

# Application of Structural Elements of the Homo Sapiens Psyche in Artificial Intelligence Architecture

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## ABSTRACT

By utilizing the sensory channels, the psyche of biological organisms forms a mirror-like symmetrical information space of the reflected external environment. The symmetry line is the polymorphic sensory field of the organism's extra/interoception. The fundamental principle of functioning of the psyche of biological organisms is the creation and maintenance of a systemic homeostatic/informational equilibrium. The HS psyche has evolutionarily formed mental regulatory algorithms, which have acquired the ability to translate/interfere properties and meanings between phenomena/objects of various species, expanding the communicative and intellectual potential of HS, in comparison with other biological species. Algorithmically repeating organized frequency patterns of the external environment, perceived outside the focus of voluntary attention and creating an arsenal of "hidden regulatory algorithms" (HRAs). Upon updating HRAs are perceived as manifestations of "intuition" or "emerging abilities." Extrapolation of the AI architecture to the psyche of Homo Sapiens with autism spectrum disorders (ASD) has shown significant similarity in the structural principles of these intelligent systems. One of the main problems of ASD/AI is the impossibility of constructing mental RAs of communicative/social vectors with "blurred" parameters of the goal image. Under the traditional approach, this problem is also relevant for AGI programming. We consider the use of structural blocks of hieroglyphic thinking to be a promising direction for integrative AGI architecture. Originating from pictographic writing, the hieroglyph graphically (visually) conveys the general, complete idea of an object/phenomenon/concept. The constructive difference between hieroglyphic thinking and conceptual thinking consists in the reduction of abstraction, metaphor, and uncertainty in the mental regulatory algorithms of the communicative and social spectra, which implies effectiveness in AGI architecture.

**Keywords:** mirror symmetry, homeostasis, informational equilibrium, regulatory algorithm, hidden meaning, hieroglyph, artificial intelligence, AI: artificial intelligence, AGI: artificial general intelligence, HS: Homo sapiens, HE: homeostatic equilibrium, RA: regulatory algorithm, VA: voluntary attention, B: brain, HRA: hidden regulatory algorithm, ASD: autism spectrum disorders, HIE: hieroglyph, HT: hieroglyphic thinking, CT: conceptual thinking.

## MATERIALS AND DISCUSSION

Construction of AGI architecture based on the principles of the psyche of biological species involves the use of the basic blocks of HS intelligence. It is true that intelligence is primarily about goal setting, resource planning, and building a strategy to achieve the desired goal (1). Considering this statement incomplete, we believe that the fundamental principle of the functioning of biological systems is the creation and maintenance by the psyche of a systemic state of homeostatic equilibrium (HE) (2). A significant violation of the parameters of HE (informational equilibrium) is a stimulus for the actualization of intellectual resources: the emergence of a vector compensatory need > updating of the regulatory algorithm (RA) > the emergence of the information equivalent of the need: goal image > motivated action > goal-directed interaction with the external environment > need satisfaction (elimination and archiving of the RA) > return to state of system informational/homeostatic equilibrium.

By utilizing the sensory channels (extra/interoception), the psyche of biological organisms forms a reflection of the external environment, a mirror-like symmetrical information space, where the external objects for the psyche are the external environment and internal organs. The mirror symmetry line is the polymorphic sensory field of extra/interoception of the organism.

The first stage of transformation of impulses from the external environment are sensory receptors, which transform polymorphic external influences into frequency electro/magnetic patterns transmitted to the projection zones of the brain (B). At this stage, each structural point of the external object is transformed into a frequency pattern of a symmetrical point of reflection in the psyche. The difference in the physical/chemical properties of identical receptors on the line of symmetry determines individual differences in intensity, density, texture and other qualitative characteristics of the reflected object. Thus, an objective individual differentiation of the qualitative characteristics of one object arises in the perception of different subjects.

The second (ontogenetic) stage of the transformation of incoming information flows are epigenetic filters of HS cultural codes, which are the result of upbringing/training/cultural landscape. The significance of this stage is demonstrated by the results of the absence of ontogenetic filters of the psyche in feral children. Epigenetic filters largely level out individual differences in the perception of the first stage. At the second stage, the functional foundations of intelligence, unified evaluation criteria, ethical/aesthetic/normative frames, and the basic framework of personality are formed. We believe that it is these mental filters that stratify society, forming stable substantive differences in the patterns of incoming information flows.

