A branch and cut algorithm to optimize sensor installation in a network

P. Meurdesoif, P. Pesneau, and F. Vanderbeck

Université de Bordeaux, IMB, UMR 5251, Bordeaux, F-33000, France
INRIA Bordeaux - Sud-Ouest, Equipe RealOpt
philippe.meurdesoif@math.u-bordeaux1.fr
pierre.pesneau@math.u-bordeaux1.fr
francois.vanderbeck@math.u-bordeaux1.fr

Consider a network represented by a directed graph $G = (V, A)$. It carries a unit flow of each comodity that has a unique source and destination node. Our purpose is be able to track the path followed by each commodity by way of monitoring the traffic in only a subset of arcs. I.e, we need to install sensors on links that are able to identify commodities going through these links. Given that a cost is associated with the installation a sensor on a link, the problem is to determine on which links a sensor has to be installed, so as to minimize the total instalation cost, while being able to reconstruct a posteriori the route of each commodity.

The initial application of such problem was to reconstruct the path used by skier in a ski resort. However, other applications arise, for instance, in a callcenter where phonecalls are usualy relayed several time to reach the good interlocutor; another application concerns the follow-up of the run of a computer program.

This paper presents a polyhedral study for this problem along with the results obtained with a branch-and-cut algorithm.