Squares of subcubic planar graphs without cycles of length 4–8 are 6-choosable

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Abstract:

The *square* of a graph G, denoted G^2, has the same vertex set as G and an edge between any two vertices at distance at most 2 in G. Wegner (1977) conjectured that for a planar graph G, $\chi(G^2) \leq 7$ if $\Delta(G) = 3$, $\chi(G^2) \leq \Delta(G) + 5$ if $4 \leq \Delta(G) \leq 7$, and $\chi(G^2) \leq \lfloor 3\Delta(G)/2 \rfloor$ if $\Delta(G) \geq 8$, and Thomassen (2018) confirmed the conjecture for $\Delta(G) = 3$. Dvořák et al. (2008) and Feder et al. (2021) further conjectured that $\chi(G^2) \leq 6$ for cubic bipartite planar graphs. A natural question is whether this bound also holds for the list-chromatic number, i.e., whether $\chi_\ell(G^2) \leq 6$ for such graphs. More generally, it is of interest to determine sufficient conditions ensuring $\chi_\ell(G^2) \leq 6$ for subcubic planar graphs. In this paper, we prove that $\chi_\ell(G^2) \leq 6$ for subcubic planar graphs containing no k-cycles for $4 \leq k \leq 8$, improving a result of Cranston and Kim (2008). This is joint work with Rong Luo (West Virginia University).