The Myerson value for augmenting structures

Jesus Mario Bilbao

e-mail: mbilbao@us.es
Escuela Superior de Ingenieros
SPAIN

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ABSTRACT

Cooperative games under combinatorial restrictions are cooperative games in which the players have restricted communication possibilities, which are defined by a combinatorial structure. The first model in which the restrictions are defined by the connected subgraphs of a graph is introduced by Myerson [4]. Since then, many other situations where players have communication restrictions have been studied in cooperative game theory.
Contributions on graph-restricted games include Owen [5], Borm, Owen, and Tijs [1] and Hamiache [3]. In these models the possibilities of coalition formation are determined by the positions of the players in a communication graph. Another type of combinatorial structure introduced by Gilles, Owen and van den Brink [2] is equivalent to a subclass of antimatroids. This line of research focuses on the possibilities of coalition formation determined by the positions of the players in the so-called permission structure.

We introduce a new combinatorial structure called augmenting system which is a generalization of the antimatroid structure and the system of connected subgraphs of a graph. The main result of the paper is that games restricted by augmenting systems generalizes graph communication situations and games with permission structures. We present an axiomatization of a new value for games under augmenting systems such that our axioms generalize the axiomatizations of the Myerson value and the permission values. In particular, we unify the fairness axioms used in both graphs and permission structures. The structural properties of the augmenting systems will be essential to provide a direct formula to compute the Myerson value for augmenting structures, that is, the Shapley value for games under augmenting systems restrictions. In this formula, the value is computed by means of the original game without having to calculate the restricted game and taking into account only the coalitions in the augmenting system.

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