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CORE SOLUTION OF FUZZY GAMES

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ABSTRACT

We have studied Fuzzy games and have considered a model of game in which the limits of the classical concept of an *N*-person game are eliminated. We have considered the exchanges of information between *N*-persons who can emit their information individually or together. If two are more parents emit their information in correlated manner, we have formed a coalition in a given come. Each of which is a statue which defines the rights and duties of a member of this coalitions. $J = \{1, 2, ..., N \text{ that } N \geq 3\}$ be the set of players. To become a member of given coalition a player *i* must define its attitude concerning the statue *S* of the coalition. If *i* accepts completely the statue *S*, becomes a rightful member of the coalition. In this case we say that the grade of membership of *i* to the given coalition is 1 otherwise 0 in refusal. In a classical *N*-person game, only these two alternative of coalitions are possible. A partial acceptance of *S* is also possible, the grade of membership in the coalition of players *i* who accepts partially in a coalitional manner the statue *S* of the coalition be a number in $[0,1]$. Hence if *S* is given then there exists a fuzzy set *A* so that *A*(*i*) is the grade of acceptance *i* for *S*. So mathematically fuzzy set *A* is exactly the coalition with *S*. In a classical *N*-person game, a coalition structure is a relation of equivalence over *J*. But in a game with fuzzy coalitions, it can be represented as a fuzzy binary relation *R*, where R_i is a possible coalition of the game and $R(I, j)$ is the grade of the intensity of the collaboration of the player *i* and *j* in making the decisions in the game

Keywords: Fuzzy games, exchange, coalition, player, fuzzy binary relation.

INTRODUCTION

Chen etal[1] studied the fuzzy topological space in which following conditions were taken in to consideration for our work.

$$(i)\phi, X \in T \quad (ii) A_i \in T,\ i=1,2,3,....,\Rightarrow A_i \in T.$$
$$(iii)\ A,B \in T \Rightarrow A \wedge B \in T.$$

the pair $\langle X, T \rangle$ is called a fuzzy topological space for fts for short. Every members of $\underset{\sim}{T}$ is called $\underset{\sim}{T}$ open fuzzy set or simply open fuzzy set. A fuzzy set $\underset{\sim}{A}$ is $\underset{\sim}{T}$-closed iff $\underset{\sim}{A}'$ is T-open. As in ordinary topologies, $[\phi, X]$ is called the indiscrete topology while the family of all fuzzy sets is called discrete fuzzy topology. $\underset{\sim 1}{T}$ and $\underset{\sim 2}{T}$ be two topologies s.t. $\underset{\sim 1}{T} \subseteq \underset{\sim 2}{T}$. Then $\underset{\sim 1}{T}$ is said to be coarser than $\underset{\sim 2}{T}$. Zadeh[2] showed that a game is determined by his formations, decisions and goals, which are fuzzy in nature. Firaman with immense entropy functions may err, set right and understanding a little may increase his understanding in the persuit of some knowledge. So in game, perfect informations, decisions and goals may not be feasible. So it was found the possibility of introducing fuzzy mathematical approach for solutions of games. The concept of excess was used to study the dynamical games by Davis and Maschler[3]. They have also defined coalitions and fuzzy coalitions in non fuzzy games $G=(N,V)$ and fuzzy games $FG=(N,F)$. They have defined the excess of a coalition and the excess of a player in non fuzzy as well as fuzzy games $A=\{S/s \subset N\}$ be a family of coalitions and $(X = X_1, X_2, ..., X_n)$ be a pay off vectors.

$$\tau^s_{(i)} = \begin{Bmatrix} 1, if i \in S \\ 0, if i \notin S \end{Bmatrix}$$

and represented by

$$\tau^s = \{\tau^s(1), \tau^2(2), ..., \tau^s(n)\}.$$

Albert[4] presented the algebra of fuzzy logic, fuzzy sets and systems to solve the games problems. Change[5] showed the fuzzy topological spaces regarding solution of games. Abdou[6] Studied about cooperative games to solve the problems of games. Johnson[7] solved the many games problems producing his concept.

