BRACED SPHERE TRIANGULATIONS AND RIGIDITY

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A simple graph $G = (V, E)$ is d-rigid if it can be realised as a rigid bar-and-joint framework in d-dimensional Euclidean space. It is minimally d-rigid if it has the additional property that the removal of any edge destroys d-rigidity. The 1-rigid graphs are precisely the connected graphs and the 2-rigid graphs have been characterised in purely combinatorial terms by Geiringer (and independently by Laman). The d-rigid graphs, for $d > 2$, remain elusive (this is a longstanding open problem) but there are partial results. For example, it is well known that surface triangulations are always 3-rigid, and sphere triangulations in particular are minimally 3-rigid.

In 2012, with Stephen Power, we initiated the study of graph rigidity in other normed spaces, beginning with the ℓ^p-plane. An intriguing prospect is that such spaces could lead to purely combinatorial characterisations of rigidity in all dimensions, albeit with non-Euclidean distance constraints. In this talk we will survey some of this work. In particular, we will present a new result which shows that doubly braced sphere triangulations are minimally rigid for a class of 3-dimensional mixed norms. This is joint work with James Cruickshank, Eleftherios Kastis and Bernd Schulze.