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On the Carathéodory and exchange numbers of geodetic convexity in graphs ☆

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Abstract

A set of vertices S of a graph G is *geodesically convex* if for every pair of vertices of S, all vertices of all shortest paths joining them also lie in S. The *geodetic convex hull of* S, denoted by $\langle S\rangle$, is the minimum geodesically convex set of G containing S. We say that S is *Carathéodory independent* if $\langle S\rangle \setminus (\bigcup_{a\in S}\langle S\setminus\{a\}\rangle)\neq\emptyset$ and that S is *exchange independent* if $|S|=1$ or there is $p\in S$ such that $\langle S\setminus\{p\}\rangle\setminus\bigcup_{a\in S\setminus\{p\}}\langle S\setminus\{a\}\rangle\neq\emptyset$. The *Carathéodory number* (*exchange number*) of G is the cardinality of a maximum Carathéodory (exchange) independent set. In this paper, we show that deciding whether a given graph has exchange number at most k is an NP-complete problem. We also present characterizations of the Carathéodory and exchange numbers for some graph classes, like unit interval graphs and powers of cycles, which allow us to determine these parameters in polynomial time.

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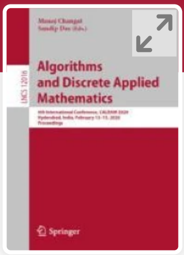

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Δ-Convexity Number and Δ-Number of Graphs and Graph Products

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Abstract

The Δ-interval of $u, v \in V(G)$, $I_\Delta(u, v)$, is the set formed by *u*, *v* and every *w* in *V*(*G*) such that $\{u, v, w\}$ is a triangle (K_3) of *G*. A set *S* of vertices such that $I_\Delta(S) = V(G)$ is called a Δ-set. Δ-number is the minimum cardinality of a Δ-set. Δ-graph is a graph with all the vertices lie on some triangles. If a block graph is a Δ-graph, then we say that it is a block Δ-graph. A set $S \subseteq V(G)$ is Δ-convex if there is no vertex $u \in V(G) \setminus S$ forming a triangle with two vertices of *S*. The convexity number of a graph *G* with respect to the Δ-convexity is the maximum cardinality of a proper convex subset of *G*. We have given an exact value for the convexity number of block Δ-graphs with diameter ≤ 3, block Δ-graphs with diameter >3 and the two standard graph products (Strong, Lexicographic products), a bound for Cartesian product. Also discussed some bounds for Δ-number and a realization is done for the Δ-number and the hull number.

Keywords

Δ-convexity Δ-convexity number Δ-number Graph products

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