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**ТЕОРИЯ ИГР И МЕНЕДЖМЕНТ.** Сб. тезисов 5-ой международной конференции по теории игр и менеджменту / Под ред. Л.А. Петросяна и Н.А. Зенкевича. – СПб.: Высшая школа менеджмента СПбГУ, 2011. – 268 с.

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Тезисы представляют интерес для научных работников, аспирантов и студентов старших курсов университетов, специализирующихся по менеджменту, экономике и прикладной математике.

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# Necessary and Sufficient Conditions for the Existence of Inclusion Map of Game with Preference Relations into Game with Payoff Functions

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**Keywords:** Game with preference relations, Strict homomorphism, Inclusion map, Game with payoff functions

Let  $K$  be a class of games with preference relations,  $\mathcal{K}$  be a class of games with payoff functions. We consider game  $G \in K$  in the form

$$G = \langle (X_i)_{i \in N}, A, (\rho_i)_{i \in N}, F \rangle$$

where  $N = \{1, \dots, n\}$  is a set of players,  $X_i$  is a set of strategies of player  $i$ ,  $A$  is a set of outcomes,  $\rho_i \subseteq A^2$  is a preference relation of player  $i (i \in N)$  and realization function  $F$  is a mapping of set of situations  $X = X_1 \times \dots \times X_n$  in set of outcomes  $A$ .

Game  $\Gamma \in \mathcal{K}$  is given in the normal form

$$\Gamma = \langle (X_i)_{i \in N}, (\lambda_i)_{i \in N} \rangle$$

where  $\lambda_i$  is a payoff function of player  $i$ .

The concept of homomorphism from game  $G$  into game  $\Gamma$  is introduced by analogy with concept of homomorphism for games of class  $K$  ([1]).

Homomorphism from game  $G$  into game  $\Gamma$  can be define as a  $n$ -tuple of mappings  $f = (\psi_i)_{i \in N}$ , where  $\psi_i : A \rightarrow \mathbb{R}$ , such that for each  $i \in N$  the following condition

$$a_1 \overset{\rho_i}{\lesssim} a_2 \Rightarrow \psi_i(a_1) \leq \psi_i(a_2)$$

holds;

homomorphism will be strict if and only if for each  $i \in N$  the condition

$$a_1 \stackrel{\rho_i}{<} a_2 \Rightarrow \psi_i(a_1) < \psi_i(a_2)$$

is satisfied;

homomorphism will be reciprocal if and only if for each  $i \in N$  the following condition

$$a_1 \stackrel{\rho_i}{\lesssim} a_2 \Leftrightarrow \psi_i(a_1) \leq \psi_i(a_2)$$

holds.

Strict homomorphism  $f$  from game  $G$  into some game  $\Gamma$  is called *inclusion map* of game  $G$  into class  $\mathcal{K}$ .

Reciprocal homomorphism  $f$  from game  $G$  into some game  $\Gamma$  is called *isomorphic inclusion map* of game  $G$  into class  $\mathcal{K}$ .

Consider several elementary properties of inclusion map.

1. If there exists isomorphic inclusion map of game  $G$  into game  $\Gamma$  then game  $G$  is game with linear and transitive preference structure.
2. Any inclusion map of game with linear preference structure into game with payoff functions is isomorphic.

The main result of this paper is the following theorem.

There exists inclusion map of finite game  $G$  into class  $\mathcal{K}$  if and only if for each  $i (i \in N)$  preference relation  $\rho_i$  is acyclic under its symmetric part  $\rho_i^s$ .

## References

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