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Some Properties of (1,2)-Dominating and Proper (1,2)-Dominating Sets in Graphs

Let $k \geq 1$ be an integer. A subset $D \subset V(G)$ is $(1,k)$-dominating if for every vertex $v \in V(G) \setminus D$ there are $u, w \in D$ such that $uv \in E(G)$ and $d_G(v,w) \leq k$. If $k = 1$ then we obtain the definition of $(1,1)$-dominating sets, which are also known as 2-dominating sets. If $k = 2$ then we have the concept of $(1,2)$-dominating sets, see [1]. A *proper* $(1,2)$*-dominating set* is a $(1,2)$-dominating set which is not $(1,1)$-dominating, see [3]. Although $(1,1)$-dominating sets and proper $(1,2)$-dominating sets cannot be equal, they do not have to be disjoint. Therefore, it is natural to ask what is the minimum possible number of vertices in the intersection of such sets in a given graph. This is why in [2] the $(1,\overline{2})$*-intersection index* of a graph was defined as the minimum cardinality of the intersection of a $(1,1)$-dominating set and a proper $(1,2)$-dominating set.

In the talk we present some relations between dominating sets, $(1,2)$-dominating sets and proper $(1,2)$-dominating sets, focusing mainly on a minimum cardinality of such sets in a given graph. Moreover, we give some results concerning the $(1,\overline{2})$-intersection index in some classes of graphs.

This is joint work with Anna Kosiorowska and Iwona Włoch.

References

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[3] A. Michalski, I. Włoch, M. Dettlaff, M. Lemańska, *On proper* $(1,2)$*-dominating sets in graphs*, Mathematical Models in the Applied Sciences 45(11), 2022, pp. 7050–7057.