Monopolarity on (P_5, house)-free graphs

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A graph is said to be polar if its vertex set admits a partition (A, B) such that A induces a complete multipartite graph and B induces a disjoint union of cliques. Polar graphs generalize several families of graphs, such as split graphs, bipartite graphs and their complements. As one would expect, the recognition of polar graphs is known to be NP-complete. Adding restrictions on the sets A and B, however, can make the problem tractable. For instance, a polar graph is said to be monopolar if its vertex set admits a partition (A, B) such that A is an independent set and B is a disjoint union of cliques.
Even though the recognition of monopolar graphs is also NP-complete in general, it is known to be polynomial-time solvable in some graph classes where recognizing polarity is NP-complete, such as P_5-free graphs. In this work, we focus on the problem of deciding whether a (P_5, house)-free graph is monopolar. We provide a characterization of the minimal (P_5, house)-free non-monopolar graphs (which is a finite set) and use it to exhibit a certyifying recognition algorithm running in time $O(|V|+|E|)$ for (P_5, house)-free monopolar graphs.

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