# The nucleolus of Directed Acyclic Graph Games

Balázs Sziklai

HAS

## Abstract

Infrastructural developments can often be modeled as cooperative games that have a graph structure. Consider for example a group of towns that would like to connect to a water reserve. Naturally not every town has to build a direct pipeline to the source. A possible solution is to connect the nearest towns with each other and then one of the towns with the reserve. The towns that are already connected to the water system can force the rest to pay some of their construction cost, otherwise they can close down the outgoing water flow. Standard tree games model such cost sharing situations. However tree networks fail to capture an important aspect of the game. No town can be forced to pay more than the cost of directly connecting itself with the water reserve. To include such consideration the underlying graph structure of the game is given as a directed acyclic graph. As the core of the game is non-empty, the nucleolus is an appealing solution for such problems. We show a polynomial time algorithm to find the nucleolus for large family of directed acyclic graph games.