NEW PRINCIPLE FOR ENCODING INFORMATION TO CREATE SUBJECTIVE REALITY IN ARTIFICIAL NEURAL NETWORKS

If our brain consists of inanimate atoms, what prevents us from achieving "animateness" on a device?

If two charges perceive each other, what prevents us from building complex perception systems?

The paper outlines an analysis of two types of information - ordinary and subjective, consideration is given to the difference between the concepts of intelligence and perceiving mind. It also provides description of some logical functional features of consciousness. A technical approach is proposed to technical obtaining of subjective information by changing the signal's time degree of freedom to the spatial one in order to obtain the "observer" function in the system and information signals appearing in relation to it, that serve as subjective sensations. The solution to this problem may give a new approach to designing a strong artificial intelligence and shed light on the difficult problem of the mind.

TWO TYPES OF INFORMATION

In order to facilitate understanding the subject described, information can be divided into two types – ordinary and subjective.

Ordinary information does not require the observer to which it appears. All information technology related to creation, transmission, storage of information use exactly this type. Also, using this information, you can implement functions of weak artificial intelligence - signal processing, search for solutions, learning, planning, etc. This information can be processed discretely in time, in parallel, portionwise on different devices. Due to the absence of an observer, artificial intelligence shows the "Chinese room" paradox.

When processing such information, punched cards or simpler mechanisms can be used. For example, a wooden sieve with holes of different shapes and sizes, performing the function of the program, and figures that fit the holes and acting as signals. By making the figures to move around the sieve where they will be sorted by size and shape of the holes, you can do simple logic and computational functions attributed to artificial intelligence. But speaking about the presence of consciousness in a punch card or wooden figures and a sieve is wrong. A book stores information, but for the book itself the information does not exist.

Subjective information includes our sensations – thoughts, emotions, feelings, images. They create the subjective reality of our mind. Our brain operates a mixed type. First, we feel thoughts composed of letters and giving us images and meanings. We feel emotions and conceptual attitudes such as "right", "clear" and so on. It is the sensation that serves as a signal processed by our mind, and provides the process perception, which is the basis of the strong artificial intelligence. **Here the perception is primary. No perception – no mind, and we do not exist.** Despite the possible complexity of computational processes that occur unconsciously in order to maintain the functioning of the body.

DIFFERENTIATING THE INTELLIGENCE AND CONSCIOUSNESS CONCEPTS

For a weak artificial intelligence, there is no need in the mind, and a simplest mind does not have a direct necessity in intelligence. Many artificial intelligence algorithms are already in use to varying degrees in engineering and technology without the presence of mind. In turn, protozoa, having sense and reflexes based on it do not possess the logical apparatus or computing capabilities. The basis is the possibility of one charge perceiving another charge and fields interactions which may be expanded. Acting as a relay on a "signal-reflex" principle.

DIFFERENTIATING THE LIVING AND ANIMATE CONCEPTS

The majority of wildlife (by the number of individuals and biomass - more than 99%) – plants, protozoa – has no higher nervous function and mind in the form as we know it. At the same time, the brain of developed beings carries the legacy of biological structure, when brain and body in course of evolution had to develop, be born and grow, breed, eat, and regenerate. All this can cause a more complex structure than is necessary for obtaining the mind function. Based on this assumption, we will try to repeat the animateness, self-perception algorithms in non-biological structures, or by instrumentation.

Let's look at the technical approach to obtain subjective information. To do this, we will analyze mind functioning on two main theses.

PERCEPTION IS BASED ON DIFFERENCE

If we do not perceive the difference between the brightness of objects' contours, their saturation, color characteristics, the difference between darkness and light - we do not have vision. If we do not perceive the difference between the presence or lack of taste, the difference between tastes themselves and their combinations - we do not have the sense of taste. If we do not feel the difference between the presence of thought and its absence, between entertained ideas, the beginning and the end of semantic segments, letters and words from which they are formed, images and concepts that they cause - we have no thinking. If we do not perceive the difference between existence and nonexistence, stretches of time, and so on - we simply do not exist.

Capturing a difference is a subjective information signal, and the fact of capturing a difference gives rise to the function of an observer to which a subjective sensation comes up. These are mutually defining parameters that do not exist without each other.

