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Research Article

Human as an Informational Device

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Abstract

Introduction and aim: Unprecedented development of the informational devices at large scale allows nowadays the intervention of the info-devices in the human body for diagnosis and treatment, or the info-assisted analysis and prediction in the healthy field. The aim of this paper is to approach the human functionality from the perspective of an informational device.

Analysis: The approach of the informational system of the human body in informational terms reveals two main categories of info-operability, one of them addressed to the mental concepts, expressible by language, and another one to matter-related information, as an intra/inter-communication between cells, supporting the body maintenance and procreation by automatic/programmed processes. It is observed that the communication by electrical pulses in the nervous system, is carried in a binary YES/NO (bit) manner, and the synaptic transference of information by chemical agents of opposite stimulating/inhibiting characteristics determines a new YES/NO step of transmission to the next neuronal cell. The matter-related mechanisms are based on the structural complementarity of the components, as a selective YES/NO process of communication.

Results and Discussion: The human organisms works as an informational device with four terminals: (i) an info-input for the info-reception by sensors; (ii) an info-output terminal, where the information is expressible by language and/or corporeal attitude, measurable in bits; (iii) an info-genetic input with information inherited from the parents, expressing the corporeal development and behavior features; (iv) an info-genetic output, expressing the genetic/epigenetic information transmitted to the offspring. The operative informational system operates the signals from reality as a rapid reaction/response, whereas the programed informational system assures the body maintenance in steady/standby state, apt to receive and operate the signals from the surrounding reality, similarly with the electronic devices.

Conclusions: The human organism can be described as an informational device, working in a small-signal regime, able to learn and self-organize the component structures as a function of the surrounding conditions.

Keywords: Mental info-operability; Matter-related information; Electrical pulses and synaptic plasticity; Long-lasting memory; Genetic/epigenetic communication; Steady/standby state; Operational info-signals and maintenance system

Introduction

It seems to be surprisingly to introduce the concept of informational "device" as human is concerned, this is a specific term in science and technology of information, referring to systems and their components able to receive, transmit and operate with information. Could be human described as an informational "device"? This question seems to be unusual because the informational concepts were not practically introduced systematically/coherently in the description of the human body and its operability [1], although, the informational world in which we live today is really abundant in information and informational devices, penetrating and enriching our own daily life with communication/computing systems. The field of the informational devices is now enlarged by the integration of intelligent medical engineering tools in the healthcare domain [2]: the artificial intelligence (AI)/learning machines has been used not only in image analysis for dermatology, pathology and radiology for fast diagnostic, but also to decrease medical errors, recommendable for optimized therapies in complex and chronic illnesses. AI/learning machines with big data

analysis in medical engineering has been gained a high attention as a practical technique applied in healthcare big data including the medical exploration, analysis and diagnostic, and also as a basis for risk analysis and treatment in psychiatric disorders, particularly in major depressive disorder [3], hearth failure [4] and more recently in the investigation of life, exploring the high throughput molecular assays in the called "omics" branches (e.g., genomic, proteomic, epigenomic, metabolomic or organimics data [2,5].

How the human organism works as an informational device can be discussed from an informational perspective. Substantial advance in the approach of unsolved issues in various scientific fields have been made till now by the introduction of the concept of information [1,6](i) philosophy, specifically concerning the mind-body relation problem [7], the nature of consciousness [1,2,8], the "hard" problem of qualia [7]; (ii) in neuroscience and neurology, concerning the informational mind-body connections [9], informational-assisted brain evolution [10], neuro-quantum phenomena [11, 12], the informational neuro-systems of the brain and their functions [13] and the relation with the universe [14]; the integration of information by epigenetic processes [15,16]; (iii) in gerontology and geriatric field regarding the life cycle [17], decision or free will [18], immortality [19], music-based neurorehabilitation therapy [20]; (iv) neuro-psychology and brain sciences concerning the functionality of the posterior cingulate cortex [21]; (v) psychology and behavioral sciences as the attitude and its evaluation is concerned [22,23]; (vi) psychology and psychiatry concerning the informational assistance of the neuro-equilibrium [24]; (vi) in neurology, treating the mental aggressiveness and its deterrence [25] and psychiatry on mood disorders [26]; (vii) physics of consciousness and life and applications [27]; (viii) social sciences on the language development and symbolism as informational tool [28]; (x) life science approaching the nature of life [29,30].

