VCU Discrete Mathematics Seminar

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

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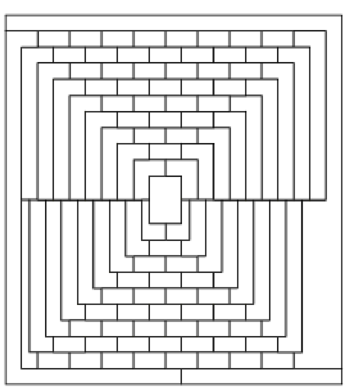
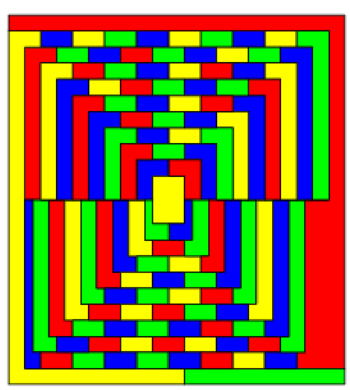
VCU!

Tuesday, April 14
12:30–1:20
4145 Harris Hall

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 alternatively, 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 $\Delta \geqslant 9$, 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.





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