MECHANICAL & INDUSTRIAL COLLOQUIUM

Fall 2011 SEMESTER: ME 794-001

Wednesday, September 14, 2011
1:00-2:25pm
MEC 224

Jerry D'Alessio II

Kinematic Synthesis of a Four Bar Spatial Mechanism and Resulting Cam Profile to replicate Knee Motion

The human knee is a complex mechanism consisting of bones, ligaments and other soft tissues that work in concert to provide for the stability and motion required to perform activities of normal living. Although kinematic analysis of the knee has been previously described utilizing planar mechanisms such as a four bar linkage to describe the motion and intracondyalr ligament interactions, it has been little attention utilizing spatial mechanisms to replicate this motion. These studies have shown that when the motion is analyzed utilizing radiographs which obtain planar pictures of the bones, the planar four bar replicates the motion and instant centers of rotation well; however, can not account for the rotations and translation occurring in actuality. The objective of this initial investigation was to determine if a spatial mechanism, specifically a four bar RRSS mechanism could be synthesized to achieve the motion of the human knee during normal gait. Further, by using previously established techniques to generate a cam pair that replicates the RRSS motion, there utility towards prosthetic design was analyzed.

Jerry D'Alessio received his BS (1993) in Mechanical Engineering and MS (1995) in Biomedical Engineering from New Jersey Institute of Technology. Upon graduation, he joined Endotec Inc, an Orthopaedic implant R&D company where he worked on the design and analysis of artificial joints for the hip, knee, shoulder, finger, ankle and tempormandibular joint. In January of 2000, he assumed additional responsibilities and was appointed as Assistant Research Director to Biomedical Engineering Trust whose purpose was studying the results of the prosthetic designs both clinically and in the laboratory. In March of 2003, he accepted a position with Stryker Orthopaedics and has held varying roles. He currently is Director of Advanced Engineering for the Global Research & Development Knee Reconstruction and Biomaterials, providing analysis and technical support in the design of prosthetic knee components. Currently he is a PhD candidate in the Department of Mechanical Engineering at New Jersey Institute of Technology.

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