The penetration of the artificial informational systems into the biosystems and/or their symbiosis, or the mimetic/imitation of some biologic processes to design/built biocompatible and/or new performant info-systems is an actual modern effort with deep applications in medicine and not only [31]. On this line, can be remarked advanced recent results concerning various DNA-based informational biocompatible devices and biosystems for diagnostics and health care like biocomputers and biotransistors with DNA and RNA, biological memories, molecular imaging DNA-based cripto-systems, genetic neuronal relays, bidimensional DNA nanostructures, FET biotransistors with carbon nanotubes, silicon capacitive sensors for biomedical applications [32], allowing a close inter-correlation for beneficial mutual development of life science and science of information and technology, concerning the artificial intelligence represented by learning machines/big-data [31]. Because information becomes a common interface between the info-device domain and living structures, it is interesting/convenient to approach the functionality of the human body from the perspective of an informational device, to better understand it in terms of device, and to bring closer the two artificial / natural areas, for a convergent description. Therefore, in this paper the human organism is analyzed from the perspective of the informational devices, by a comparison of the functionality of the human body with an informational system.

Operative and Programmed Informational System of the Human Body

- In Figure 1 left side it is shown a schematic representation of the informational system of the human body (ISHB), defined as follows. (1) CASI (Center of Acquisition and Storing of Information) and CDC (Center of the Decision and Command), which form actually the operative informational system (OIS=CASI+CDC) for the exploration of reality, by connection with internal and external sensors for info-capturing/memorization/info-analysis/decision, transmitting the command to the motor (M) elements of the human body (muscles), specifically to the vocal system, as an informational output. CDC is connected to the prefrontal cortex and to various other zones of the cortex hemispheres, and works closely with CASI, where are stored the necessary data in a standby state, which are to be used for operational processing of judgment. The informational operator is the thought, which fulfils the task to search and find the necessary information in memory and to insert it into the judgment process. The thought transmits also the decision to memory and/or to informational output for external expression. This refers to vocal or gesture/posture attitude/reaction, achieved by means of dynamic execution (motor – M) elements, as it shown in the upper left side of Figure 1. In the right upper side of Figure 1 are shown the brain areas involved in the informational activities of the informational system of the human body (ISHB). Specifically, CASI is supported by the prefrontal area of the cortex for short-term memory, by the hippocampus for the long-term memory, and by cerebellum for the learned motor info-abilities related with the corporal movements, posture and equilibrium (Figure 1).

- IC is the info-connection pole of the organism, connected with the anterior cingulate cortex, which acts as a selective YES/NO automatic switching hub of information, before the distribution toward the prefrontal cortex of CDC area, as a function of decision criteria from memory. Mentality is the sum of the closely related forms of judgment, especially acquired during the first years of childhood from parents and community, consisting in cultural, social and religious beliefs. IC is therefore a fundamental manager of information, automatically selecting the acceptance/rejection of a new information, according to the Good/Bad previous experience stored in memory. The vital

alarm signals from amygdala are also short-circuited through IC, asking to CDC a urgent defensive decision/reaction. The posterior cingulate cortex is an informational area contributing also to IC activity, deviating/disrupting the external attention to the internal world and personal projects during the day-dreaming process [20. Therefore, IC should be included as an automatic operational center in OIS. As it was recently shown, this center is involved in extreme mental states like Extracorporeal, Near-Death, Extra Sensorial and Mystic and Religious Experiences [11,12,14].