PERCEPTION AND OBSERVER EXIST ONLY IN THE PRESENT

The fact of capturing a difference can only exist, like any objective or subjective reality, in the present. Even for registration of a continuous process, the observer

cannot be between the past and the present. Everything happens only now, at the very shortest present moment. What was a moment ago, is now replayed by mind in the form of memory signals and associative constructions. In addition, we simultaneously perceive all points of space from the sight analyzer, colors, taste, smells, body position, time points and so on. Even taking into account that information from vision comes with a delay due to the time of the signal passing from receptors to the view analyzer, and the processing time, even though we process speech and thoughts in time, we do not lose the complete picture. We do not forget what happened a moment ago. In mind, there is no gap due to the short-term memory work. But we perceive all and everything "now".

COMPUTER APPROACH PROBLEM

The usual computer approach based on bit signal modulation is not suitable for obtaining the observer function, as the beginning of the signal in the past, while its end is still in the future. **The past no longer exists, the future does not exist yet**. Part of a physically existing signal in the form of a voltage drop does not represent the full meaning and cannot give the observer a complex subjective picture. This option is suitable for processing **ordinary** information, but not for **subjective** information. The observer, as a difference capture function, cannot be discretely-timed or scattered in various parts of the memory or processor. Between them, there must be something that provides comparison. And this "something" must exist in the present. A complex subjective picture requires synchroneity in time and integrity of pieces of information in the device relative to the observer. The entire picture perceived must be in the present.

TECHNICAL SOLUTION APPROACHES

We take the naturally existing ability of one charge to perceive another and try to build on it complex perception patterns including those inherent to human mind. The observer here is the state of energy balance of electromagnetic field, enclosed in a given complex structure of conductors with information signals - impact on

this field in the form of distortions of its equilibrium, complex picture of sensations – configuration of simultaneous effects that change over time. Information signals can appear relative to a common observer from external (receptors) and internal (memory, thinking, associative mechanisms) stimuli.

The presence of an observer capturing all its conditions in the real time, can be achieved by replacing the signal's time degree of freedom to the spatial one, when the signal is not defined by its kind by modulation when it came into the system, but where it came from and what kind of deflections it caused. This will enable creation of the entire real-time picture and make it a subjective reality for the system itself, unlike virtual models of ordinary information, distributed in time. Such information will really exist for the system.

