

A Model for Overlapping Coalition Formation

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Abstract

In task-oriented domains, agents form coalitions to perform tasks. The usual models of cooperative game theory assume that the desired outcome is either the grand coalition or a coalition structure that consists of disjoint coalitions (i.e., a partition of the set of agents). However, in practice an agent may be involved in executing more than one task, and distributing his resources between several (not necessarily disjoint) coalitions. To model this domain, we introduce cooperative games with overlapping coalitions.

We focus on the concept of stability in this setting. We define and study a notion of the core, which is a generalization of the corresponding notion in the traditional models of cooperative game theory. Under some quite general conditions, we provide a criterion for checking whether a pair of the form (coalition structure, imputation) is in the core. We also show that any element of the core maximizes the social welfare. Furthermore, we extend the notion of convexity to our setting and show that under natural assumptions convex games have a non-empty core. Finally, we explore alternative definitions of allowable deviations by a set of agents and the corresponding notions of stability.

To the best of our knowledge, this is the first theoretical treatment of the topic of overlapping coalition formation.