- IES is the Info-Emotional System of the human body and is connected to the limbic system, including also hippocampus and amygdala, the alarm element of the ISHB. IES is a reactive component of ISHB, responding by sensations, emotions and affective states to the input information and is connected manly in the body with the heart region, administrating the blood distribution in the necessary regions. The emotions are also an important contributor to decision, stored in memory (hippocampus is a common component of IES and long-term memory), so OIS is actually a result of the activity of CASI, CDC and IES, with IC intervention: OIS=CASI+CDC+IES+IC.

- MIS is the Maintenance Informational System with a very important role – metabolic processing of the external matter (food, water, air) and the conversion in energy (E) and other necessary body micro-components, schematically shown in Figure 1 left side by the orange trajectory line with a matter input and output. Such a process is automatically managed mainly by the brain stem, thalamus and hypothalamus, supported in the body mainly by the digestive system with its motor (M) components. Therefore, while OIS is dedicated to the info-adaptation to the surrounding conditions, MIS is an automatic inexorable informational system, acting for the permanent maintenance of the body integrity and its capacity of survival during the lifespan. Body launches to CASI/CDC also signals concerning the metabolic status, particularly consisting in hunger/thirst sensations, represented in Figure 1 left side by the corresponding black arrow.

- GTS (Genetic Transmission System) and IGG (Info-Genetic Generator) are related with genetic information: GTS manages the preparation and transmission of the genetic info-material and represents the info-genetic output, while IGG – info-genetic input, manages the body growth and development according to the age, both of them connected mainly with hypophysis. Together with MIS, these centers forms the Programmed Informational System (PIS) of the human body: PIS=MIS+GTS+IGG, assuring the existence/development of the body and specie survival. The body launches also signals to CASI/CDC, referring to sexual impulses and inherited predispositions/abilities, marked by the black arrows to CASI in the Figure 1 left side.

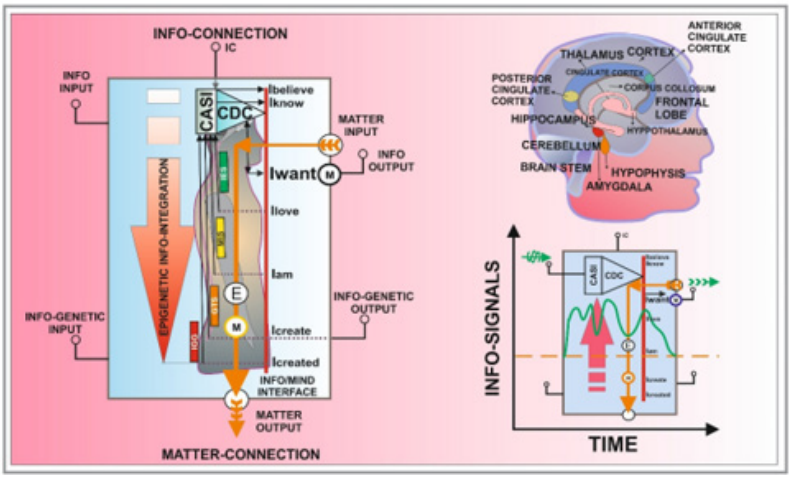

Figure 1: Schematic representation of the informational system of the human body (ISHB) and its operability, like an informational device with an input and output of information for rapid reaction to the received signals, and with an input and output of the genetic information. The matter circuit (orange line in the left side) provides energy and nutrients for body maintenance and operability.

The decoded information processed from the specific informational systems ISHB= CASI+CDC+IC+IES+MIS+GTS+IGG at the info/mind interface is consciously detected in mind as I=Iknow (Ik – memory), Iwant (Iw – decision), Ibelieve (Ib – beliefs), Ilove (Il – love as a driving force of the life, emotions/affectivity), Iam (Ia – vitality/healthy/power), Icreate (Ic – biologic creation), Icreated (Icd – inherited properties).

According to above analysis, the human is a bipolar entity, connected to information and matter, as it is shown also in Figure 1 left side. The connection to information assures actually the connection with reality, necessary to find the food and material conditions for survival, whereas the genetic info-transmission

assures the specie survival. The connection with matter is necessary to maintain the energetic power and material constitution of body. As the entire body is sensitive to information, each of his parts receiving and transmitting information, the body material could be defined as informed matter. MIS manages the maintenance of the present body inherited from parents by IGG, and GTS prepares the matter-related (genetic) information for transmission to the descendants. PIS manages therefore the matter-related information and OIS the mental (virtual) information.

