WENDY FINBOW-SINGH, Saint Mary's University

Constructing Generically Rigid Frameworks

The combinatorial characterization of general graphs that can be realized in 3-space as isostatic (rigid and independent) bar and joint frameworks is a major unsolved problem in rigidity theory. In the absence of a general characterization, it is interesting to investigate certain classes of graphs and confirm the rigidity and independence of almost all realizations of this graph in 3-space (generic rigidity), something that follows from the existence of even one isostatic realization.

Cauchy, Dehn, and Alexandrov proved that arbitrary convex triangulated spheres are isostatic, and therefore any realization of these 3-connected planar graphs $G=(V,E)$, with $|E|=3|V|-6$, at generic positions of the vertices are also isostatic. Finbow and Whiteley provided another class, the class of 3-dimensional isostatic frameworks, the block and hole polyhedra, along with methods to verify generic rigidity that can be extended to other classes. These methods are based on tracking when a larger framework can be derived from a known small example using vertex splitting, an operation known to take a minimally generically rigid framework to a new minimally generically rigid framework with one more vertex.

There is another technique for adding a vertex to a rigid structure that preserves isostatic rigidity; spider splitting. In this talk we will present some preliminary results regarding the relationship between vertex-splitting and spider-splitting.