

# Architectonics of Thinking: The Conception of Human Brain Organization as Multiprocessing System

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**Abstract.** This paper is devoted to the development of hypothesis about human brain "cartation", i.e. spatially distributed structure of human brain systems for cogitative activities maintenance, containing neural parts with various degree of rigidity and different functional tasks (cartoids), which was suggested by Institute of Brain of the Russian Academy of Sciences (St.-Petersburg) under supervision of acad. N. Bekhtereva.

In the paper is suggested the conception of the structurally-logic organization of thinking processes, which defines the main attitudes between the emotional-strong-willed (unconscious) and the intellectual-ethical (conscious) components (cartoids-processors) of thinking for the situation analysis and for the choice of actions ways by the person during decisions making and realization. The conception is based on the architectonics of the artificial intellect of the future generations for creation of the emotionally and morally-oriented knowledge bases and supercomputers, capable to realize all the processes of the productive creative thinking.

## 1 Introduction

Nowadays, the important scientific problem is the development of computer systems with the artificial intellect, which facilities are more and more closer to the human abilities to think productive. [1] The artificial intellect systems should in the shortest terms make, instead of the person, the decision, which are, for example, by validity and speed parameters, better than decisions, that are making by the person. Due to wide-spread using of the computer systems and the global and corporate networks, consisting from the personal and professional computers, the interest to the playing, planning and other systems for decisions making, has essentially increased. [2],[3] The meta-mechanisms, that simulating the functions of human intellect, are the base components of the intellectual software, allowing automate the cogitative activities not only for the ordinary computer users, but also for the programmers.

Thus, the actual problem is researching of the architectonics (meta-models and neural processors) of human thinking, which will allow to design the structurally-logic organization of artificial neural intellect, which is capable to realize both conscious formal-logic, and unconscious emotional-intuitive mechanisms of the creative thinking and the informal decisions making by person. [1]

## 2 The Architectonics of Common Bus-based Images Processing with Neural Networks

The important factor of human's reactions is the verbal expression of the person's attitude to a perceived image on the basis of perceived before actions ways and of the management skills (articulation) of the speech mechanism for the ideas expression. The attitude to *Wi*-concept can be reflected in speech, i.e. can be determined the word or the semantically connected chain of words that are formed by a neural-stack of a actions ways window (articulation windows). The corresponded neural networks with their final neurons are directly connected to reflex arches of the speech mechanism muscles management: a mouth, tongue, throats and breath which realize "knitting" of sound speech images structures, which probably reflecting the real World and allowing coordinate the actions of the people's groups and collectives. The general structure of effectors networks connections of neural-stacks for various windows of the neural-screen of human brain bark is shown on Fig. 1.

Using the effectors networks of brain organization as example there is an opportunity precisely to show differences of databases, for example, for recognition visual both sound images, and bases of knowledge which collect in the actions ways window for realization of corresponding skills and actions algorithms, including the ways and algorithms of a "convincing articulation" which can be perceived as logic thinking.

In databases for recognition of visual or sound images are accumulated and "passively" stored the big enough volumes of "etalon" images, including phonetic sound and sign visual images of words and word-combinations which provide recognition with the general perception only as: "has understood" or "has learned", so it is possible to generate corresponding, associated with this concept, actions.

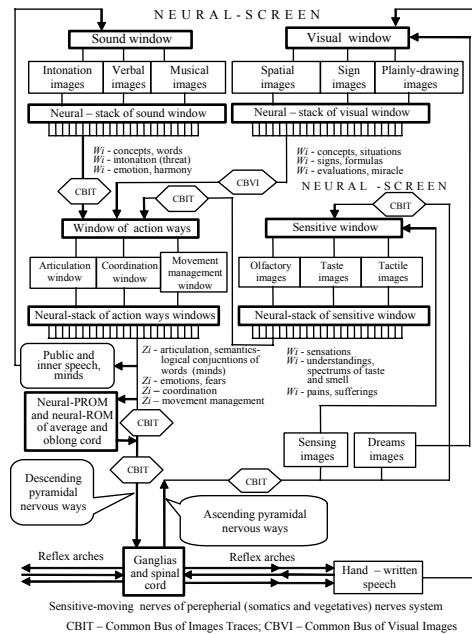
*To understand* are means to save up some set of "reference" sound or visual images which will allow for neural-stacks to distinguish images similar to them and to generate corresponding signals *Wi*-"known", which can have both verbal and emotional form: "has understood!"

