Akbari, Saieed; Mirrokni, Vahab S.; Sadjad, Bashir S.
A relation between choosability and uniquely list colorability. (English) Zbl 1100.05032

A list assignment $L$ of a graph $G$ is a function that assigns a set of colors to each vertex of $G$. Graph $G$ is (uniquely) $L$-colorable if there is at least (exactly) one function that assigns to each vertex $v$ of $G$ a color from $L(v)$ such that any two adjacent vertices are assigned distinct colors. The definitions of an edge-list assignment and a uniquely $L$-edge-colorable graph are analogous.

The main result of this paper says that if $G$ is a uniquely $L$-colorable graph with $n$ vertices and $m$ edges such that the sum of $|L(v)|$ over all vertices $v$ of $G$ equals $n + m$, then $G$ is also $L'$-colorable for any list assignment $L'$ satisfying $|L'(v)| = |L(v)|$ for each vertex $v$ of $G$.

The proof is based on an algebraic technique developed by N. Alon and M. Tarsi [Combinatorica 12, No. 2, 125–134 (1992; Zbl 0756.05049)]. As a corollary, it is shown that if a connected non-regular multigraph with an edge-list assignment $L$ satisfies $L(\{u, v\}) = \max\{d(u), d(v)\}$ for each edge $\{u, v\}$, then it is not uniquely $L$-edge-colorable. The authors conjecture that this result holds also for any regular graph $G$ of degree at least two and verify it in the case that $G$ is bipartite.

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References:

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