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The maximum infection time in the geodesic and monophonic convexities[☆]

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Abstract

Recent papers investigated the maximum infection time $t_{P3}(G)$ of the P_3-convexity (also called maximum time of 2-neighbour bootstrap percolation) and the maximum infection time $t_{mo}(G)$ of the monophonic convexity. In 2014, it was proved that, for bipartite graphs, deciding whether $t_{P3}(G) \geq k$ is polynomial time solvable for $k \leq 4$, but is NP-complete for $k \geq 5$ [23]. In 2015, it was proved that deciding whether $t_{mo}(G) \geq 2$ is NP-Complete even for bipartite graphs [12]. In this paper, we investigate the maximum infection time $t_{gd}(G)$ of the geodesic convexity. We prove that deciding whether $t_{gd}(G) \geq k$ is polynomial time solvable for $k = 1$, but is NP-complete for $k \geq 2$ even for bipartite graphs. We also present an $O(n^3m)$-time algorithm to determine $t_{gd}(G)$ and $t_{mo}(G)$ in distance-hereditary graphs. For this, we characterize all minimal hull sets of a general graph in the monophonic convexity. Moreover, we improve the complexity of the fastest known algorithm for finding a minimum hull set of a general graph in the monophonic convexity.

Keywords: Geodesic convexity, maximum infection time, monophonic hull number, monophonic convexity

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