

Intelligence in perspectives of the Systems Psyche: Natural, Human and Artificial



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Abstract

Mind and Intelligence are two important tools used by human psyche for its behavioral output. Human intelligence is a creation of open-ended intelligence in nature through evolutionary process. Artificial Intelligence (AI) is a creation of human intelligence. Hybridization of physical science with biological materials and psychological functions is felt necessary for future progress of AI in an open-ended manner. Open-endedness is to be secured by acquiring the cascading integrity across the nested hierarchy of nature. Lessons for devising open-ended AI device could also be learnt from how the message in neural signals could reach the domain of consciousness by climbing up, and how the 'will' of consciousness is translated as neural signal by climbing down the ladder of cognition within the systems psyche.

Keywords: Systems psyche; Intelligence; Artificial intelligence; Open-endedness; Human intelligence

Definition of Intelligence

There are about fifty odd definitions of intelligence. The definition, which would be useful for improvement of current state of affair in Artificial Intelligence (AI), could perhaps be as follows. Intelligence is the ability of the systems to choose the best from all available options. In absence of any option it is the ability to perform as best as it can, with open-endedness. The process of development and execution of intelligence are complex. Why complex? Because, it is not simple to understand, not simple to emulate and even difficult to simulate! It involves several operations layered hierarchically in a labyrinthine manner.

Three main domains of intelligence

Intelligence could be seen working in three main domains [1]. First, it could be as we see it in nature. This is Intelligence in Nature. No one knows who or what created this or how does it operate? Intelligence is there in nature as we observe its role in the process of biological evolution, in formation of organs such as compound eye, human brain etc. According to many sociologists, even the cultural evolution has been shaped at many points by intelligence in nature. Second, we are familiar with human intelligence. We all work with two psychological tools; our mind and intelligence. Human intelligence is far more complex because of socio-cultural influence in addition to its complex biological support system for psychological manifestations. Our 'self' is the driver of this intelligence while past memory and experience are its fodder. Most of the achievements as well as evils of mankind are primarily the products of human intelligence. Intelligence is

so important in determining the behavior of the systems that in *Bhagavat Gita*, Lord Krishna has been seen to ask Arjuna, "Offer me your mind and offer me your intelligence. Be sure, following this you would reside within me." Third is Artificial Intelligence. AI is a creation of human intelligence by an inside-out phenomenon. What was happening inside the psyche has been discovered, understood and made to work, although partially, within an outside mechanical system. AI reflects ingenuity of human intelligence. Presently, AI is considered to be the religion of the scientists, while the robot is considered their God! We will revisit the statement in the concluding remarks of the paper.

Characteristics of the three intelligences

Nature's intelligence works with a program, which is based on genuine open-ended algorithms. This is not specifically limited to work as a great optimizer for any particular problem/world. The program never runs out of steam of energy. It never exhausts its search space space or options [2]. Being nonspecifically open-ended both horizontally and vertically, it exhibits, while operating, explosion of novelty, complexity, solutions, as well as problems. Human intelligence, as it is a creation of intelligence in nature, shows graded vertical openness. Its vertical depth, although, is inexhaustible its manifestation is limited by cerebral cortical infrastructure. Horizontally it could be open to a few worlds while at the same time closed for many other worlds. Artificial intelligence, on the other hand, so far has no contribution from operation of 'life', and therefore cannot act beyond algorithmic specifications, cannot act in an open-ended manner when there is no option available. AI thus, in its

present state, does not fulfill the second part of the definition. On the same vein, this fault-line in AI offers the scope and future direction for its growth.

Open-endedness

The problem with open-endedness of a system is that the system remains in a fragile state with proneness of its cognitive apparatus to several kinds of errors. There are numerous slippery slopes from the open vortex. Sometimes it seems to be a quagmire situation! Supracortical consciousness and the Essence of the Multiversity (systems of multiple universes) are two open-ended theories in the context of human brain and the universe respectively, accommodates within intellectually comprehensible common worldview. Supracortically open brain rhythms with multiple universe(s) and multiple universe(s) reciprocate with supracortically open brain. The two might be twin theory, which have been pursued by the author since 1985. Future of AI could grow well under the umbrella of such theory. Open-endedness demands integrity of the systems across the cascade of hierarchically nested nature; classical integrity in synchrony with quantum rules, quantum integrity in synchrony with informational/phenomenal mechanics, informational/phenomenal integrity in synchrony with inviolable rules of nascent nature/mother nature and finally in harmony with the rules of operational mechanics of consciousness. A difficult job with difficult tasks!

What the robotic intelligence in its present state has in its possession?