*To know* are means to save up some set of ways for "correct" articulation which will allow to connect "logically" and "convincingly" to express in the sounded speech images some concepts and their correct or desirable attitudes to concrete discussed problem area.

The skills of "convincing" speech are got during all human life and, first of all, during dialogue, education and training on more than fifteen-year of base and high educational schools and universities speech trainings and competitions. Knowledge allow to generate the "adequate", clear for surrounding humans reaction as corresponding actions, which special case is the statement. [4], [5]

In the knowledge bases of *Wi*-concepts contact to the "etalon" images of the actions ways (in speech or impellent forms) to maintain the actions efficiency according to the existing rules and/or existing laws in mutual relations of the person with other people and an environment.

The basic knowledge of the person as syntax-logic images conjunctions of "correct" articulation are collected in neural-stacks of actions ways (skills) window in frontal areas of an impellent zone of the right and left hemisphere of human brain bark, which are directly connected by descending nervous ways to the speech



**Fig. 1.** The general structure of effectors networks connections of neural-stacks for various windows of the neural-screen of human brain bark.

mechanism (a mouth, a throat, tongue and lips), and also with average, oblong and a spinal cord, and through them with bodies and muscles of all body of the person. Many "sharp" direct reactions of articulation or action ways on to certain images and concepts are not realized by the person or because of absence of subconscious emotional (power) support, or are blocked by conscious and overconscious strong-willed efforts of moral-ethical behaviour skills.

The skill to think "in itself" in the form of internal speech actually is the habitual blocking of the articulations separate phases, for example, breath and lips moving, at undistinguished for itself realization of "convincing" articulation skills, although sometimes in deep meditations a certain mutter or even silent speech nevertheless sounds.

The neural-stacks of action ways window, which is subdivided into a window of an articulation, a window of coordination and a window of movement management, as it is shown on a Fig. 1, together with neural-stacks tactile window in the central area of a brain include up to 50-60 % of all neurons of brain bark that is the confirmation of importance of the movement (ways of actions) for all representatives of the biological World. Distinctive feature and a trouble of the human is filling of the neural-stacks of action (movement) ways window with "etalon" syntax-logic articulation images conjunction instead of coordination or movement skills, that sometimes even is dangerous during enforced studying of the foreign languages on the average or old human age. There are known the cases of the full loss of the coordination in space skills after the hard work in the foreign language environment of the man with bad language background.

In general, the output signals  $Z_i$  of the allocated layers of actions ways window of neural networks are the control signals which on descending pyramidal nervous ways are transferred in peripheral nervous system for realization of the actions connected to fixed concept and corresponding visual or other image. But the intellect of the person is in fact that before to start to operate he should think, accept and to explain for surrounding human his decision.

Frequently the decision is accepted by the person only intuitively, i.e. by transfer  $W_i$  from neural networks outputs from the one window on the receptors layers inputs of other windows, and the actions ways windows with output control signals  $Z_i$  of neural-stack, which "go through itself", i.e. on descending and ascending nervous ways with blocking in a spinal cord, allow at a level of body sensations images "to evaluate" an opportunity of accepted decision realization. And only after that the correctly or incorrectly choose words conjunctions during an external or internal articulation (meditations) allow to prove formally the decision and to sound it in speech for coordination of collective actions. [6]

### 3 The General Scheme of Decision Making in Intellectual Neural Networks

The general circuit of conclusions for any intellectual neural network includes some stages of transformations: image recognition; concept; the estimation of situation; the choice of action way; decision making; action way realization. [7]

The conclusions scheme in emotionally-oriented intellectual neural networks includes also an additional blocking-inducing chain of emotional reactions and adjusting influences on realization of habitual or unusual actions ways, which is based on known for neural networks concept and includes: the concept; emotional reaction (fears, curiosity, cares); the choice of the natural or got actions skills; the forcible-adjusting influence on decision-making (passion, famine, cold) – control and realization of actions skills.

