Extremal values in graphs for metric-locating-dominating partitions

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Abstract

Let $G = (V, E)$ a graph of order n. Let $\Pi = \{S_1, \ldots, S_k\}$ be a partition of V. We denote by $r(u|\Pi)$ the vector of distances between a vertex $v \in V$ and the elements of Π, that is, $r(v|\Pi) = (d(v, S_1), \ldots, d(v, S_k))$.

The partition Π *dominates* G if, for every $i \in \{1, \ldots, k\}$ and for every vertex $v \in S_i$, $d(v, S_j) = 1$, for some $j \neq i$. The *partition domination number* $\gamma_p(G)$ equals the minimum cardinality of a dominating partition in G.

The partition Π is called a *locating partition* of G if, for any pair of distinct vertices $u, v \in V$, $r(u, \Pi) \neq r(v, \Pi)$. The *partition dimension* $\beta_p(G)$ of G is the minimum cardinality of a locating partition of G.

The partition Π is called a *metric-locating-dominating partition* of G if it is both dominating and locating. The *partition metric-location-domination number* $\eta_p(G)$ of G is the minimum cardinality of a metric-locating-dominating partition of G.

The partition Π is called a *neighbor-locating-dominating partition* of G if, for every $i \in \{1, \ldots, k\}$ and for every pair of distinct vertices $v, w \in S_i$, there exists $j \in \{1, 2, \ldots, k\}$ such that $d(v, S_j) = 1$ and $d(w, S_j) > 1$. The *partition neighbor-location-domination number* $\lambda_p(G)$ of G is the minimum cardinality of a neighbor-locating-dominating partition of G.

Parameters η_p and λ_p have been introduced and studied in [3]. Among other results, we have obtained tight bounds for these parameters in terms of the order of the graph and we have characterized all graphs attaining them. Furthermore, we have generalized for these two parameters some well-known properties in other related parameters, with the approach given in [1,2].

References:

[1] J. Cáceres, C. Hernando, M. Mora, I. M. Pelayo, M. L. Puertas, Locating-dominating codes: Bounds and extremal cardinalities, *Applied Mathematics and Computation* **220** (2013) 38–45.

[2] C. Hernando, M. Mora and I. M. Pelayo, Nordhaus-Gaddum bounds for locating domination, *European Journal of Combinatorics* **36** (2014) 1-6.

[3] C. Hernando, M. Mora and I. M. Pelayo, Extremal values for metric-locating-dominating partition in graphs, preprint.