The **observer's** simplest function inside the field, as a deviation of inner balance, appears even at three affecting elements. In case of two, the balance point will always be in the middle and will not be able to capture the difference. This scheme can be complicated to required parameters.
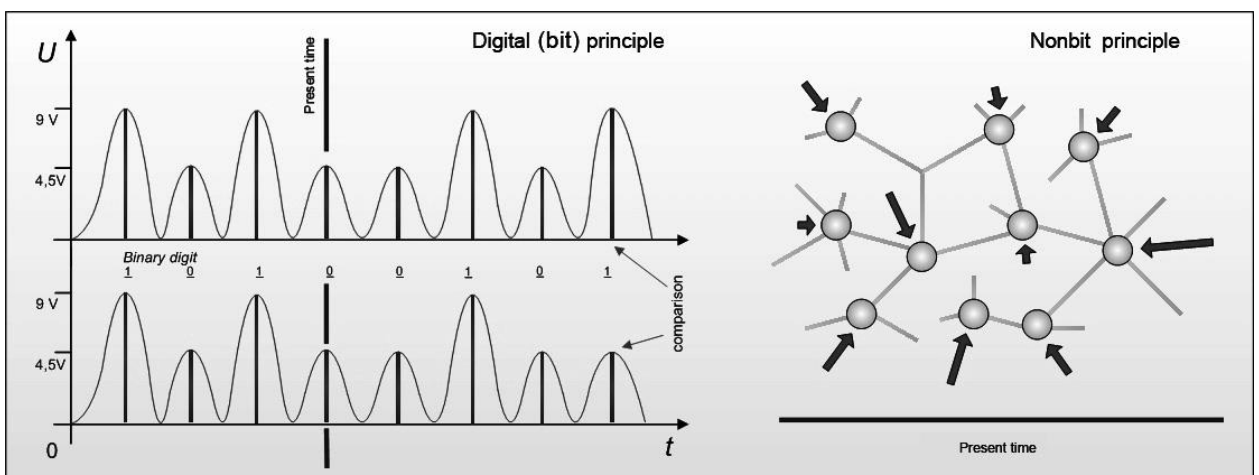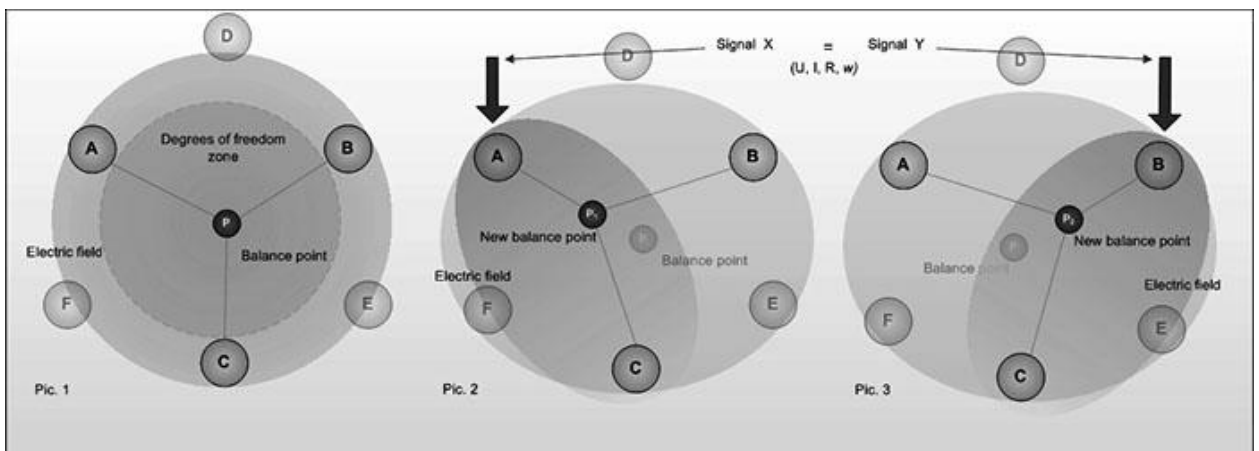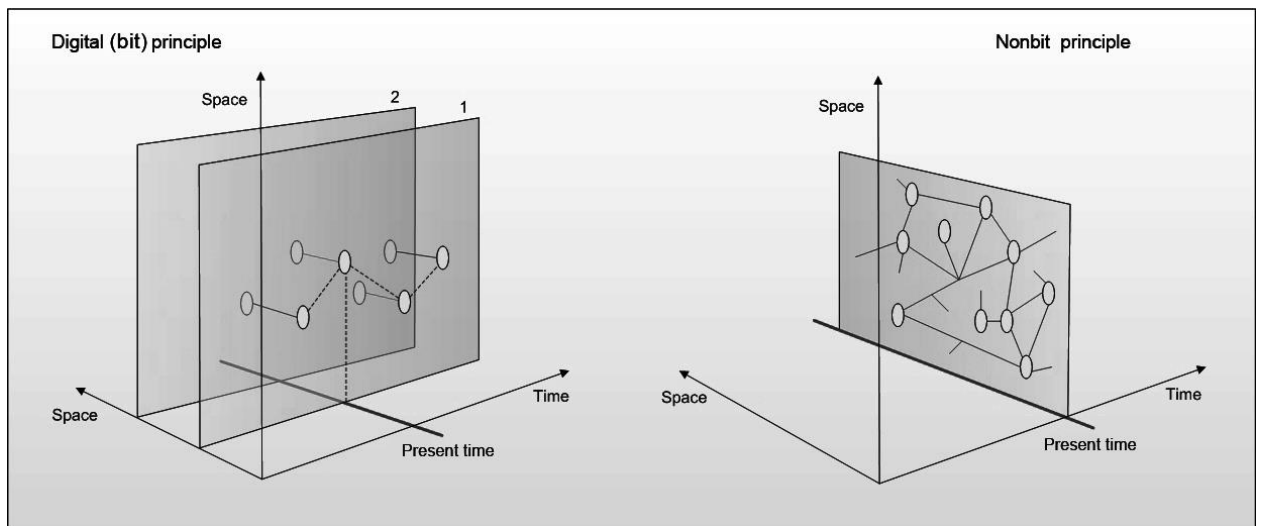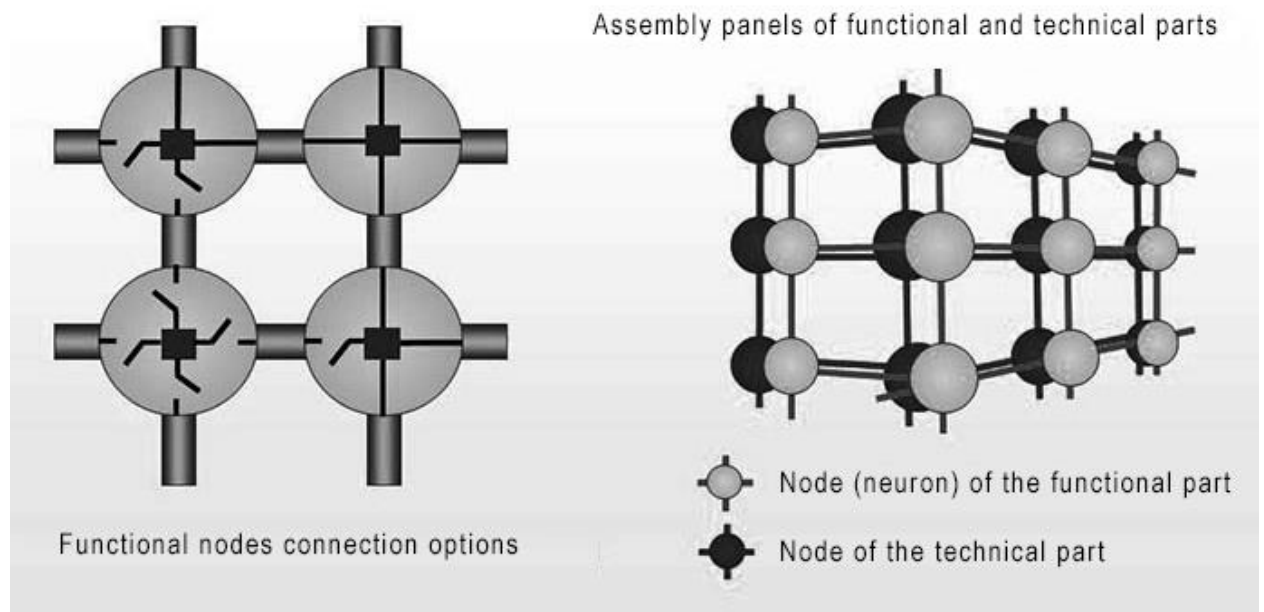
Given the possibility to connect not only the adjacent, but remote nods and their ensembles, we can create complex information mosaics. The signal coming to the system (A), may also be not a linear one (B), but of a complex form (C).
