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Distant sum distinguishing index of graphs with bounded minimum degree

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Abstract

For any graph $G = (V, E)$ with maximum degree Δ and without isolated edges, and a positive integer r, by $\chi'_{\Sigma,r}(G)$ we denote the r-distant sum distinguishing index of G. This is the least integer k for which a proper edge colouring $c\colon E \to \{1, 2, \ldots, k\}$ exists such that $\sum_{e\ni u} c(e) \neq \sum_{e\ni v} c(e)$ for every pair of distinct vertices u, v at distance at most r in G. It was conjectured that $\chi'_{\Sigma,r}(G) \leq (1 + o(1))\Delta^{r-1}$ for every $r \geq 3$. Thus far it has been in particular proved that $\chi'_{\Sigma,r}(G) \leq 6\Delta^{r-1}$ if $r \geq 4$. Combining probabilistic and constructive approach, we show that this can be improved to $\chi'_{\Sigma,r}(G) \leq (4 + o(1))\Delta^{r-1}$ if the minimum degree of G equals at least $\ln^8 \Delta$.

Keywords: Distant sum distinguishing index of a graph, neighbour sum distinguishing index, adjacent strong chromatic index, distant set distinguishing index.

Math. Subj. Class.: 05C15, 05C78

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Razlikovalni indeks oddaljenih vsot grafov z omejeno minimalno stopnjo

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Povzetek

Za poljuben graf $G = (V, E)$ z maksimalno stopnjo Δ in brez izoliranih povezav ter za poljubno pozitivno celo število r označimo s $\chi'_{\Sigma,r}(G)$ razlikovalni indeks r-oddaljenih vsot grafa G. To je najmanjše celo število k, za katerega obstaja takšno pravilno barvanje povezav $c\colon E \to \{1, 2, \ldots, k\}$, da velja $\sum_{e\ni u} c(e) \neq \sum_{e\ni v} c(e)$ za vsak par različnih vozlišč u, v na razdalji največ r v G. Postavljena je bila domneva, da velja $\chi'_{\Sigma,r}(G) \leq (1 + o(1))\Delta^{r-1}$ za vsak $r \geq 3$. Doslej je bilo dokazano, da velja $\chi'_{\Sigma,r}(G) \leq 6\Delta^{r-1}$, če je $r \geq 4$. S povezovanjem verjetnostnega in konstruktivnega pristopa pokažemo, da lahko to izboljšamo na $\chi'_{\Sigma,r}(G) \leq (4+o(1))\Delta^{r-1}$, če je minimalna stopnja grafa G enaka najmanj $\ln^8 \Delta$.

Ključne besede: Razlikovalni indeks oddaljenih vsot, razlikovalni indeks sosednjih vsot, sosedni krepki kromatični indeks, razlikovalni indeks oddaljenih množic.

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