On a stable allocation rule for minimum cost spanning tree problems

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Abstract

We consider the standard minimum cost spanning tree (mcst) problem, where a group of agents located at different points must build a network that connects each of them directly or via other agents in the group to a source point. Various cost sharing rules have been proposed to split the minimum total linking costs in such a way that no agent or subgroup of agents can improve upon the proposal. The majority of these stable cost allocation rules are based on the Shapley value of a cooperative TU game induced not by the original mcst problem but by a closely related one with suitably modified link costs.

We propose a stable allocation rule based on the well-known cost sharing concepts of separable and nonseparabale costs. In terms of the related mcst game it can be described as the average of certain core extreme points, at each of which the core upper bound for a particular player is attained. We discuss various monotonicity properties of this stable allocation rule. In order to being able to compute the particular core extreme points directly from the network data we allow changes in the link costs but only if they do not alter the core of the original mcst game.