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Methods of solving perfect informational games

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We consider a two persons game in complete and "$1 \leftrightarrows 2$"$-$perfect information with the normal form $\Gamma = \langle X, Y, H_1, H_2\rangle$. The "$1 \leftrightarrows 2$"$-$perfect information permits us to use other types of strategies, which represents "programs of action". We call these strategies "informationally extended strategies" and denote the sets of these strategies by $\Theta_1 = \{\theta_1 : Y \to X \ \forall y \in Y, \theta_1(y) \in X\}$, $\Theta_2 = \{\theta_2 : X \to Y \ \ \forall x \in X, \theta_2(x) \in Y\}$. We shall remark the following ways to solve games in informationally extended strategies.

1. For any strategies profile (θ_1, θ_2) it is constructed the normal forms of game on set of informationally nonextended strategies X, Y. Thus the set of games $\{\Gamma\left(\theta_1,\theta_2\right)\}_{\theta_1\in\Theta_1}^{\theta_2\in\Theta_2}$ is generated. In this case only the form of utility functions is chainged $\widetilde{H}_1(x, y) \equiv H_i\left(\theta_1(y)\right), \theta_2\left(x\right))$ and $(x^*, y^*) \in$
$$NE(\Gamma\left(\theta_1,\theta_2\right)) \rightleftarrows \begin{cases} \max\limits_{x\in X} \widetilde{H}_1(x, y^*), \\ \max\limits_{y\in Y} \widetilde{H}_2(x^*, y). \end{cases}$$

2. The case when $\widehat{H}_i : \Theta_1 \times \Theta_2 \to R$ are not functions, but functionals and we operate not with elements $x \in X$ and $y \in Y$, but with the functions $\theta_1 \in \Theta_1$ and $\theta_2 \in \Theta_2$. Equilibrium profiles are defined on the set $\Theta_1 \times \Theta_2$.

3. The case when the utility of players is described by the functions H_1 and H_2 respectively, but solutions are defined on the set $\Theta_1 \times \Theta_2$. Let $(x^*, y^*) \in NE(\Gamma)$, then as a solution one can take the strategy profile $(\theta_1^*, \theta_2^*) \in \Theta_1 \times \Theta_2$ for which is verified $\begin{cases} \theta_1^*(y) = x^* \ \forall y \in Y, \\ \theta_2^*(x) = y^* \ \forall x \in X. \end{cases}$

4. The case when it is "extended" the number of players introducing "$1 \leftrightarrows 2$"informational type players. It is considered the game with the following normal form $\widetilde{\Gamma} = \left\langle I, J, \Theta_1, \Theta_2, \widetilde{H}_i, \widetilde{H}_j \right\rangle$, where I is the set of θ_1^i-informational type players "generated" by the strategy $\theta_1^i \in \Theta_1$, J is the set of θ_2^i-informational type players "generated" by the strategy $\theta_2^i \in \Theta_2$, $\widetilde{H}_i\left(\theta_1^i, \theta_2^j\right)$, $i \in I$, respectively $\widetilde{H}_j\left(\theta_1^i, \theta_2^j\right)$, $j \in J$, is the utility function of the θ_1^i-informational type players, respectively of the θ_2^j-informational type players. Here it is possible to use Harsanyi principle in solving such types of games.