Combinatorics Seminar

Dynamic coloring and list dynamic coloring of planar graphs

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Abstract: A *dynamic coloring* of a graph G is a proper coloring of the vertex set $V(G)$ such that for each vertex of degree at least 2, its neighbors receive at least two distinct colors. A dynamic k-coloring of a graph is a dynamic coloring with k colors. Note that the gap $\chi_d(G) - \chi(G)$ could be arbitrarily large for some graphs. An interesting problem is to study which graphs have small values of $\chi_d(G) - \chi(G)$.

One of the most interesting problems about dynamic chromatic numbers is to find upper bounds of $\chi_d(G)$ for planar graphs G. Lin and Zhao (2010) and Fan, Lai, and Chen (recently) showed that for every planar graph G, we have $\chi_d(G) \leq 5$, and it was conjectured that $\chi_d(G) \leq 4$ if G is a planar graph other than C_5. (Note that $\chi_d(C_5) = 5$.)

As a partial answer, Meng, Miao, Su, and Li (2006) showed that the dynamic chromatic number of Pseudo-Halin graphs, which are planar graphs, are at most 4, and Kim and Park (2011) showed that $\chi_d(G) \leq 4$ if G is a planar graph with girth at least 7.

In this talk we settle the above conjecture that $\chi_d(G) \leq 4$ if G is a planar graph other than C_5. We also study the corresponding list coloring called a *list dynamic coloring*. This is joint work with Seog-Jin Kim and Won-Jin Park.

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