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YET ANOTHER DEFINITION OF THE CONCEPT "INFORMATION"

To date, a curious situation is formed: the majority of people living on our planet feel they live in the so-called "information society", but a unified and generally accepted definition (interpretation) of the concept "information" is still missing. Known approaches to the construction of the desired definition, focusing on some important aspects of information, overlook the others, no less important. For the definition proposed in this article the intuitive notion of information as well as syntactic, semantic, pragmatic and ontological aspects of this phenomenon were taken as far as possible into account.
Keywords: *nature; form; life; knowledge; consciousness; description; technology; information.*

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ЩЕ ОДНЕ ВИЗНАЧЕННЯ ПОНЯТТЯ «ІНФОРМАЦІЯ»*

У статті показано, що до теперішнього моменту склалася курйозна ситуація: більшість людей, які населяють нашу планету, вважають, що вони живуть у так званому «інформаційному суспільстві», проте єдине і загальноприйняте визначення (тлумачення) поняття «інформація» досі відсутнє. Відомі підходи до конструювання шуканого визначення, концентруючись на одних істотних аспектах інформації, ігнорують інші, не менш важливі. У пропонованому у статті визначенні по можливості враховано інтуїтивне уявлення про інформацію, а також синтаксичний, семантичний, прагматичний і онтологічний аспекти феномену, що розглядається.
Ключові слова: *природа, форма, життя, знання, свідомість, опис, технологія, інформація.*
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ЕЩЁ ОДНО ОПРЕДЕЛЕНИЕ ПОНЯТИЯ «ИНФОРМАЦИЯ»

В статье показано, что к настоящему моменту сложилась курьёзная ситуация: большинство живущих на нашей планете людей считают, что они живут в так называемом «информационном обществе», однако единое и общепринятое определение (толкование) понятия «информация» до сих пор отсутствует. Известные подходы к конструированию искомого определения, концентрируясь на одних существенных аспектах информации, упускают из виду другие, не менее важные. В предлагаемом в статье определении по возможности учтены интуитивное представление об информации, а также синтаксический, семантический, прагматический и онтологический аспекты рассматриваемого феномена.
Ключевые слова: *природа, форма, жизнь, знание, сознание, описание, технология, информация.*

Introduction. To date a curious situation is formed: the majority of people living on our planet feel that they in the so-called "information society"[1], but a unified and generally accepted definition (interpretation) of the concept "information" is still missing (Wikipedia (rus.), 2012). In the absence of clear and precise definition (inter-

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[1] March 27, 2006 UN General Assembly adopted a resolution which proclaimed 17 May as World Information Society Day.

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pretation), all sorts of speculations with the term "information", which became fashionable, lead to unexpected results, up to the appearance of such strange terms as "bioenergoinformation"[2].

In a situation when it is not clear what "information" is, the introductions to the consideration of all sorts of "information", equipped with adjectives – such as "physical information" (Wikipedia (en.), 2012) – do not help.

In parallel with this acute problem there exists another one: the nature of mutual relations between the concepts of "knowledge" and "information". No one doubts they are not synonymous. But it is the fact that they are widely used as synonyms. How do they relate?

Analysis of recent research and publications:

1. Information. It seems, that the "information theory" (Shannon, Wiener, Brillouin), perceived today by many people as a classic, did not clearly answer the question "What the information is?" (Triclot, 2007) gives a detailed retrospective analysis of the origins and development process of the theory, the results of which were disappointing:

- contradictions in the approaches of different authors of the theory are revealed – Wiener tries to think of information as a physical quantity (Wiener, 1948), while Brillouin is trying to think about physical quantities as information (Brillouin, 1964);

- entropy measure of information does not reflect the quantitative characteristics of the information object (message), but of the source of messages;

- we have the unit of "quantity of information" (bit), but we can cite many examples when it is impossible to express the quantity of information for the objects intuitively assessed as information objects. It turns out that we attempt to measure the amount of something, for which a physical status is not defined;

- there is the concentration on the quantitative aspects of information at the expense of ignoring semantic and pragmatic aspects. This, in particular, poses an insurmountable barrier to determining the value of information;

- it is widely accepted that there is the ignoring of intuitive idea of information;

- in fact, there is a fiasco in a desperate attempt to see the information as the "last frontier of the physical world" (Triclot, 2007). However, due to this the idea that everything is "information" is firmly "ingrained" in the minds of many people. Needless to say that this idea leads to dissolution of information without a trace in the vast Universe.

