1089-65-183 **Dan Bates*** (bates@math.colostate.edu), **Eric Hanson** (hanson@math.colostate.edu), **Jon Hauenstein** (hauenstein@ncsu.edu) and **Charles Wampler** (charles.w.wampler@gm.com).

Searching for exceptional mechanisms via fiber products. Preliminary report.

Kinematicians find value in special mechanisms (e.g., robotic arms) that have more degrees of freedom than general mechanisms of the same type. We refer to these as exceptional mechanisms. There are very few known exceptional mechanisms, and there are currently no general methods for locating them within their respective mechanism types. Schreyer and others have had success with techniques that sometimes produce examples, but it would be useful to have a general method.

In this talk, I will introduce some new techniques coming from numerical algebraic geometry to produce an efficient, general algorithm for finding such exceptional sets. I will outline our method, touching briefly on the basics of numerical algebraic geometry, homotopies for fiber products, and recent methods for numerical irreducible component intersection.

In fact, this problem is of more general interest than stated above. Our algorithm finds parameter values for which a parameterized family of polynomial systems has solution sets of dimension higher than those at general points in the parameter space. As a simple example, our method finds the unique parameter values (a, b, c) so that the equation $ax^2 + bx + c = 0$ has a positive-dimensional solution set. (Received February 14, 2013)