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Game Theory Applications in a Water Distribution Problem

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ABSTRACT
A water distribution problem in the Mexican Valley is modeled first as a three-person noncooperative game. Each player has a five-dimensional strategy vector, the strategy sets are defined by 15 linear constraints, and the three payoff functions are also linear. A nonlinear optimization problem is first formulated to obtain the Nash equilibrium based on the Kuhn-Tucker conditions, and then, duality theorem is used to develop a computational procedure. The problem can also be considered as a conflict between the three players. The non-symmetric Nash bargaining solution is suggested to find the solution. Multiobjective programming is an alternative solution concept, when the water supply of the three players are the objectives, and the water authority is considered to be the decision maker. The optimal water distribution strategies are determined by using these solution concepts and methods.

KEYWORDS
Nash Equilibrium; Conflict Resolution; Multiobjective Optimization; Water Distribution

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