WALTER WHITELEY, York University

Global Rigidity I: Coning

When an embedding of a graph in Euclidean space is congruent to any other embedding with the same edge lengths, we say it is globally rigid. How do you tell? One way is to assume that the configuration is generic, which means that the coordinates of the configuration are algebraically independent over the rationals. There is a matrix, the stress matrix, such that when it has maximal rank, it implies that the graph is generically globally rigid. We will present a summary of some recent results, joint with Bob Connelly, on transferring the generic global rigidity of a graph G between a Euclidean space of dimension d and the cone of the graph in dimension $d + 1$. Key to the new proof is the fact that coning keeps the stress matrix at maximum rank—which is generically, necessary and sufficient for global rigidity of the underlying graph. This result also demonstrates that generic global rigidity of a graph transfers between Euclidean and spherical metrics.

However, geometrically, coning may take a globally rigid framework $G(p)$ to one that is not globally rigid, or take a framework that is not globally rigid to one that is. We briefly indicate a set of examples and counter-examples that arise in basic discussions of global rigidity.

A related preprint is available at: `http://www.math.cornell.edu/~connelly/GlobalTechniquesConing-09V2.pdf`.