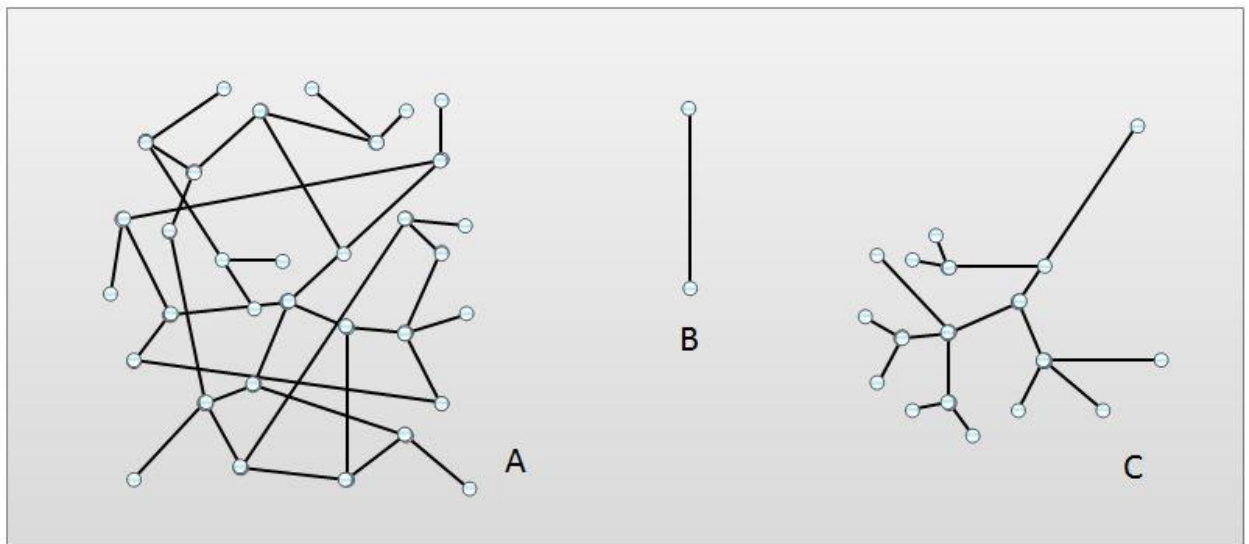
By setting the constructive functionality of automatic node switching depending on electrical characteristics and configurations changes of the field in predetermined zones of the system, the process can be made infinite. The role of the program will be played here by the nodes connection configuration, and information processing - by tending to equalize the energy balance. The nodes themselves act as neurons. This will allow for systems that do not require a discrete calculation of relations between all the nodes. All will occur naturally and almost instantly.

