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Topic of Research: A Computational Approach for the Modeling of Planar Multiple Jointed Kinematic chain and Mechanisms

FINDINGS

Keywords: Isomorphism, Distinct Mechanisms, Kinematic chains, Kinematic graphs, Modified adjacency weighted matrix

In present work, graph theoretic approach is adopted in the modeling of kinematic chains and mechanisms. In a kinematic graph, vertices designate the links and edges signify the joints. The edges of the kinematic graphs are provided with a weight of joint value. Now, the sum of all weighted edges assigned with joint values of the kinematic graph is equal to the number of joints existed in kinematic chain. Then the Modified adjacency weighted matrix [MAW] is developed.

If the corresponding row and column elements of [MAW] are changed to zero, the n-[MAW] matrices will be obtained for n-mechanisms. Using MATLAB, the Characteristic Polynomial Coefficients of these [MAW] matrices pertaining to Kinematic chains and Mechanisms can be obtained. These Polynomial Coefficients serve as an identification code for determining the existence of isomorphism among kinematic chains. Also, it will remain identical for equivalent Mechanisms while being diverse for Distinct Mechanisms.

The methodology of isomorphism detection has been applied for identifying 134 Distinct Multiple Jointed Kinematic Chains, derived from 176 possible assortments of

1F, 8 links, 10- joint 16 Base kinematic chains. The results are validated and represented in the tabular form. The total number of distinct mechanisms derived from the family of 8-link, 10-joint multiple kinematic chains are 964, given also in the tabular form. Thus, an efficient methodology is followed for detecting isomorphism and deriving distinct mechanisms from multiple jointed Kinematic Chains.