

[1, 2]-dimension of graphs

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Abstract

Let G be a connected graph with vertex set V , where the distance between two vertices is the length of a shortest path between them. A set $S \subseteq V$ is $[1, 2]$ -resolving if each vertex of G is at most distance-two away from a vertex in S and, given a pair of distinct vertices not in S , either there is a vertex in S adjacent to exactly one member of the given pair, or there are two vertices in S each of which is distance-two from exactly one member of the given pair. The $[1, 2]$ -dimension of G is the minimum cardinality of a $[1, 2]$ -resolving set of G . In this paper, we study the $[1, 2]$ -dimension of graphs by proving that the $[1, 2]$ -dimension problem is an NP-complete problem, and determine the $[1, 2]$ -dimension of some classes of graphs, such as paths, cycles, and full k -ary trees. We also introduce a generalization of metric dimension of which the (original) metric dimension and the $[1, 2]$ -dimension, as well as other metric dimension variants in the literature, are special instances.

Keywords: $[1, 2]$ -resolving set, $[1, 2]$ -basis, $[1, 2]$ -dimension, NP-complete, full k -ary tree.