Generating Cyclically 4-Connected Cubic Graphs

S. R. Kingan*, Brooklyn College and the Graduate Center, CUNY
R. J. Kingan, Bloomberg, LLP

A 3-connected cubic graph is *cyclically* 4*-connected* if it has at least $n \geq 8$ vertices and when removal of a set of three edges results in a disconnected graph, only one component has cycles. By introducing the notion of cycle spread to quantify the distance between pairs of edges, we get a new characterization of cyclically 4-connected graphs. Let Q_n and V_n denote the ladder and Möbius ladder on $n \geq 8$ vertices, respectively. We proved that a 3-connected cubic graph G is cyclically 4-connected if and only if G is either the Petersen graph, Q_n or V_n for $n \geq 8$, or G is obtained from Q_8 or Q_{10} by bridging pairs of edges with cycle spread at least $(1, 2)$. The focus in this talk is the algorithmic nature of the results. The concept of cycle spread naturally leads to methods for constructing cyclically k-connected cubic graphs from smaller ones. We implemented an algorithm based on these results using McKay's nauty system for isomorphism checking.

Keywords: cubic graphs, cyclically 4-connected graphs, graph generation