Nevertheless, some progress has already been observed. For example, in Wikipedia (rus., 2012) we can see the distinction between "objective" and "subjective" information:

- objective (primary) information is the ability of material objects and phenomena (processes) to produce a variety of states, which, through interactions (fundamental interactions[3]) are transferred to other facilities and express themselves in their structure;

- subjective (semantic, secondary) information is the semantic content of objective information about the objects and processes of the material world formed by the

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[2] Its prevalence, at least in Russian literature, does not need specific references.
[3] Modern physics distinguishes between such fundamental (primary) interactions: gravitational, electromagnetic, weak, strong.

human mind by the means of images (words, images and sensations) and fixed in any tangible medium.

It remains to show that so-called "objective" information doesn't exist. There is simply no need.

2. Information and knowledge. Traditionally (according to the construct DIKW — data, information, knowledge and wisdom) "knowledge" is considered to be some special kind of "information" (Ackoff, 1989). But where are the criteria for distinguishing "knowledge" from "information" (Malyshev, 2008)? What is the nature of so-called "tacit knowledge"?[4]

Given the lack of answers to these and other related questions, (Malyshev, 2009, 2011) set out a position directly opposite to DIKW: knowledge is the primary thing, information is the secondary one. He suggests to consider "knowledge" as a philosophical category which does not need definition, "information" as the tangible result of the conscious representation of knowledge.

Statement of the problem. Our task is to give a reasonable definition of "information" that takes into account the intuitive understanding of it, as well as its syntactic, semantic, pragmatic and ontological aspects.

In particular, the desired definition should make it possible in each case, for each object to answer the question whether it is "information" or not.

Supporting arguments:

1. Forms. The nature constantly demonstrates us its ability to produce and in natural way[5] to convert all sorts of "form" — distinguishable in some way real (as opposed to abstract) objects, which occupy a certain space-time volume (have a shape) and have some (in some way changing) state.

We emphasize that the concept of form introduced into the consideration in this way is intended to draw attention to the fact that not all the forms are carriers of information.

2. Something shapeless. But it would be wrong to say that everything in the world is shaped. When we think of nature as a repository of real objects, we naturally lose from sight such a thing as an "abstraction", which main feature is that it does not exist in nature. If something doesn't exist, it doesn't have a shape and is not a form in our meaning.

It is clear that a rational being, capable of generating an abstraction in the process of thinking can manipulate them arbitrarily. But how to make an abstraction common to different individuals? To convert it to "form".

3. Lifeless World. Imagine a world without life, in which the formation and transformation of shapes and forms of state transformation is performed by the implementation of fundamental interactions. As the set of the fundamental interactions does not include any "information" interaction, we can assume that for such a hypothetical world the concept of information is redundant and should be cut off by Occam's razor.

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[4] Criticizing the concept DIKW in one of its provisions, we reserve the consideration of the legality of presence hier of concepts of "data" and "wisdom" and the absence of criteria to overcome the boundaries between "data" and "information", "knowledge" and "wisdom".

[5] Based on the implementation of fundamental interactions (see above).

4. World with Life. In the living world we see everywhere the evolutionary formed exchange of knowledge between its members (actors of exchange are subjects-sources and subjects-receivers of knowledge). Recall:

- scout bees dance that tells the location coordinates of honey;
- "marks" left by animals;
- all kinds of audio exchanges etc.