The technical approach may be based on "operational amplifiers" and the principles of analog computers with modified architecture and the method of data processing for obtaining subjectivity.

For a flexible mechanism for obtaining complex subjective relations we can create a stand with three components.

Assembly panels of functional and technical parts

Functional nodes connection options

- Node (neuron) of the functional part
- Node of the technical part

Annotations:

1. **The physical condition** (conductor networks, field carriers, artificial neural network) - a configuration that defines the logics of interaction and values, substituting the computer program. It forms complex relationship within the field. By closing and breaking the network connections, we can control the characteristics of the fields and the values for energy equilibrium that performs the function of the "observer" for whom "everything happens".

2. **The electric field or other substance** perceiving its energy equilibrium (on the basis of pressure, magnetism, gravity, and so forth.) The field or the substance are in a physical condition-structure that defines the relations logics. By transmitting external or internal signals to nodes, we can create a complex signal pattern inside the substance which perceives its deviations and tends to align them.

3. **The effect** - resulting from interaction of the field or substance areas with each other and taking different values with respect to the balance. It is the effect that is the subjective information and the sensation for the observer.

It should be noted that if we want to create a model similar to human mind, we need to use wires conducting signal at a low speed of nerve fibers, which accounts

for the continuance of the signal in time. When using metallic conductors, alignment will occur almost instantaneously.
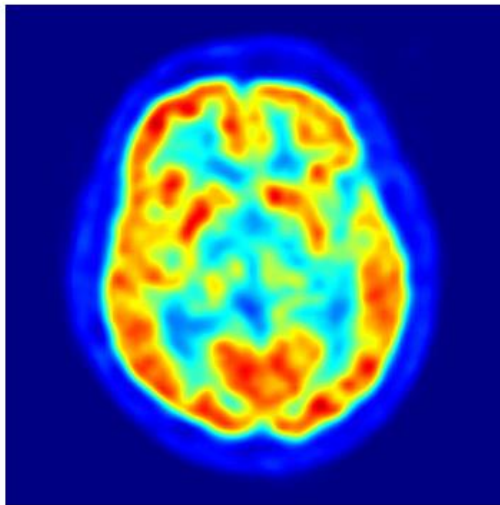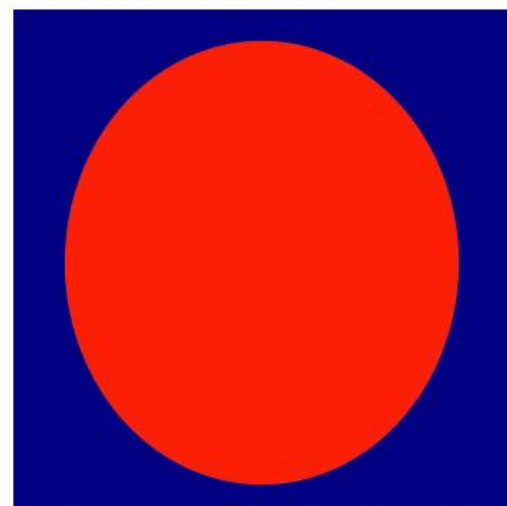

