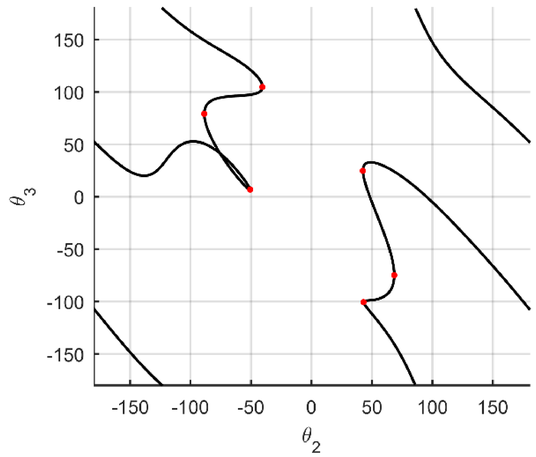


Motion curve for RCCC projected onto θ_1-d_2

RRRCC Linkage

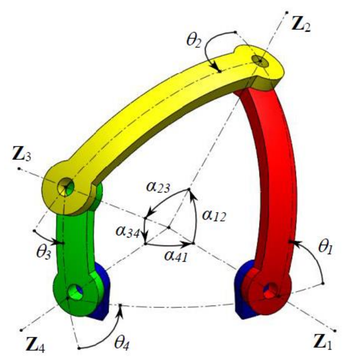


RRRCC schematic diagram

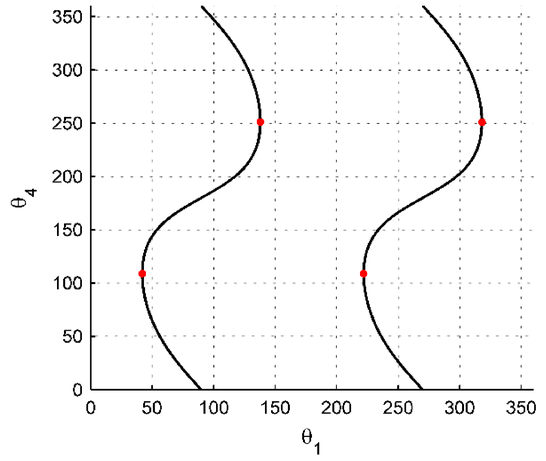


Motion curve for the RRRCC projected onto θ_2-θ_3

Spherical Four-Bar Linkage

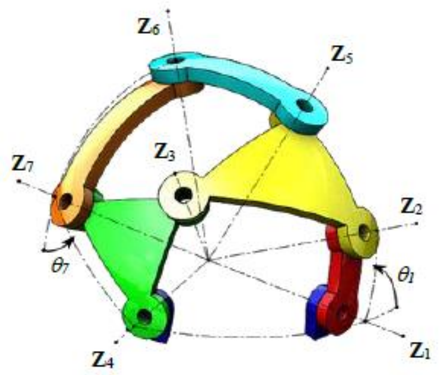


Spherical four-bar linkage schematic diagram

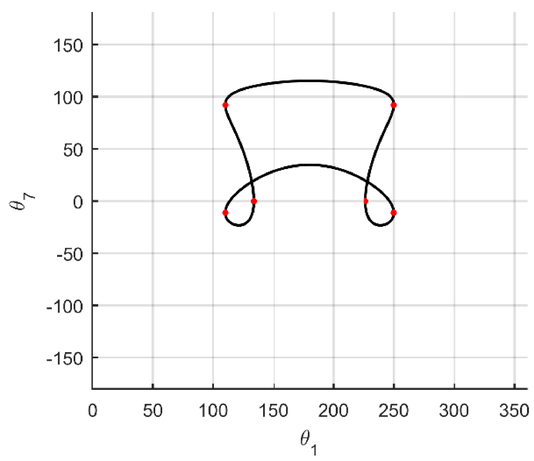


Motion curve for spherical four-bar projected onto θ_1-θ_4

Spherical Watt I Linkage



Spherical Watt I linkage schematic diagram



Motion curve for spherical Watt I projected onto θ_1-θ_7