

A graph transformation for the clique interdiction problem with interdicted edges

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Abstract

Bilevel programming represents a decision making process with two players hierarchically ordered: a leader and a follower. The *clique interdiction* problem is a bilevel programming problem where the leader forbids the use of (or *interdicts*) some edges or nodes of an undirected graph, while the follower computes the maximum cardinality clique using only the remaining elements. The aim of the leader is to find the smallest possible maximum clique permitted by its interdiction powers. If the leader does not allow to use some nodes, we speak of *node* interdiction. Otherwise, if some edges are not available, we have the *edge* interdiction problem. We show how to transform a maximum clique problem in a given graph into a maximum clique problem in an auxiliary graph. When applied to the clique interdiction problem, the transformation allows to map a clique interdiction problem with edge interdiction into a clique interdiction problem with node interdiction. As a byproduct, we can use for the former all the results that are known in the literature for the latter, deriving a (non compact) single level reformulation of the edge interdiction problem and providing some complexity results.

Keywords : *Bilevel programming, Clique interdiction, Complexity, Reformulation.*

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