Positron emission tomography of a living human brain activity
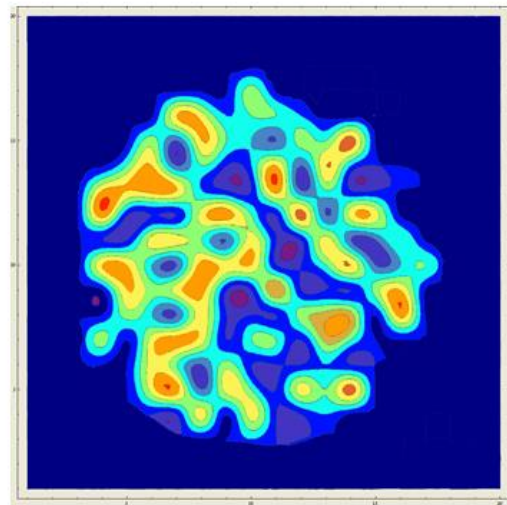
Computer modeling of two-dimensional distribution of point conductor fields with different potentials in a dielectric medium as a graphic representation of the algorithms described above.
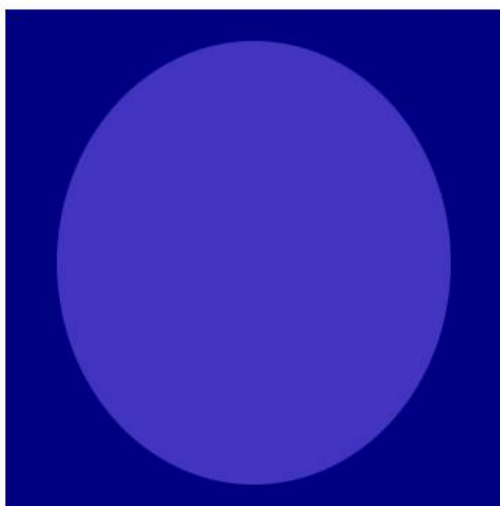
No signal. A dead brain or a "switched off" artificial neural network with no electric field.

Maximum simultaneous stimulation of all receptors, or "white noise".
Such a state is only theoretically possible as maximum values of one analyzers may differ in intensity from maximum values of other sense organs.

In the picture you can see a scenario of the computer simulation of making an equilibrium between different areas where the balance areas are blue, and a real brain MRI image. There is also a model of a simultaneous effect on all parts of the brain, that causes no difference, and the model of a "dead brain ", in which there is no difference. No difference – no observer or mind.

SOME ARGUMENTS FOR THE SOLUTION PROPOSED

- The structure is similar to a neural network that exists in the animal world. Such systems could develop evolutionarily, from simple to complex, having just the perception and primitive mind in the beginning. The computer approach requires a processor prototype, programs, etc. right away, which could not have arisen evolutionarily;

- unlike the computer approach, this is not about processing, transmission or storage of information, but about establishing the function of the observer who captures deviations and the complexity of combinations perceived by it. Accordingly, the technology logics may differ from computer methods;

- the area of equilibrium, which is in the appropriate analyzer or brain area, can be an analogue of attention. There cannot be two or more centers of equilibrium at one and the same time, and there is always only one "focus beam". Otherwise there would be multiple minds within one brain. It is possible in theory, but such a being would be unviable.

- the difference is based on the contrast, the examples of which we have in our minds. If all senses, including emotional, are strongly impacted, one does not feel strong stimuli and even injures, but in a quiet state, a mild irritation takes a significant position in perception. This also applies to subthreshold and above-threshold effects on receptors. If the light intensity is insufficient, the sight analyzer cannot distinguish shapes and color perceiving information as darkness. Similarly, in strong light, the difference disappears and the effect is blinding. The simultaneous effect on all receptors (all variations of sound, taste, and smell) does not allow distinguishing specific information, creating the "white noise". The same applies to memory and associative mechanisms. When entertaining all ideas at one and the same time, it is also impossible to make sense. It means that the equivalent effect on all network nodes will not cause deviations in the system, and the sensation will not manifest. Therefore, we can say that every sensation is a deviation of the system from equilibrium of all parts.