Information in the Human Organism

Information is associated with an operation. Information in OIS is operated by CDC, which closely interchange information with CASI. As it is shown in Figure 1 (left and right-bottom side), CASI receives informational impulses from PIS: MIS circuits transmits hunger/thirst sensations, GTS sexual impulses and IGG the inherited behaviors, recognized in CASI/CDC. In CASI is actually acquired and accumulated the entire experience of life as information, expressible by concepts, words and symbols about internal/external reality. CASI contains therefore first or all the language "dictionary" for the interpretation of reality, learned during the first years of childhood from parents. This dictionary allows the communication, either with self or with others. Information is therefore at the mental level conveyed by language and symbols in the common or scientific communication discourse. CASI and CDC communicate closely. The decision operated by CDC is a result of the interaction with internal/external reality via CASI and interpreted/judged on the basis of decision criteria, which represent stable GOOD/BAD Acceptance/Rejection YES/NO selectors of information learned from the experience. As emotions represents a reactive response to the input information, these are also included/codified in CASI and communicated when necessary to CDC.

The communication process, expressible or not in external environment, can be described by the information theory, formulated with the reference to the communication into the electronic systems composed by an information source, an info-codifier, a channel for info-transmission, a receiver of information and an info-decoder [32]. In the human brain, the external/internal information is firstly codified by sensors, which transduce the signals in electric impulses and chemical agents of information in the nervous cells. Further, information received from internal/external sensors is codified in CASI for info-storage. The interpretation is made by language "dictionary". The decision can be also stored in CASI, and/or communicated accordingly. OIS works therefore with virtual information, codified as input signals, operated by CDC in conjunction with CASI, and delivers outside a signal response as decision (attitude), observable / detectable at an info-output vocal reaction and/or gestures / posture / facial expression, measurable in bits [33,34], as it is schematically shown in Figure 1 right-bottom side.

The intracellular communication in the nervous system is achieved by signals consisting in ionic pulses along the axon created by the sudden successive increase of the permeability of Na+ atoms from the external side of the semitransparent bilayer membrane, due to an informational stimulus came from touch, taste, sound, light or other types of sensors, and the penetration inside of the cell, depolarizing to about -55mV the resting (polarization) potential of about -70mV, naturally formed on the nervous cells due to the imbalance between the concentration of the K+ ions on the internal membrane and Na+ ions on the external interface [35]. Such a micro-device works as a "pump" of Na+/K+ ions against their concentration gradient (formed due to their high difference in membrane permeability), powered by the energy obtained in mitochondria by means of adenosine triphosphate (ATP)-an energy-carrying molecule, which captures energy from the breakdown of nutrients and releases it in subsequent chemical reactions during the metabolic MIS-type processes. By depolarization to a critical – threshold value, the neuron "fires" the action potential, the same for each neuron, which produces a positive charge flow along the cytoplasm. If the threshold value is not reached, no fire process is achieved, so this works actually like an ALL or NOTHING YES/NO Bit-unit, similarly with the commutation transistor in our computers. As the amplitude of the nerve impulses are the same, the distinction between signals is determined rather by the number and frequency of the firing process. On the other hand, the cell inter-communication is supported by neurotransmitters, which are signal carrying chemical agents within the synaptic gap, each of them with specific chemical structure, complementary with that of the receptor on the next cell, and excitatory or inhibitory competitive effect on the subsequent firing process of the next nervous cell, so a new YES/NO step is achieved on this way.