In the intellectual emotional-oriented human neural networks the conclusions scheme includes also the parallel chain of verbal support for the "deep" conscious analysis of a situation and a logic substantiation of the decision making, that is sharply necessary at coordination of collective actions, but not always used in the real life as it is shown on Fig. 2.

Each stages in the conclusions scheme is a signaling of  $W_i$ -concepts from outputs of last layer of neurons of neural networks of the one windows and neural-stacks on inputs neural networks of other windows with the subsequent processing of the concept and concomitant factors (other types of images) in the effectors layers and the formation of the new  $W_i$ -concept-sensations and  $Z_i$ -control-ways of the actions.

Quite often the humans use  $W_i$ -emotions without the analysis of concepts or  $W_i$ -word without formation of corresponding concepts, that practically excludes an opportunity of decision-making and results in the impulsive inadequate actions or in the infinite and pointless conversations.

Basically the conclusions scheme in an ordinary life frequently does without a verbal support, and the advancing of subconscious emotions even is appreciable in comparison with overconscious intuitive estimation of current situation and the more

so with its conscious analysis on the basis of the all logic known to the person or even on the ethics which replace logic in many cases and, in particular, because of its absence.

Verbal support essentially slows down the process of conscious decision-making, because the speech images of words and phrases are compared to many images types of corresponding concepts and their relations in neural-stacks of various windows of the neural-screen and for the first hand with speech images in a neural-stack of a sound window and speech images of a neural-stack of actions ways window for articulation, where the bases of the person knowledge as corresponding types of “ready conclusions” fragments of the speech images about "correct" or "wrong" decisions in certain situations are collected, which are perceived during all life and labour activity of the human as a result of dialogue, education, training and self-training. It is should be noticed, that first two chains of the conclusions scheme, realized by subconsciousness and overconsciousness are peculiar to all representatives of the biological world.

The special problem is the conceptual (substantial) analysis of neural networks functions for overconscious estimations of situation, based on the "glorified" intuition. In abilities of an intuitive prediction the certain role is played the factors of spatial transformations of visual images in some allocated layers-processors of human brain and using of the other types of “etalon” visual images and associated with them in neural-stacks of all windows of the neural-screen.

The recognition of the most important concepts and problems in overconsciously changing pictures and the whole scripts of situations by the random or directed choosing of the comprehensible actions ways variants provide the especially successful decisions generation, which intuitively result to completely surprising

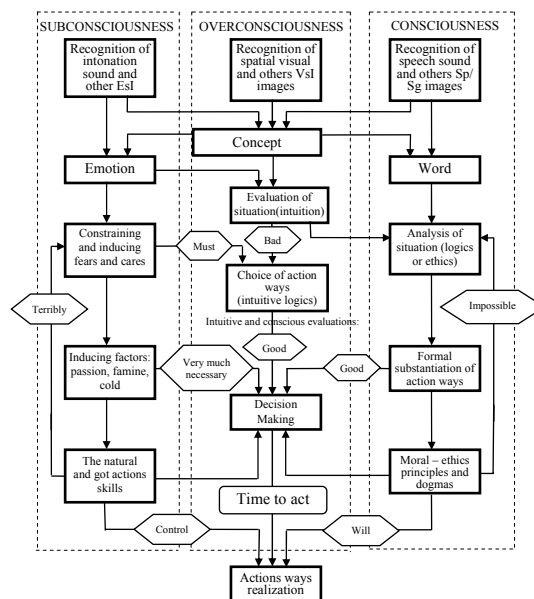


Fig. 2. The general scheme of conclusions in the emotional-oriented neural networks of human brain.

unexpressed, but to desirable results. Such "wonderful" prediction and corresponding rare, but successful concurrences of circumstances, really take place and are considered by many humans as the Miracle.