The robot has a complex signal system, hierarchically structured. Unlike human being or an organism, robot's signal processing is remarkably error-free. It has memory of processed signal, the capacity of which is far more than human being. It can process signal much faster as compared to human being. It often performs complicated task faster (even often cozier) than human being. Since a robot does not need oxygen or water for survival, to perform a specific function it can be sent to a place where live human or animal cannot survive (e.g., in Mars).

What the Robotic Intelligence does not have in its possession?

The robotic intelligence does not have wide range of activity like human mind. Since it does not have a sense of 'self', a robot's intelligence totally lacks episodic memory. Its memory of signals even cannot be equated with semantic memory of information as seen in a living organism or being. The robot does not have the 'sense' of the whole and its parts. It has no ability to manage unexpected uncertainty. It does not have choice outside algorithmic pre-specifications. It does not have the ability to learn from its past mistake. Automated AI-device might compete with human being for a job. However, a robotic device does not have any intention to do or not to do a job. It does not have any feelings and emotional response for the task it is engaged in and therefore it has no desire or will to improve on the job. Therefore, AI device cannot replace human being even for a specialized job.

Why is it so difficult for robotic intelligence to have what the psyche of a living being is capable of?

Intelligence is an outcome of interaction of operations of mind and self with active participation of stored memory and experience on the *background*. Some of the properties of mind have been mechanized in robotic intelligence. The ability of context-based choice from different available options is a very preliminary property of self, which has been inculcated in AI. In robotic intelligence, full property of mind and self, as described earlier [3], are difficult to blossom. The reason is as follows. There is no 'life' and consciousness in AI systems. In systems psyche, the strength of mind comes from 'life' and fecundity of mind comes from consciousness. Self and 'life' in a living situation maintain a tangled hierarchy and are found indispensable for each other's function. Emotion and feelings generate as outcome of operation of mind, information and life. However, the feelings of emotional reactions are experienced by the non-observable operator 'self', which has the ability to modulate it. Consciousness supervises all autonomous activities of mind, self and life. Therefore, full blossoming of intelligence could happen only in a live conscious situation.

The Cognitive Apparatus

The Systems Psyche

Psyche, as conventionally understood, is not just mind or consciousness. It has five constituents as ontological entity with defined specific operations working hierarchically in a labyrinthine manner. The author developed the concept of systems psyche [4], which consists of operators like, and operations of information, mind, self, life and consciousness. Systems psyche has fully blossomed in human system and works as an interface between brain-bound and brain-independent consciousness [5].

Following is a brief description of the constituents of the cognitive apparatus, which has been called systems psyche. Physical world communicates through signal. In human situation, it is mind, which chooses signal from noise. It is also the operation of mind, which converts non-intentional signal into intentional information. In the artificial device, although, sorting out of signal from noise is partially possible, no artificial device is capable of making information out of signal. Information thus becomes the unit of communication between two conscious systems. Mind is at the forefront of the organ of communication between two conscious systems. Mind is, however, not capable of converting information into knowledge. It is the 'self' of the systems, which does this by formatting this information for the whole. Self is that which evokes the sense of 'i', 'me' and 'mine' within the system. Self is representative of consciousness, customized to work as CEO (Chief Executive Officer) of the systems. 'Self' programs mind for signal networking while itself remains engaged in network analysis and operates with formal logic. The process of cognition by psyche could never be complete and fanciful without presence of operating 'life'. 'Life' is observably characterized by the ability of the systems

to maintain homeostasis within. Homeostasis is all-inclusive; at biochemical level, at biophysical level and even at subtle level.

At the subtle level, life-processes execute uncertainty-certainty homeostasis, asymmetry-symmetry homeostasis and dark energy-visible energy homeostasis. Interaction of 'life', mind and information generates feelings and emotion within the systems, which is experienced and could be modulated by self. It is 'life', which shapes and designs the experience from knowledge architecture developed by self. Information has intentional property. Knowledge, in addition, has sensor property. Experience has, in addition, negotiating and censoring property. Experience also has predictive ability. Wisdom shaped out of experience manifold of a large number of systems has governing property. All mind, self and life work under the umbrella of consciousness. With coordinated support operations from self and 'life', operating consciousness is responsible for awakening, awareness, choice, decision and will. These five abilities have relationship respectively with cascading layers of *supporting* consciousness, *participating* consciousness, *intervening* consciousness, *creative* consciousness and *ground* consciousness. In the hierarchical line of management, mind reports to self. Self and life maintain a tangled hierarchy. Both self and life independently report to consciousness. Consciousness reports to none but to itself. A working definition of consciousness is that which looks after and is in-charge of what all is going on in autonomously operating mind, self and 'life', in terms of quality management of information or phenomena within the systems. Consciousness *supports* the autonomous activity of mind, self and life. It often *participates* in their activity with contribution of advice and suggestion. Rarely consciousness *intervenes* in the system's function to censure with a view to preserving the integrity and the wholeness of the systems. Consciousness regularly *indulges in research* and *creativity*, beside its activity as an ever active and alert *ground*. The *ground* consciousness is stacked with wisdom manifold.