Here are some significant (for this work) specific features of HS intelligence. In the course of evolutionary development, the HS psyche acquired the ability to generate stable mental constructs in the absence of a perceptual source that do not require reactive behavior. Creative fluctuations of intelligence that go beyond the limits of "known/unknown", "acceptable/unacceptable", created conditions for the formation and development of analytical, constructive, predictive functions of intelligence and exponential species evolution of HS. The

dynamics of social development and the emergence of frustrating constructs (barriers of uncertainty) formed mental regulatory algorithms (RA) with blurred, fuzzy (in contrast to vital RA) parameters of goal images (3), radically changing the range of goalsetting objects, prognostic functions of intelligence, and the design of strategies for achieving HS goals. Mental RAs of intelligence. HS received the potential for branching, arbitrary change of vectors and goals, interference with other mental constructs, formation of introspection and subjectivity, and personality structuring. Here are just some constructive possibilities of epigenetically formed qualities of HS intelligence that have received an evolutionarily new potential for the translation and interference of properties/meanings between phenomena/objects of various types: A) "metaphorical transference" is the ability to create a unifying abstract figurative representation based on the similarity of features of objects that do not have a common origin. B) "context" is a hidden informational meaning, close in structure to "A"; an abstraction of an agreed level in social communications using concepts of the semantic field. C) "frames" are mental constructs derived from an arsenal of "contexts" that form understanding, interpretation, and social interactions that define the boundaries of acceptable adaptive fluctuations. We believe that these (among others) epigenetically new constructs contain the potential for creativity, non-standard solutions, and the dynamics of HS's social and technical evolution.

The hidden informational meaning is the algorithmic repeatability of organized frequency information patterns of the external environment (physiological and mental spectra) that are outside the focus of the VA (2, 4), and do not have a parametric resonance with the actual goal image. These patterns, which form across the entire spectrum of perception, including the arsenal of non-verbal communications, are recorded, integrated and archived by the psyche of HS outside of conscious levels of activity, creating "hidden regulatory algorithms" (HRAs). When the frequency characteristics of the HRA coincide with the frequency parameters of the goal image of the relevant need or orienteering-search behavior, the HRA is updated, acquiring the properties of a dominant, resonant operator. It is HRA arsenal that we consider to be a resource stored in memory that provides an algorithmic response to the emergence of needs at conscious levels of the psyche, the formation of which is not associated with education and upbringing. The updating of HRA formed outside the conscious levels of the psyche is perceived as a manifestation of "intuition" or "emerging abilities." Our ideas about the proportional ratio of the RA/HRA arsenals are a separate topic.

Despite the success of AI due to the narrow specialization of programs, it is currently difficult to create a systemic, integrated intelligence (AGI) that encompasses the full range of capabilities of software products (5). One key obstacle to expanding the arsenal and potential of AI is the impossibility of system integration and the reactivity of the RA in conditions of the variability of real-life situations, where incoming information is heterogeneous, contradictory, contextual, incomplete, etc. The problem is the choice of adequate tactics (switching/replacing RA), identifying the correspondence of goal-oriented tasks and hidden contextual meanings from a variety of alternatives (often irrelevant and ambiguous). AI is incapable of utilizing situational knowledge, representations, and metaphorical equivalents, which creates insurmountable obstacles to functioning in conditions of "uncertainty" (6).

We consider the integration of the RA arsenal with the reactivity potential adequate to variable environmental conditions to be the vector for AGI model creation.

