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Local irregularity of k-multigraphs

A locally irregular graph is a graph in which every pair of adjacent vertices has different degrees. A locally irregular coloring of a graph G is an edge coloring in which each color class induces a locally irregular subgraph.

The definition of locally irregular multigraphs is analogous to the definition of locally irregular graphs. An edge coloring of G is called locally irregular if each color class induces a locally irregular submultigraph. The locally irregular chromatic index $\mathrm{lir}(G)$ is the smallest number of colors needed for a locally irregular coloring of G. A k-multigraph is a multigraph obtained from a graph G by replacing each edge of G with k parallel edges and is denoted by ${}^kG$.

In [2], Grzelec and Woźniak proposed the Local Irregularity Conjecture for 2-multigraphs, which was generalized for other k-multigraphs in the following way in [1].

Conjecture (Local Irregularity Conjecture for k-multigraphs [1]) For every connected graph $G \neq K_2$ and every integer $k > 1$, the k-multigraph ${}^kG$, obtained from G by replacing each edge with k parallel edges, satisfies $\mathrm{lir}({}^kG) \leq 2$.

This is joint work with Igor Grzelec, and Alfréd Onderko.

References

[1] I. Grzelec, A. Onderko, M. Woźniak, *On local irregularity conjecture for* 2*-multigraphs*, Applied Mathematics and Computation 514, 2026, 129832.

[2] I. Grzelec, M. Woźniak, *On decomposing multigraphs into locally irregular submultigraphs*, Applied Mathematics and Computation 452, 2023, 128049.