The human brain as neural networks super-parallel and highly reliable intellectual and emotionally – oriented supercomputer is the perfect creation of the Nature, but its logic organization and architecture can be realized not only on neurons, but also on some other elements or technological base in near and even the foreseeable Future.

#### **4 The Role of Fuzzy Intuitive Estimations and Fears in Decision Making Process**

The spectrum of the overconsciousness intuitive estimations-understandings of a situation by the person is insignificant. The negative intuitive estimations-understandings of current situation like "something is bad", "poorly", "very bad" and "is awful", through the mechanism of the Will and the subsystem of the Passion-Prana (Prana means the life power), as shown on United Seven-Components Model of Human Intellect (USCMHI), induce the alarm and Emotional Rise of Reserve Forces (ERRF), which provide through Neural Humoral System (NHS) inflow of forces for overcoming difficulties, problems or sufferings, and in case of powerlessness due to expected ("it is "very bad" and "is awful") cause so-called "black fear". The positive intuitive estimations-understandings of a situation, for example: "let it be", "not poorly", "there are no problems", "it is good-normally", "very well", "perfectly", also cause sometimes even the greater ERRF on the same Ring of Decision-Making (RDM): Will – Emotions (pleasure) – NHS.

The dynamical changes at the repeated independent decision of practical problems in the RDM are storing the skills of the intellect for "good" decisions acceptance on the concrete situations and thus its adaptation in the real world is provided. The conscious speech substantiation or the explanatory of the accepted decisions frequently appears difficultly formalized for the person or not explained at all, that results to misunderstanding or to mistrust on the people. The intellectual and neural-physical opportunities of the person adaptation to real environment conditions are extremely high. Undoubtedly, that the main role during adaptation plays not only the consciousness, but also overconsciousness and subconsciousness of the person and corresponding mechanisms and skills of situational management (See Fig. 2).

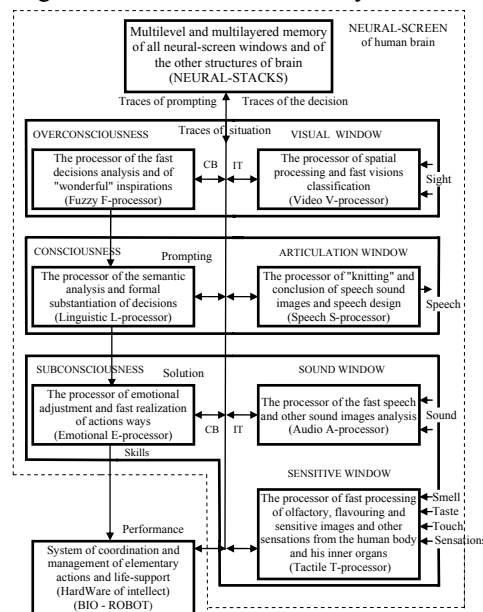
The development of the human intellect is provided due to the mechanism of self-training and accumulation of knowledge, skills of decision-making in contours of the mental overconsciousness (less often conscious) situational management by iterative overconsciousness (intuitive), subconscious (sensual) and conscious (formal) analysis of mental images of a subject and the actions ways, and the expected results with the subsequent formation of the overconsciousness intuitive (less often conscious logic) estimations-understandings of achievement degree level of conscious or overconscious goals.

