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On Least Squares-Based Motion Generation of Adjustable Spherical Mechanisms

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ABSTRACT

With conventional motion generation methods, the number of rigid-body poses the user can prescribe (and subsequently, the number of rigid-body poses the synthesized mechanism can achieve) is limited to the number of mechanism dyad unknowns to be calculated. This presentation will review a motion generation method that incorporates the method of least squares "best fit" criteria for multi-phase motion generation of spherical mechanisms.

The primary advantage of least squares-based motion generation is that the user can synthesize mechanisms to approximate substantially more rigid-body poses than mechanism dyad unknowns. The examples in this presentation demonstrate the synthesis of adjustable spherical mechanisms to approximate three times the number of prescribed rigid-body poses than with a conventional motion generation method for a comparable problem.

- Spherical Mechanisms Introduction
- Motion and Multi-Phase Generation Introduction
- Conventional Spherical Motion Generation
- Least Squares Based Spherical Motion Generation
- Examples
- Extension of Least Squares Motion Generation Method

BIOGRAPHY

Dr. Kevin Russell holds undergraduate and graduate degrees in mechanical engineering from NJIT. Dr. Russell is a senior analyst in the Small and Medium Caliber Weapon Systems Division of the U.S. Army Research, Development and Engineering Center (ARDEC) at Picatinny, New Jersey and has experience in explicit numerical modeling. At ARDEC his is primarily responsible for the development of dynamic numerical models for the design, fabrication and analysis of weapon systems and weapon system phenomena.

Dr. Russell is also an adjunct professor of mechanical engineering at NJIT and has published extensively in the areas of mechanism kinematics and synthesis in such journals as *Mechanism and Machine Theory, Journal of Mechanical Design, JSME International Journal, CSME Transactions and Mechanics Based Design of Structures and Machines.*