

COMPUTATIONAL COMPLEXITY OF PROBLEMS FOR SIMPLE GAMES WITH GRAPH RESTRICTED COALITIONS

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Simple games are used to formulate the situations in which the actors or players have to decide about one alternative. Simple games were firstly introduced in 1944 by von Neumann and Morgenstern [3] and constitute the classic way for such models. Briefly speaking, a simple game is determined by the monotone family of the *winning coalitions*, i.e., those sets of actors that can force a “yes” decision. In recent several authors have considered the study of simple games under graph restricted coalitions. In this setting it is assumed that the players are related through a social network represented by a graph. Under the hypothesis that a coalition to be formed requires some communication among its members it seems natural to restrict coalitions by requiring that the subgraph induced by the coalition is connected.

The objective of this work is (1) studying the basic definitions, parameters and properties of simple games, following the book by Taylor and Zwicker [2]; (2) study the computational complexity classification of problems related to parameters and properties of simple games given in [1] and other papers; (3) analyze the impact of restricting coalitions to just connected subgraphs in the computational complexity of those problems.

Requirements Basic knowledge of computational complexity (P and NP-classes and reductions) and algorithmics.

References

- [1] J. Freixas, X. Molinero, M. Olsen, and M. Serna. On the complexity of problems on simple games. *RAIRO-Operations Research*, 45(4):295–314, 2011.
- [2] A.D. Taylor and W.S. Zwicker. *Simple Games: Desirability Relations, Trading, and Pseudoweightings*. Princeton University Press, New Jersey, USA, 1999.
- [3] J. von Neumann and O. Morgenstern. *Theory of games and economic behavior*. Princeton University Press, Princeton, NJ, 1944.