5. Objects and their descriptions. There exists a fundamental difference between an object (real or abstract) and its description, which sometimes needs to be expressed, as follows:

- a drawing is a detailed description basing on which the real detail could be made;
- a photo of a man is a description of his appearance (at a certain angle and distance of view);
- ECG is a description of one aspect of the complex physical processes occurring in the human body;
- shellac is a compact description of the sound image, which can be used for its re-imaging;
- a painting is a map of the artistic image that emerged in the imagination of the painter;
- a recipe is a description of the method of cooking;
- a computer program is a description of a method of data processing;
- human speech is a map of some aspects of the thinking process;
- Leo Tolstoy's novel "War and Peace" is a description of the fictional story which was interspersed with descriptions of the real historical facts;
- one possible description of a person is his sketch;
- piano notes of Sonata N 23 of Ludwig van Beethoven, op. 57 ("Appassionata") is a description of the musical image created by a great composer;
- "Black Spot", handed to Billy Bones, is a very concise description of the current situation to the point in the pirate team (Stevenson's novel "Treasure Island");
- article "Information" in "Encyclopedia of Cybernetics" is a verbal description of the important concept which is relevant to cybernetics.

It seems that we have given enough examples of what can be considered as a description.

The description of an object can be made at a logical level, verbally. Another way is to describe an object by displaying (mapping) any of its aspects. For example, let an original object be real or fictional process. Its story is a verbal description. To voice the story or to write it means the mapping of speech flow.

We assume the following assertions:

1. An object can not be a description of itself.
2. No real object can be described exhaustively.

Regarding the first assertion it is needed to add that an object always requires for its description some other object used as a carrier of description.

Regarding the second, we note that although we can not exhaustively describe any fragment of reality, however, we are able to formulate universal laws.

6. Typical living creature in the community of their own kind. We can not give a generalization of all living beings. But we can identify some types which are impor-

tant to us. Let's start with the simplest. From the morphological point of view it is a conglomerate of interpenetrating components[6]:

- organs of reproduction;
- sensory organs that allow individuals obtain some information about the environment and about themselves;
- organs of action, allowing individuals carry out environmental impacts and the impacts to themselves;
- bodies of memory, providing the ability to maintain long-term specific states;
- organs of government (central and peripheral).

Knowledge of such entity, in particular, includes:

- reproduction technology[7];
- technologies of identification of real objects and their states through the sensory organs;
- technologies of maintaining viability through the implementation of exchange processes with the environment.

Such a creature can live in a community, but can not share his own knowledge with his peers. To make this possible, it requires some additional components, as a minimum:

- knowledge containing the pairs of type "form/state ↔ meaning";
- technologies to create the descriptions of knowledge in terms of "meanings";
- technologies to create the specific forms and to give them specific states (using the organs of action), starting from specific meanings;
- technologies to recognize the meanings (using the sensory organs), starting from the form/state.
- technologies to assimilate the obtained description of knowledge.

The process of knowledge transfer between two entities can be described as follows. We distinguish between the source (S) and recipient (R) of knowledge. The process starts as a result of an incentive effect of some impulse — S wants (must, have to) to share with R some of its partial knowledge.

S can not directly pass on this knowledge. Therefore, S generates its description in terms of "meanings" and then, on the basis of its correspondences "meaning — form/state" and with the help of organs of action creates the appropriate form in the required state. R, in turn, using the sensory organs, explores the proposed "form/state", and on the basis of his own correspondences "form/state ↔ meaning" obtains the "meaning" which becomes, after the assimilation, his own partial knowledge.

In this case:

- motivating impulse for knowledge exchange for S can be internal or external;
- the transition from knowledge to its description, in general, is associated with its inevitable partial loss or distortion of knowledge;

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[6] Speaking of "components" we do not divide the original essence into independent non-overlapping parts. In particular, its knowledge is allocated to all of it.

[7] The term "technology" is used in its primordial sense - this is a knowledge about how and what to do to achieve the desired result.

- as a real object, which presents "form/state", can be S itself (gestures, facial expressions, postures) or an object external to S (ambient air with the sound wave, a spot with a certain smell, written sheet of paper, signal flags etc.);

- "embedded" in S and R technologies of creation/perception of "forms/states" provide syntactic and semantic aspects of knowledge description exchange, and must in some way correspond to each other;

- pragmatics of knowledge description exchange process to S and R may be different;

- the whole process of knowledge exchange takes place solely because of the realization of fundamental interactions.

Of course, such a knowledge exchange does not guarantee anything, because it is influenced by:

- the adequacy of the description to described knowledge;

- quality of technologies of creation/perception of the "forms/states", and their degree of conformity with each other, in particular, the degree of similarity of their matches "form/state ↔ meaning".

- subjective assessment of the value of the knowledge description, produced quickly by R etc.