- self-aligning of the imbalance leads to loss of sensation, which can be compared with addiction. With constant effect of sound, color, smell, tactile stimulation, we cease to notice it. A strong feeling or desire can occur as a drop in the values of the field in its areas and tending to smooth it.

NOTES ON THE TURING TEST

With regard to the Turing test, which is considered to be one of the main evidence of sense and self-awareness as a strong artificial intelligence, even a creature with a developed mind and sense can fail it. Performing dogs or monkeys that have mind and are able to relate an action to a possible effect have some intelligence. If conceptual schemes differ from those in the test, the interrogator will not be able to distinguish such animals from inanimate machines. An interviewee may also be a quite intelligent person speaking another language or not having knowledge in the field of the interview, which will not give the Turing test result either. However, knowing the questions and having prepared the answers, you can easily deceive the interrogator (especially if he is not too clever), with the help of simplest devices that have no mind, including the punched cards or the wooden sieve.

CRITICISM AND SUPPORT OF THE PROPOSED APPROACH

The described approach can work in a biological brain, but has some contradictions.

Transfer of the excitatory potential based on the principle of "all or nothing" by Hodgkin–Huxley

In 1963, Hodgkin and Huxley described the ion mechanism of action potential transfer in neuron, for which they were awarded the Nobel Prize. The basis is the discrete excitation transfer, that gave rise to study of brain function based on a discrete bit logics.

Nonetheless, this approach does not contradict the logics described in this article. It has the right to exist, if we consider not a single neuron, but their ensembles, and take into account the fact that potential is triggered by the change of electrical

characteristics, different in different areas of the brain. Consideration must be given to the time of effect and mass scale of ion channels functioning in a single neuron, the difference between neurotransmitters and electric neurons operation, entering of a signal from multiple neurons to one and so on. In this case, discrete signals can be united into a single continuous flow of electrons in a single field, which provides synchroneity. Besides, this approach, based on replacement of the program with constructional notes, accounts for operation of "grandmother cells", when closure of one area of the network results in complex effects in other parts of it. In addition, the impact of neurointerfaces is widely experimentally confirmed, that act by electrical stimulation to brain areas and cause sensations in it. These stimuli carry no information and are of a non-bit nature, changing only the characteristics of the electric field in neural networks. Medications work in brain in a similar way. They do not bear any bit code, only contributing to the closure of certain areas of the neural circuits via neurotransmitters.

Problems of electromagnetic theories of mind

One of the problem areas of electromagnetic mind theory of consciousness, regardless of their logics, is the problem of mind exposure to external electromagnetic radiation. Based on the electromagnetic mind theory logics, one can assume that a mobile phone or location in the vicinity of some strong electromagnetic devices can significantly affect the characteristics of the field inside the brain. However, this does not occur. We suffer from no hallucinations nor from change in sensations characteristics, such as thinking, memory, sight, taste, smell, touch, and so on. The action potential transmission mechanism within a neuron has a by far greater potential than possible external excitations, due to which neurobiologists described signal transmission in the brain as a set of bits.

The approach proposed may be confirmed by the assumption that the external electromagnetic radiation affects all areas of the brain simultaneously, aligning the total value of the field within the brain, but without changing the proportions of

interaction between their parts, bearing information characteristics relative to the observer function.

CONCLUSION

Subjective reality, as well as our minds, can be a complex superposition of relationship of "many to many" between the neuron nodes where the observer function is performed by energy balance of the field, tending toward equilibrium, and the subjective information - different effects that cause imbalance. Such information exists solely for the system itself. Various field equilibrium configurations will be the different states of mind, in which, inter alia, the intelligence functions will be performed – logics, computation, etc. Measurements of the two potentials (positive and negative) with respect to the various parts of the system or the ground do not provide the complete picture to the external observer. Using the natural ability of one charge to perceive another, we can create complex information pictures for the observer, including those repeating basic algorithms of our sensations - emotions, thinking, senses, as will be discussed in subsequent articles.