A distinct communication process occurs between the cell nucleus and cytoplasm, which transmits the genetic information from deoxyribonucleic acid (DNA) to new proteins via messenger ribonucleic acid (mRNA), in a 4-"letter" type "alphabet" of the nucleotides adenine (A), thymine (T), guanine (G), and cytosine (C), to form a multitude of communicating "words" and "sentences", by means of DNA sequences, with the participation of the amino acids (11 fabricated by the body itself and 9 taken from foods) and the transfer-RNA (tRNA) from ribosomes (organelle of the cell) [29, 36]. An important characteristic of this "language" is that A can be paired only with T, and C only with G, on the basis of chemical complementary structure. Such type a communication is a suggestive example on a matter-related process of the transmission of information, by structuration/destructuration chain of processes.

The information-assisted structuration/destructuration can be defined in relation with the interaction between some components A and B to compose (structure) for instance the system AB. By this process, a quantity of information is incorporated (integrated/"

embodied") into a structured system for the system reconfiguration by the composing process, according to the reaction:

$$(A + B) + I \Leftrightarrow A(I)B \quad (1)$$

where (I) is defined as "embodied"/intrinsic/incorporated information within the interaction process. While such an information is not detectable, as part of the interacting system, this information can be observed/detected within the reverse process of destructuration, when the complex composed structure A(I)B is decomposed into the initial components A and B with release of information I.

The quantity of information can be measured by using the concept of probability referred to the certainty of new event distinct of the others in a binary system, as it was defined within an electronic communication system as mentioned above [32]. Even taking into account such a definition, it is not clear what would be the relation with the matter structuration. Such a relation comes from the entropy H of a system under interaction and/or (re)organization conditions. The quantity of information I can be in such way calculated as a difference of entropy ΔH between the initial and final state of the system of N possible states, in other word by eliminating the uncertainty during the (re)organization process, so:

$$I = \Delta H = \log_2 N \quad (2)$$

all states N have the same probability during the binary (YES/NO) process. The Bit unit of information is therefore defined by rel. (2) with N=2. Information transmitted through the nervous system is stored in memory. The brain zone of the long-lasting memory is hippocampus. Recent researches on the storing mechanisms shows that these should be treated in terms of synaptic plasticity, which means the modifications of their efficacy as a function of the applied signal (referring to functional plasticity), and on the other hand the changes both in the structure and number of synaptic connections (which refers to the structural plasticity) [37]. That means actually the dynamic behavior of each neuron cell in the concerted behavior of the network which is a part, assisted by a synaptic strength and the synchronization of a rhythmic electromagnetic field with various frequencies created by the electric charge variation. If a repetitive/intensive signal is received/operated systematically for a long time period by CASI/Ik ⇔ CDC/Iw with the contribution of emotion (IES/Il), which can amplify it, this is integrated successively as an automatic ability (MIS/Ia-type), finally in the genetic system (GTS/Ic) as a new acquired trait, transmissible to IGG/Icd of the new generation, by epigenetic processes, as it is suggestively indicated by the big arrow in the left side of Figure 1. This remarkable property shows that adaptability of the human to information could be integrated as info-genetic information expressible by new traits and behavioral features.

The most neurotransmitters are synthetized in the cytoplasm of the nervous cell and deposited in cell vesicles, expulsed into the synaptic gap to the next neuron, once the action potential activates them. The most important neurotransmitters inducing mood sensations and impulses of arousal (epinephrine and norepinephrine) or inhibition (serotonin and gamma-aminobutyric acid (GABA)) are glutamate, GABA (γ-aminobutyric acid), dopamine, adrenaline (epinephrine), serotonin, oxytocin, acetylcholine. Glutamate is an excitatory neurotransmitter in 90% of neuro-synapses in the central nervous, which stimulates the neuroplasticity mechanisms of memorization and learning (CASI/Ik), involved also in Parkinson's disease [38]. The mood states, interpretable as emo-states (IES/Il), are a contributing result of the neurotransmitters activity as follows: calming/relax state assisted by GABA, temporary pleasure sensation, contributing to addiction-like states of drugs/video gaming/gambling/shopping addiction assisted by dopamine, "fight or flight" fear response (adrenaline), wellbeing and happiness, appetite satisfaction, sexuality (serotonin), loyalty state, maternal feelings and satisfaction behavior (oxytocin). The learning processes (CASI/Ik) are stimulated by glutamate but negatively influenced by serotonin. Decision making (CDC/Iw) under stressful conditions is stimulated by adrenaline. Acetylcholine is involved in memory processes (CASI/Ik) and Alzheimer's disease. Dopamine stimulates the wakefulness state (CASI/Ik//CDC/Iw), serotonin is involved in the regulation of the body temperature, sleep, vomiting (MIS/Ia). Some automatic functions (MIS/Ia) are also influenced by neurotransmitters: GABA lowers the heart rate and blood pressure, dopamine stimulates voluntary movements (CDC/Iw) and automatic motor-abilities, adrenaline the motor "fight or flight" motor reaction, oxytocin in uterus contractions during the birth process and the release of milk after, acetylcholine the neuro-muscular junctions for conscious/unconscious movement of muscles (execution elements), for heart and peristaltic activity of the digestive tract [39].