Three dangerous trends in practical use of AI

With robotic intelligence, the scientists have build up pymetrics, the next generation career search platform (founded by Frida Polli and Julie Yoo), kismet robot (affective computing technology developed by Cynthia Breazeal) for reciprocal facial expression following eye contact, and humanoid receptionist now used in banks and similar places, for examples. There are computer games such as alpha Go, which can defeat human expert! With machine learning one can track the traffic over the road to destination, trace a lost car or a missing child or even identify person's handwriting. However in absence of 'life' and axiology of consciousness, the pursuit of AI can take three dangerous trends; (i) production of robotic weapons capable of mass destruction, (ii) enhancing pleasure of human sexuality by sex toys and sex robots, which is not accompanied or complemented by adequate feelings, emotion and compassion between the partners and (iii) possible reduction of human capabilities by production of vacuous brain. The first two trends

are guided respectively by uncontrollable human 'ego' and drive for 'sex'. The third one is a leftover effect of an unplanned journey. It is said that intelligence generate on active participation of stored memory and experience. If different kinds of memories are outsourced from the human brain to different robotic devices then how human brain could act optimally to generate intelligence! Brain-AI interface device could severely impede the independence of the human brain.

The Desirable Trend

What is desirable is to bring femininity in the whole affair of presently cultivated masculine culture in AI. This could possibly be done by hybridization of physical science with biological materials (natural biology products or synthetic biology products) and thus develop biologically inspired systems science (BISS). From machine learning one has to shift focus to evolutionary algorithm(s), activity statistics, quality diversity program etc. [1]. One of our goals is to produce an intuitive computer, with the help of biological sensor and censoring materials, which could execute checks and balances at the points of critical instability of the systems. The sensor property in biological materials has been observed in proteins of tertiary and quaternary structure as well as in spherical proteins like histone. Censoring property in biological material has been observed in proteins of quaternary structure and in spherical proteins. How all such chemicals such as proteins of complex structure, DNA-as-such or DNA within protoplasm could be gelled with liquid metals, special chemical jelly [6], liquid crystals (?), and be used for this hybridization, merit further investigation. 3-D printed brain could act as great sensor and censoring device. The scientists working in the field of AI need to have an integrated 'theory', which is likely to conform to the experimental results and innovations, and has the ability to grow for a larger worldview. Such a theory has been constructed by the author in the ladder of cognition [7] through four well-defined operations. Operation I is for converting signal into information. Operation II is the process of building up knowledge from information. Operation III involves the process, which transforms knowledge into experience and operation IV is by which system-confined experience becomes a worldview for a number of systems to follow. Psychologists imply the prime role of mind in operation I, prime role of self in operation II, prime role of 'life' in operation III and special role of consciousness in operation IV. None of the operations and operators is fully independent. The given autonomy is stretchable within the holonomy of the systems.

The ladder of cognition

The ladder of cognition (Figure 1) begins with sorting out signal from noise! Non-intentional signal is then converted into intentional information. Information builds up into knowledge. Knowledge is that information which could be used without further deliberation. This is possible because unlike information, knowledge is holistically formatted for the systems (Gödelian information). When the invariant symmetry architecture of knowledge can withstand the symmetry-breaking processes

of 'life', the knowledge becomes experience of life. Experience is system-confined. There are occasions when the experiences of a large number of similar systems concur and generate the wisdom/worldview. This description of the ladder is in terms of linguistics. The milestones on the ladder could also be described as factual knowledge/data (replacing signal), informative knowledge (replacing information), formative knowledge (replacing experience) and sublime knowledge (replacing wisdom). The stairs of the ladder could also be articulated with the terminology used in information

science, such as space-time construct of information (replacing signal), Shannonian information, Gödelian information, information manifold, and crystal information. Following the ladder in mathematics, one travels from arithmetic/algebra to geometry, symmetry, super-symmetry and the Point/Moment of wisdom. Note the limitation of our language in the expression. We begin the cascade with signal, which is the space-time construct of information. We end the ladder on a Point (space) or Moment (time) of wisdom.

