ARCHITECTURE OF CAD FOR DISTRIBUTED ARTIFICIAL INTELLIGENCE BASED ON SELF-ORGANIZING NEURO-COGNITIVE ARCHITECTURES[□]

Z.V. NAGOEV¹, Z.A. SUNDUKOV¹, I.A. PSHENOKOVA², V.A. DENISENKO²

[1]Federal public budgetary scientific establishment «Federal scientific center
«Kabardin-Balkar Scientific Center of the Russian Academy of Sciences»
360002, KBR, Nalchik, 2, Balkarova street E-
mail: kbncran@mail.ru
[2] Institute of Computer Science and Problems of Regional Management –
Branch of Federal public budgetary scientific establishment «Federal scientific
center «Kabardin-Balkar Scientific Center of the Russian Academy of Sciences»
360000, KBR, Nalchik, 37-a, I. Armand St.
E-mail: iipru@rambler.ru

The goal of the work is the creation of CAD for distributed artificial intelligence based on selforganizing neurocognitive architectures.

The object of the study is to develop an architecture and substantiate its applicability for creating CAD systems for an intelligent agent. An intelligent agent is a rational software agent that includes a significant number of other software agents that implement the necessary functionality of life support systems, specialization and management of the agent's intellectual behavior. Many interacting software agents-neurons form a neurocognitive architecture, which can distinguish cognitive nodes that perform heterogeneous functions, are connected with each other according to data, and form an invariant of the organizational and functional structure of the intellectual decision-making process. The invariant of multi-agent neurocognitive architecture consists of interconnected nodes for recognizing input images, evaluating, setting goals, synthesizing an action plan, modeling the consequences of fulfilling a plan, managing the execution of the plan.

It is proved that the client-server architecture is the most effective in the development of CAD for an intelligent agent. The developed CAD for an intelligent agent architecture takes into account the dynamic properties of neuron agents, distributed architecture, topology and the possibilities of self-organization and self-training based on the formation and termination of multi-agent contracts. Some implemented elements in the prototype CAD for an intelligent agent are presented.

Keywords: artificial intelligence systems, multi-agent system, neurocognitive architecture, CAD, self-organizing systems.

REFERENCES

1. Robinson J.A. A machine-oriented logic based on the resolution principle. Journal of the Association for Computing Machinery. Vol. 12 (1965). Pp. 23-41.

2. Papert S., Minsky M. Perceptrons: An Introduction to Computational Geometry MIT Press. 1969. 258 p.

3. Russell S., Norvig P. *Iskusstvennyy intellekt. Sovremennyy podkhod (2-ye izdaniye)* [Artificial Intelligence. The Modern Approach (2nd Edition)]. Williams Publishing House. 2006. 1408 p.

4. Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence / Ed. by G. Weiss. The MIT Press. 1999. 643 p. ISBN: 0262232030.

5. Nagoyev Z.V. *Intellektika, ili Myshleniye v zhivykh i iskusstvennykh sistemakh* [Intelligence, or thinking in living and artificial systems] // Nalchik: Publishing House of KBSC RAS. 2013.

6.   Nagoev Z.V. *Metody prinyatiya resheniy i upravleniya v nestrukturirovannykh zadachakh na osnove samoorganizuyushchikhsya mul'tiagentnykh rekursivnykh kognitivnykh arkhitektur* [Decision making and management methods in unstructured tasks based on self-organizing multi-agent recursive cognitive architectures]. Thesis for the title of Doctor of Engineering Sciences, Nalchik. 2013. 304 p.

7.   Nagoev Z.V., Nagoeva O.V. *Modelirovaniye semantiki slovosochetaniy s atributivnymi prilagatel'nymi na osnove mul'tiagentnoy rekursivnoy kognitivnoy arkhitektury* [Modeling the semantics of collocations with attributive adjectives based on multi-agent recursive cognitive architecture] // *Izvestiya Kabardino-Balkarskogo nauchnogo tsentra RAN* [News of the KBSC of RAS]. 2018. No. 3 (83). Pp. 11-20.

8.   Pshenokova I.A., Nagoeva O.V., Sundukov Z.A. *Imitatsionnaya model' funktsii raspoznavaniya i ponimaniya staticheskikh ob"yektov samoobuchayushchimsya robotom na osnove mul'tiagentnykh neyrokognitivnykh arkhitektur* [A simulation model of the recognition and understanding of static objects by a self-learning robot based on multi-agent neurocognitive architectures] // News of SFU. Technical sciences. 2019. No 1 (203). Pp. 75-84.

9.   Nagoev Z., Nagoeva O., Gurtueva I. Multi-agent neurocognitive models of semantics of spatial localization of events // Cognitive Systems Research. 2020. V. 59. Pp. 91-102.

10.   Nagoev Z.V., Nagoeva O.V., Pshenokova I.A., Gurtueva I.A. Multi-agent model of semantics of simple extended sentences describing static scenes // In the collection: LECTURE NOTES IN COMPUTER SCIENCE 2019. Pp. 245-259.

11.   Nagoev Z.V., Nagoeva O.V., Pshenokova I.A. *Mul'tiagentnyye neyrokognitivnyye modeli semantiki prostranstvennoy lokalizatsii sobytiy* [Multiagent neurocognitive models of the semantics of spatial localization of events] // *Izvestiya Kabardino-Balkarskogo nauchnogo tsentra RAN* [News of the KBSC of RAS]. 2019. No 2 (88). Pp. 11-23.

12.   Nagoyev Z.V., Pshenokova I.A. *Mul'tiagentnyye neyrokognitivnyye modeli semantiki prostranstvennoy lokalizatsii sobytiy* [An approximation model for multidimensional functions based on the apparatus of multiagent existential mappings] // *Izvestiya Kabardino-Balkarskogo nauchnogo tsentra RAN* [News of the KBSC of RAS]. 2018. No. 6-3 (86). Pp. 34-40.