Human as an informational device and functionality

The informational devices within the microelectronics domain are based mainly on the electric conduction in the miniature microchip circuits, and the operability of such circuits in a certain logic mode determines the functions and the functionality of the entire microchip system. Such integrated systems could operate with information received from external sensors and the decision is transmitted to a mechanic device, if the case. In computers, the information follows specific software rules for the specific application. The artificial intelligence in the learning machines operates by neuronal networks, different from the functioning of the nervous cells [40], but the neuromorphic systems try to mimic the efficient nervous cell/brain operability [41].

While microchip technology exploits the electrical properties of the semiconductor materials, especially silicon from the group

IV of periodic elements, which can be selectively doped with V/(III) group impurities to obtain electronic/hole conduction zones, the sensor and actuator technology exploits the physical or chemical properties of silicon substrate [42], and more recently the carbon material to obtain high resistant and conductive nanotube and biocompatible 2D devices on graphene [27].

However, in order to benefit of the knowledge gained in artificial informational systems, we have to observe similar functions in living systems and apply their similar concepts from informational devices. In terms of informational concepts stated from the first time in electronic communication circuits [32], we have to conclude from the above analysis that the distinction between various types of signals and their codification in human are achieved by: (i) the number and frequency of the electrical pulses into the neurons; (ii) the storage and codification of the received information into the central nervous system is achieved by synaptic plasticity processes, at least for declarative (non-motor associated) information; (iii) the contribution of the neurotransmitters as informational agents is essential for the information transmission in within synaptic gap, and for the discrimination of various categories of information, as mood (IES/Il), automatic/voluntary motor-stimulating (MIS/Ia)//CDCIw) and learning processes (CASI/Ik); (iv) the info-integration on (CASI/Ik)//(CDC/Iw)//(IES(/Il)->GTS=> inherited IGG route by epigenetic mechanisms is a long-lasting / stable storage of information in the genetic system, with acquisition of new traits, which can be transgenerationally transmitted; (v) the genetic structure as a basic "memory" of body and behavior of specie, and the structuration / destructuration ("embodiment / disembodiment") of information as a communication matter-related mechanism in 4-"letter" alphabet of DNA/RNA. The associated info-communication mechanisms are based on YES/NO types of intra inter-neuronal transmission, YES/NO structural complementarity of (agent-carrier) / receptor of information at the cell membrane interface, DNA nucleotides pairing, and genetic info-transference.

Distinguishing between the two fundamental forms of information, i.e. mental/conceptual information, codified/operated in (CASI/Ik)-(IES/Il)//(CDC/Iw) for rapid conscious adaptation by OIS, and automatic matter-related information in PIS, expressed by energy release (MIS/Ia), genetic inherited (IGG) and transmitted (GTS/Ic) communication, allow to observe two basic types of functionality: the info-operability for the info-connection / exploration of reality and reactivity response, and the maintenance of the energetic/material resources of the body. This can be traduced in the maintenance of the "hardware" support – which is the body himself, and the corresponding "software" operability at the mental level, expressible in language/corporeal attitude as an informational output.