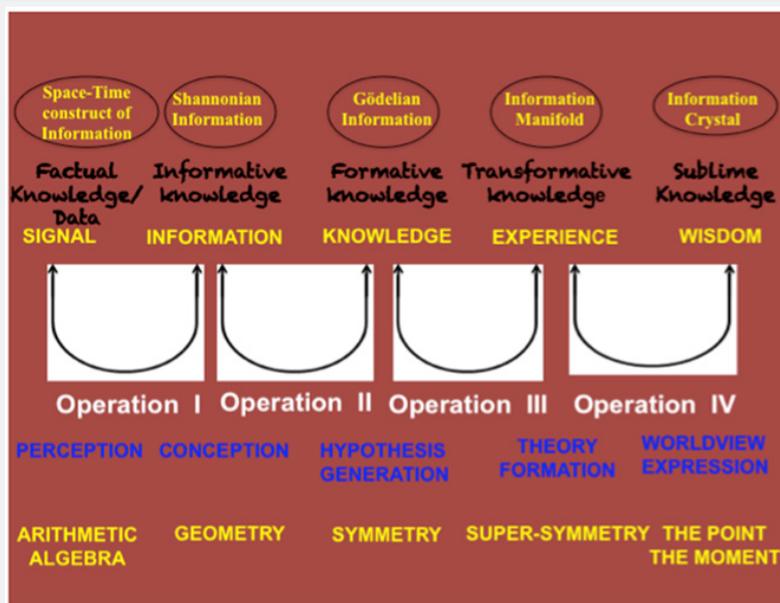


Figure 1: This shows the ladder of cognition with five milestones and four operations in between. Operations are bidirectional. Milestones have been described in terminology of linguistics and in the terminology used in information science and neuroscience. One may not use the psychological terms for the operator and the operations while developing AI. Operation I it is primarily of mind, II of self, III of 'life' and IV of consciousness. The corresponding ladder in mathematics has been shown at the bottom of the figure.

With this model in hand, we are now in a position in explaining the cascading steps from sensory inputs to behavioral outputs, from perception to wisdom journeying through the *thin layer between neuroscience and consciousness*. Perception involves the process of distinguishing signal from noise. When the signal takes the shape of specific information, the concept is build up. Informed concept further develops into hypothesis. Theory accommodates several hypotheses. Under the umbrella of worldview, several theories work. Neurologically we travel from coding of signals to neuro-informational geometry. Neuro-informational geometry develops an invariant symmetry in form of architecture of knowledge. Experience is designed out of a number of knowledge architectures involving neural manifolds. However, nothing is registered, attended and experienced till there is accord from consciousness (Attention). Therefore, till such time, 'self' cannot choose, or execute the 'will' on behalf of consciousness. The polarity of neuronal cell membrane and extensive tripartite synaptic networking guide the neural signal to climb through the ladder of cognition within the systems psyche to reach the domain of consciousness.

The brain is not the source of consciousness. Human brain could be considered, for simplicity, an "information condensate"

working like a "diffraction prism" inserted on the pathway of vertical vector of the "radiation" from any and every Point of wisdom in nature. The layered disposition of neurons over the cerebral cortex help the horizontal balancing act in neuro-information dynamics executed by the vertical vector of this radiation. This lateral balancing of vertical vector, in turn, is required for cosmo-cortical interfacing at the physical energy level (Adrian Klein in e-mail communication with the author following author's publication on Mechanism of Intuition in *Current Opinions in Neurological Science* 2.1 2018: 356-361).

Concluding Remarks

Intelligence at the level of nature, in human condition and in artificial state have been discussed in the perspectives of the systems psyche. Scientists working on AI are to learn from how intelligence is generated in the systems psyche and then operates in human condition on the thin layer between neuroscience and consciousness across the pathway from signal to 'will' and from 'will' to signal climbing up and down respectively the ladder of cognition! The effort on AI might not succumb to the purpose of uncontrollable human ego (production of war weapons) or insatiable human sexual desire (production of sex robots). To bring open-endedness in the automated device one has to plan

hybridization of physical science with biological materials and psychological functions along with securing nested integrity (ability for check and balance at the critical point of instability) across the spectrum of nature.

During this exciting phase of science, while great churning has been going on in nature influencing evolution/transformation of human brain and in its scientific endeavors, the worldview that has been emerging could not be lop-sided. It accommodates equally Science Humanity and Spirit in consonance with three fundamental questions well articulated thousands of years back in *Prasna Upanishad*; who am I (Addressing Humanity)? What is this world (Addressing Science)? And who is God (Addressing Spirit)? In this scientific endeavor on intelligence, Artificial Intelligence makes room for the world. Human Intelligence takes care of self, and should we pursue with Intelligence in Nature, it makes room for God!

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