A MODEL OF STOCHASTIC GAME OF NEUGENTS

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The model development of stochastic game of neural network agents (neugents) for collective decision-making in the conditions of uncertainty is the purpose of this work.

Training processes in multiagent systems for optimisation of collective decision-making in the conditions of uncertainty are object of research.

The model of matrix game of neugents with random prizes is a subject of research.

Neugents are constructed on the basis of artificial neural networks (neuronets) with feedbacks and with training without a teacher. The current collective decision appears after an independent choice of personal options of decisions of all players. Each player forms a current variant of the decision on values of outputs of a neuronet. The choice of variants of decisions is carried out by neugents in the random way, is independent in time and of other agents. The random choice provides calculation of probabilities of a choice of variants of decisions by optimum projection of neuronet outputs on the unit simplex.

After a choice of a collective variant a response of the environment of decision-making as a set of values of current prizes of neugents is defined. The current prize of each neugent goes to the inputs of a corresponding two-layer neuronet. Further training of neugents by change of weights of communications between neurons on one of the algorithms of training without the teacher is carried out. Training process repeats in time before stabilisation of weights of communications between neurons with the set accuracy. The training course is directed at the maximisation of average prizes of neugents. The game decision is reached in one of points of a collective optimality or balance depending on values of parametres of the chosen method of training of neugents.

The developed program model confirms convergence of a game neugent method of decision-making. Efficiency of a method is estimated by means of characteristic functions of average prizes and errors of a collective choice of an optimum variant of decision-making. Convergence of a game neugent method depends on quantity of players, quantity of variants of decisions and parameters of a method and parameters of the environment of decision-making. The result of increase in quantity of players, quantities of variants of decisions and a dispersion of estimations of current decisions are the reduction of convergence rate of a game neugent method.

Reliability of the received results is confirmed by repeatability of values of the calculated characteristics of a game neugent method of decision-making for different sequences of random variables.

Results of this work can be used for construction of the distributed control systems and decision-making under the conditions of uncertainty.

The research can be continued in a direction of use of other configuration of neugents and other methods of their training, information interchange between agents of stochastic game, increase in quantity of players and quantities of their pure strategies, definitions of theoretical conditions of convergence of a game neugent method.

Keywords – collective decision making, uncertainty conditions, neuroagent stochastic game, adaptive learning methods.