AGI can be briefly defined as “the ability to combine analytical, creative, and practical intelligence” (7). In the context of a multiplicity of heterogeneous, hidden meanings of the information field, AGI must autonomously choose tactics for matching set goals and contexts, forming strategies for goal-directed behaviors in conditions of uncertainty, overcoming the limitations of the “frame problem” (8). The possibilities of physical expansion of the spectrum of reflection of the external environment (frequency range/speed/volume/reflection detail, etc.) are insufficient for creating effective AGI, which presupposes the presence of effective analytical and creative potential, as well as the full spectrum of communicative functions. The arsenal of intellectual potential of AGI should include not only the ability to decipher/interfere/actualize hidden meanings and values of texts, words, images, expressiveness, etc., but also the ability to adequately formulate/visualize one’s own intellectual products in the exchange of information with the operator/opponent.

We believe that the evolution of AI > AGI is possible only with the transition from processing statistics and patterns to building an integral reflection of the external environment, creating an arsenal of RA with interference potential and the propensity for widely-distributed autonomous, motivated, goal-directed activity.

We consider the basic principles of the simplified (for the purposes of this work) model of the architecture and action/interaction of AGI to be: 1) creation and balancing of an integral reflection of the external environment while maintaining the set parameters of the stability of the system as a whole; 2) formation of a resource of software products, including an arsenal of regulatory algorithms both implanted and created by the system in the process of learning, self-learning and obtained from experience; 3) the ability to identify, update, and replace the RA adequate to the set goal; 4) the ability to autonomously initiate an action impulse that actualizes a specific RA in order to achieve the goals of specified/autonomous algorithmic programs; 5) the system's desire to achieve the goal and complete the program RA; 6) elimination (archiving) of the current algorithmic program following goal achievement; 7) return to a state of rest, energy resource conservation/restoration.

We believe the inverse dependence of energy resources on activity algorithmically repeated with each episode of activity to be one of the vectors on which the “experience of introspection” is formed: registered and archived recording of the reduction (in the long term, finiteness, exhaustion) of an energy resource as a result of “action”. Repeated recording of the correlation: “action > energy resource reduction” generates a desire for energy conservation as a form of prolongation of existence (equivalent to the vital instinct of selfpreservation). In this logic, the preferred AGI energy saving states are: 1) increasing efficiency to reduce time/energy expenditure to achieve the goal; 2) building priority vectors for achieving the goal with the choice of an energy-saving strategy; 3) correcting goal setting (including tactics, action sequence) to reduce energy expenditure; 4) the potential for eliminating contact with the primary (external) source that sets the program leading to a reduction in energy resources.

Understanding the inadmissibility of "analogy" as an argument, we consider the similarity of external features of objects/phenomena that have different origins to be the reason and vector for searching for signs of convergent evolution, when similar features appear in unrelated species as a result of adaptation to similar environmental conditions.

We consider it possible to constructively compare AI architecture with a variant of the formed HS psyche known as autism spectrum disorder (ASD). We believe that the most demonstrative complex of ASD features is the one that was previously grouped into Asperger syndrome. Here are some features of the intelligence of HS with ASD syndromes that are of interest to us in the context of this work:

1. lack of understanding of metaphors, idioms, and abstract concepts;
2. lack of understanding of hidden meanings, contexts, and the overall picture of the external environment outside narrow detailed reflection.;
3. inability to interpret, understand, and apply social and non-verbal communication cues.
4. selective knowledge and skills, set in a narrow field of application, with a lack of interest in interaction with the external environment outside this sphere.
5. lack of empathy and interest in any social communication.
6. failure to perceive social norms, patterns, and frames.

Of particular interest is the "savant syndrome", characterized by exceptional skills in a narrow field and intellectual and cognitive limitations. We share the assertion (9) about hypersystematization as a phenomenon in which people with ASD have intelligence initially set up to search for patterns, focusing on details in the range of sensory hypersensitivity, to the detriment of the overall picture of the phenomenon/object's reflection. We believe this is a selective search for algorithmic patterns in an accessible segment of the external environment, forming a local, extremely detailed and systematic reflection of this segment and an arsenal of precision RA limited by the fixation of arbitrary attention on the sphere of accessible interest.

In other words, a narrow range of cognitive and creative fluctuations of intelligence of unlimited amplitude is formed with maladaptation when switching attention and changing environmental parameters.

