Finding overconstrained mechanisms via fiber products

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Abstract: An overconstrained mechanism moves with more degrees of freedom than expected based on the Gruebler-Kutzbach mobility criterion. Viewed as spatial mechanisms, planar and spherical mechanisms are overconstrained, but so-called "paradoxical mechanisms" also exist and can be useful. When the kinematic closure conditions of a mechanism are formulated as a system of polynomial equations in terms of motion variables and link parameters, the search for overconstrained mechanisms is equivalent to finding algebraic sets of exceptional dimension. This talk will explain how a construct from algebraic geometry called a fiber product promotes exceptional sets to become irreducible solution components making them computable using the tools of numerical algebraic geometry.