CERTIFIED DOMINATION IN GRAPHS USING BINARY LINEAR PROGRAMMING

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A set D of vertices of a graph $G = (V_G, E_G)$ is a *dominating set* of G if every vertex in $V_G - D$ is adjacent to at least one vertex in D. The *domination number* of a graph G, denoted by $\gamma(G)$, is the cardinality of a smallest dominating set of G. A subset $D \subseteq V_G$ is called a *certified dominating set* of G if D is a dominating set of G, and every vertex in D has either zero or at least two neighbours in $V_G - D$. The cardinality of a smallest certified dominating set of G is called the *certified domination number* of G, and it is denoted by $\gamma_{\text{cer}}(G)$.

A BLP (binary linear program) is constructed to derive the system of linear constraints corresponding to the certified domination conditions. The objective is to drive the minimum cardinality of the certified dominating set problem through a linear optimisation problem. This approach is used to identify the optimal domination set in different categories of graphs.

The clarity of the results demonstrates that the BLP algorithm is effective in recognising the minimum certified dominating set associated with the certified domination set. This will result in significant advances in theory, practice, research, and applications.

References

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