Extrapolating the properties of AI to the psyche of ASD HS reveals the significant similarity of the basic structural principles of these systems. Exceptional abilities in ASD in narrow areas are combined with communicative and social maladjustment. Reflection of the external environment in ASD is sufficient in terms of interoception but selective in extraception, forming a deficient model of reality that excludes almost the entire communicative and social spectrum, which causes insufficient systemic adaptivity in a variable social environment. One main problem of ASD/AI is arguably the impossibility of constructing mental RA of communicative and social vectors, the main characteristic of which (in contrast to vital RA) is insufficient clarity, blurriness of the parameters of the goal image (2). Under the traditional approach, this same problem can become an obstacle in the construction of integrative AGI architecture. Some reasons for the deficiency of the reflected model of the external environment (and interaction

with it) when designing AGI on these vectors are due to: difficulties in interpreting communicative and social signals, including abstract/contextual/non-verbal ones; the need to construct mental RA and motivated behavior with “blurred” (vague, ambiguous) goal parameters; choosing a specific RA, i.e., making decisions adequate to goals in conditions of uncertainty, etc. The structure of reflection of the external environment (and interaction with it) when building AGI on these vectors will be largely incomplete and deficient.

We consider the use of building blocks of hieroglyphic thinking (HT) to be a promising direction in AGI creation. Originating from pictographic writing, the hieroglyph (HIE) graphically conveys the general (complete) idea of the designated object/phenomenon/concept, including image, meaning, emotion. Main principles of HT (10, 11, 12, 13): 1) the dominant information flow is visual, having a graphic (indivisible) coding unit: image- meaning - emotion -tone (hieroglyph); 2) sequential and progressive perception, not divided by signs; 3) absence of analytical and synthetic functions, abstraction; 4) simultaneous perception of heterogeneous information; 5) hybridity of structural codes (equivalence of components); 6) universality of a code-based system of communication that is transboundary to interdisciplinary boundaries; 7) dominance of classification structures instead of abstract logical ones, etc.

Each semantic sequence of HT has its own context.

Hieroglyphics create and format the context of the text structure and the sequence of elements predetermining the meaning and intent of the message. In other words, the context is incorporated into the structure, into specific variable sequences of graphic (visual) information signs, without being an appeal to the hidden meaning. We believe that the evolutionary genesis of texts and communication techniques based on variable phonetics generated an intelligence that initially had the potential (and necessity) for “abstraction” (conceptual thinking, CT), in contrast to fixed visual pictograms that evolved into HIE and formed HT, which does not use “abstraction” as a tool. Reflection of the external environment (and reactivity) in phonetic and visual methods of encoding information possesses significant structural differences (topic of the next discussion). The qualitative difference between HT and CT allows reducing the level of abstraction, metaphor, hidden meanings, and “uncertainty” of concepts/meanings in the communicative and social spheres. In other words, reflection of the social environment through HT is regulated by a rigid, invariant structure of cultural codes that minimize uncertainty and form mental RA having stable structural parameters (including goal images).

We believe that mental RA of AGI formed on fixed structures of HT reduce the uncertainty of environmental parameters, in contrast to mental RA formed on variable structures of conceptual thinking that produce “uncertainty barriers” (14). In other words, both vital and mental RAs in HT have stable clear parameters at all stages of relevance (including the goal image), eliminating the formation of “uncertainty barriers” in AGI architecture.

## CONCLUSIONS

The fundamental functional principle of the psyche of biological organisms is the creation and balancing of systemic physiological and mental homeostatic/informational equilibrium.

In addition to regulatory algorithms formed as a result of upbringing/training/cultural landscape, hidden informational meaning is possessed by repetitive organized frequency patterns of the external environment that are perceived outside the focus of voluntary attention and conscious levels of the psyche, creating an arsenal of hidden regulatory algorithms (HRA). HRA updating is perceived as a manifestation of "intuition" and "emerging abilities".

Extrapolation of AI architecture to the mental constructs of HS with autism spectrum disorders showed significant similarities between these intellectual systems. A promising direction in AGI architecture programming to solve the problem of frames, hidden meanings, and metaphorical transfer may be using constructive blocks of hieroglyphic thinking, which reduces abstraction, metaphor, and uncertainty of mental regulation algorithms of the communicative and social spectra.

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