METHOD

There are so many categories of solution of games. One of the simplest solution concept of a game is the set of all allocations. The core is the set of allocations which cannot be improved upon by any coalition. We have introduced such set of allocations which have introduced such set of allocations which have not be improved by fuzzy coalition.

A fuzzy coalition is τ as a coalition in which player i can participate with a rate of participation $\tau_i \in [0,1]$ instead of $\{0,1\}$. The characteristic function or coalitional worth function of a fuzzy game is a real valued function.

$F:[0,1] \to R$ which specifies a real number of $f(\tau)$ for any fuzzy coalition τ. This fuzzy game is denoted by

$$FG = (N, f)$$

for the core of fuzzy games with side payment by its coalition worth function is

$f':[0,1]^n \to R$, such that $\tau \in [0,1]^n$ and $f'(0) = 0$.

We have assumed the coalitional worth function to be positively homogeneous i.e. $f'(\lambda\tau) = \lambda f'(\tau)$ fall all $\lambda > 0$.

Now we have set up the coalitional worth function $f' \to R_+^n$ by

$$f'(\tau) = \left[\sum_{i \in N} \tau_i\right] f'\left\{\frac{\tau}{\sum_{i \in N} \tau_i}\right\} \text{f}$$

where $\tau \in R_+^n$

A multiutility $C = (C_1, C_2, C_{3,\ldots\ldots}, C_n) \in R^n$ is improved upon by a fuzzy coalition τ if $\sum_{i \in N} \tau_i C_i < f'(\tau)$.

For core of fuzzy games without side payment are associated to a fuzzy coalition $\tau \in [0,1]^n$, the map $\tau^* : R^n \to R^n$ defined by $(\tau^* C)_i = \tau_i C_i$ and its product $A_\tau = \{i \in N / \tau_i > 0\}$, that is the subset of players. I participating in the fuzzy coalition τ. We regard R^n as the space of multiutilities and the sets.

$$R^\tau = \tau^* R_1^n,\ R_+^\tau = \tau^* R_+^n,\ R_+^{+\tau} = \tau^* R^{+n}.$$

As the set of multiutilities of fuzzy coalition τ, respectively, positive, strongly positive multiutilities of τ.

RESULTS AND DISCUSSION

We have studied the core solution concept of a fuzzy game with and without side payments. The concept of excess was used which is a kind of evaluation of a payoff vector for each coalition. The concept of excess is concerned with a coalition. We have introduced a new concept of an excess of a player by extending the concept of an excess of a coalition in non fuzzy as well as fuzzy game. By considering a payoff. Vector which minimize the excess of a player in the Lexicographical order, we have obtained a new solution by concept of fuzzy games.

For excess of a fuzzy coalition we have considered a fuzzy game $FG = (N, f), X$ be a pay off vector and G be a fuzzy coalition. Then the excess of the fuzzy coalition $\tau \in [0,1]^n$ to pay off vector *X* is given by $e(\tau, X) = f(\tau) - X.\tau$, where $f(\tau)$ is a value of the characteristics function representing the gain that the fuzzy coalition τ was obtained from a game alone and $X.\tau$ is the amount of payoff of the fuzzy coalition τ for the payoff Vector *X*. Excess of a power in fuzzy game has been found. For a fuzzy game $FG = (N, f), (\tau, X)$ be an excess of fuzzy coalition $\tau \omega.r$ to a payoff vector X. Also $D \subseteq [0,1]^n$. Then an excess of power *i* in any fuzzy game is given by

$$e^*(i, X) = \int_D \tau_i e(\tau, X)\,dt + \sum_{\tau \in T} \tau_i e(\tau, X).$$

CONCLUSION

We have obtained the solution of games by using concept of fuzzy coalition. The core is the set of allocations which was improved by a set of allocations by fuzzy coalition. The obtained results were found in good agreement with previously obtained results.

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