Continuing with the analogy, the body is maintained in a steady/standby state permanently by PIS, equivalent with the polarization/standby state of a transistors for instance, apt to receive, process and transmit a response from an operational signal under info-operation/connection conditions. The body is found in the full steady / standby situation during the sleep, when it is practically disconnected from external stimuli, and the OIS circuits are activated when the sensors are (re)connected to the external and internal reality. Such a functioning is shown schematically in the Figure 1 right bottom side, where the activation of OIS is expressed by the variation of the processed info-signals, with respect to the basic (standby) polarization, represented by the horizontal red broken line (no signal applied). The codification of the external signals in the sense of information theory, starts to be operated already in the sensory cells, and transmitted to the brain corresponding areas by nerves cells channels. The image decoding receiver from the information theory is represented by the corresponding processing circuit, which at human is one of the most developed, involving more than 50% of the cortex [43], terminated with the mental "display" in the prefrontal cortex. The informational decoding circuits used for the processing of information from the sensors are used also in the recalled information from memory (CASI/Ik), which is projected on the mental "display", which is the awareness prefrontal region of the (CASI/Ik)//(CDC/Iw) short memory/judgment [44,30]. The recalled information shows a lower resolution, depending on the degree/accuracy of information storage in memory and on the transmission channel, so the quantity of information is smaller. During the "day-dreaming", a disruptive process of connection to reality during the day, for the connection with the internal world of personal projects and dreams via posterior cingulate cortex, the high consumption of energy is mainly explained by the maintenance of the external and internal reality during the simultaneous connection. It is expected that a similar functionality could be applied to the other sensing circuits. As in the case of electronic devices, the functioning is assured within a certain limited range, for reasonably small-intensity signals. The application of larger / intensive / repetitive signals induces repercussions on the functionality of human by dysfunctionalities of the informational system and diseases [24, 26].

Conclusions

The analysis of the informational system of the human body revealed that OIS operates with mental information, expressible by meaning concepts on reality within the frame of language, and PIS operates with matter-related information absorbed / released during the structuration / destructuration processes. By the comparison with informational devices working with electronic currents, it was shown that the functionality of human can be described by a steady / standby state when is disconnected from the perception of reality, and in a low-intensity informational range when is connected, operating the mental informational system with virtual / conceptual information. This is expressible by attitude and

communicated to CASI/Ik and/or externally by vocal/corporeal language, measurable in bits. The human can be regarded as an informational device with four info-terminals, an information input and an output for OIS "soft" info-operability, and with two genetic terminals allowing the operation with genetic matter-related information, one as info-genetic input and another for info-genetic output.

Such a device operates with electrical binary YES/NO (all-or-nothing) bit-type pulses in the nervous system, where important for the info-operability are the number and frequency of pulses, and YES/NO contribution of neurotransmitters operating in excitatory/inhibitory opposite mode. The neurotransmitters contribute to the mood states (IES/Il), memory/operability activation/deactivation (CASI/Ik//(CDC/Iw), and voluntary/automatic movements. The structural YES/NO complementarity of the info-carrier agents with that of the receptors, assures a selective transmission of information at the cell membrane and inside of the cell, particularly within the genetic system. The storage of information in memory is a plasticity-assisted synaptic process, different from the electronic devices, for reference accumulation of data, but necessary as well for reference data. The genetic communication is assured in a 4-type letter alphabet from DNA to RNA/mRNA and proteins. As distinct in comparison with the artificial devices, the human informational "device" is able to intervene in the genetic system by epigenetic mechanisms and current/flow stream, which is a specific way to integrate the insistent/repetitive information in the genetic memory and the transgenerational transmission of the acquired information to the offspring.

The info-circuitry for communication of the informational signals in the brain and nervous system can be approach in terms of the information science applied to the electronic devices, working with an information source and a coder of information (the sensors), a transmission channel (the nervous system), a receiver and decoder as final terminals (the decoding circuits in the brain). The recalled information uses the same circuits, with a loss of informational accuracy.

Conflict of Interest

No financial interest or conflict of interest exist.

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