## 5 The Structure of Processor-ware of Supercomputer of Human Brain

The uniform form for representation of the all traces of the objects for supervision images as traces of the structures of adjustments-associations of the neural networks, formed in neural-stacks of all windows of the neural-screen, plays the main role in the organization of coordinated work of overconsciousness, consciousnesses and subconsciousness and of their uniform interface as the Common Bus of Images Traces (CBIT). The beginning and the end of CBIT are in an impellent window of the human brain neural-screen, where as result of decision-making cycles the concrete decision on a concrete situation (See earlier Fig. 1 and Fig. 2) is realized.

CBIT is combine of the stacks of the all neural-screen windows with impellent window and its neural-stack, that is actively working in the decision-making Contour and includes: descending pyramidal ways – a spinal cord and ganglies – ascending pyramidal ways – the window and neural-stack of sensations and again an impellent window and its neural-stacks, and in some cases also visual and sound windows and their neural-stacks for the fast or direct (long) multi stages images recognition, conclusion and decision-making. The base structure of processor hardware for emotionally-oriented supercomputer of the future generations, capable to realize the basic functions of overconsciousnesses, consciousnesses and subconsciousness of the person on USCMHI, is shown on Fig. 3.

As it was shown before, the primary emotionally-oriented subsystem of overconscious-subconscious situational management can provide the continuation of human kind and the other representatives of the bio-World even in the most severe conditions of surrounding nature. Thus two base subsystems for decision-making are



**Fig. 3.** The base structure of processor-ware of the emotionally and morally-oriented supercomputer of human brain.

involved: the overconsciousness, working with the induced visions of perceived images-excitations and with the packed traces of visions as adjustments-associations of the neural networks, and also the subconsciousness, operating with sound, olfactory and sensational images, that induced and packed in parameters of neural-stacks.

The important factor in conclusions of human and in the all decision-making Contour is the visions of action subject, scripts of a concrete situation and expected result. Such visions should be reflected on the neural-screen during all the time of the operative processing of the speech and other images, which are formed and transferred on CBIT. Therefore, obvious is the special role of visual support for the working of the all subsystems of human intellect – overconsciousness, consciousnesses and even subconsciousness, so the special Common Bus for visual subject and sign images (CBSI), which directly connects the processor of spatial images processing (Video V-processor) by overconsciousness with the basic processors (neural-stacks) of the brain base subsystems is obviously necessary.

The consciousness is formed only after when the person seizes speech, i.e. the specific sound signals, which fragments (words) and their various elements (statement) have the certain conditional messages, accepted in some environment – in the society and reflected in the dictionaries. Such elements of speech (language of dialogue) by the messages spectrum should differ essentially from estimations-understandings of overconsciousness.

The consciousness of the person-expert can scan the all windows of the neural-screen and to generate the mental speech image, that is marking basing on the words and statements the specific features of certain image projections of observable object, that is provided the allocation of the information and its probable further registration. That is why in some believes, that “the first was a word”. It is true, but only for the human consciousness formation.

## 6 Conclusions

In the paper is suggested the base biological model of thinking: “any image – action”, and also the internal articulation (idea) or the external articulation (speech) are considered as the actions ways, that naturally depend on the collective actions synchronization. Although there is the "latent" system organization of cartoids connections in receptor and effector layers of human brain, we suggest the system-technical model of the functional-oriented neural processors and of the neural coprocessors interactions organization for processing of the various type of the images and of the images traces from the knowledge bases stacks. These elements are the base for the multilevel associations of the images and their processing methods as system-psychological software, which realize all the processes of cognitive, confidential, creative cogitative and creative activities of the person (for more detail see [1]).

The advantage of the suggested structures is their flexibility and feature to create the diversified contours for the mental images processing, that provides the various decisions making depending on certain situation. The thinking and feeling robots will be highly survivable and adaptive. The specific of the suggested structures is the



complexity of the artificial intellect subsystems integration in the real practice, because it requires the significant material and human resources. However, the effective realization of the intellectual systems is impossible without the concrete concepts of the architectonics of thinking.

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