Student Research Talks (StReeTs)

Mason Experimental Geometry Lab (MEGL)

Coloring Squares of Planar Graphs with no 4-cycles and no 5-cycles

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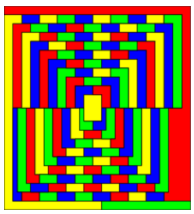

Abstract

The famous Four Color Theorem states that any planar graph can be properly colored using at most four colors. However, if we want to properly color the square of a planar graph (or alternately, color the graph using distinct colors on vertices at distance up to two from each other), we will always require at least $\Delta + 1$ colors, where Δ is the maximum degree in the graph. For all Δ, Wegner constructed planar graphs (even without 3-cycles) that require about $\frac{3}{2}\Delta$ colors for such a coloring.

To prove a stronger upper bound, we consider only planar graphs that contain no 4-cycles and no 5-cycles (but which may contain 3-cycles). Zhu, Lu, Wang, and Chen showed that for a graph G in this class with $\Delta \geq 9$, we can color G^2 using no more than $\Delta + 5$ colors. We improve this result, showing that for the same class of graphs, as long as Δ is sufficiently high, at most $\Delta + 3$ colors are needed. Our approach uses the discharging method, and the result extends to list-coloring and other related coloring concepts as well. This is joint work with Dan Cranston.

Date: Friday, October 27, 2017
Time: 2:30pm–3:30pm
Place: Exploratory Hall 4106

Pizza and soda will be served at the presentation.

For further information or for special accommodations, please contact Sean Lawton via email at `seanlawton@gmail.com` or drop by the MEGL.