7. The role of consciousness[8]. It can be argued that:

- in the act of "forming" the required knowledge description, since the moment of emergence of incentive impulse, the consciousness of the "source" subject play the main role;

- in the act of "perception" of existing knowledge description the consciousness of "receiver" subject, whose attention should be drawn one way or another, plays the main role too.

So, the knowledge description cannot be created/used without direct or indirect participation of consciousness.

Definition. The foregoing analysis has allowed allocating the small number of key supporting auxiliary concepts ("description", "defined form", "consciousness") that will serve for the construction of the required definition. As a result, the concept/term "information" obtains the following definition: *information = the description of something/someone, presented consciously in the defined form.*

Note 1. It should be noted that this definition is consistent with the etymology of the word "information": informatio, onis f [informo] (Latin) 1) an explanation, description, interpretation, 2) representation of the concept, and 3) awareness, education[9].

In essence, we do not need any definitions — the creators of Latin, unlike us, clearly understood what "information" is!

Note 2. Definition reflects the fact that information is not a kind of physical reality, but a completely subjective phenomenon.

Note 3. Any object intuitively considered as "informative object" exists in the form of real object with distinguishable significant states, defined within the technologies of its creating/using (in the defined form).

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[8] We use the term "consciousness" in its ordinary sense.
[9] The Latin roots and Greek origins of the word "information" is presented in Capurro (2003).

Note 4. Real object, which plays for some subject (source and/or receiver) the role of "information" from the standpoint of physics does not contain any "information". If the last subject, which has "keys" to the "informative" object (technology of reading), for any reason, disappears or loses the information perception technology, "informative" object, in turn, loses, perhaps forever, its "informational" role.

Note 5. So-called "informational" interactions are realized solely on the basis of fundamental interactions and are a kind of "superstructure" over them, formed by consciousness through technologies.

Note 6. It is assumed that a being with consciousness somehow builds different models of the world and its fragments. Despite the power of this speculative modeling, it has its limitations. And then the opportunity of information modeling comes to assist, when the model leaves the thinking process, and is embodied in the real object.

Testing the definition. One of the goals that we set at the beginning of our study is to obtain a reliable criterion that enables to distinguish information objects from the rest. Let's see how our definition will "work" in the following examples.

It goes without saying that an ordinary vase of flowers is not an information object. But if a couple of subjects agreed that its appearance at a particular time and place for specific signals, such as of dangers, then it is certainly an information object.

Drawings of a vehicle is an information object. The car made according to these drawings is not. But if we make a model car or use a real car as an example to explain to someone what "a car in general" is, then it might well be considered as a part of our description of "a car in general".

An average person is not an information object. But if we are looking for the offender X, and a witness who remembered his face, shape, habits, points us to another person Y, who, in his view, is very similar to desired X ($Y \neq X$), then why should we not consider Y as a part of the information object – the description of X? Of course, it is somewhat extravagant – to drive Y every time for identification of X. It is better to make other objects from Y – pictures, video.

It is rather difficult to imagine some objects as informative objects. For example, the planet Earth is hard to imagine as a model of the habitable planet used for any purpose. But if you're under much strain, then maybe you can.

Human contribution to the development of information tools. In this area (knowledge representations and knowledge transfers, using information tools) people, compared to other living beings, have moved much further:

- for people the choice of objects – carriers of information – is virtually unrestricted. Having virtually always a possibility to manipulate real objects of any nature, human being uses the criteria of the following plan – practicality, reliability, efficiency, speed etc.;

- people not only express their internal knowledge (feelings, emotions, reasoning, beliefs, ideas, abstract concepts, narratives, dreams, fantasies etc.), but also show described (converted into a "form/state") certain aspects of the real processes (photo and video, audio, graphics, characteristics of processes etc.);

- people have created, improve and create, and will create and improve more and more languages and formats to promote the best reproduction of any specific knowledge;

- informative objects generated by a person not only serve for a transfer of rational knowledge — a lot of artifacts purports to affect the emotional state of man (art);

- finally, people have developed a computer — a machine that allows them virtually remove the restrictions to the number of distinguishable unified states and rate their managed conversion in accordance with established methods.

Conclusion. In conclusion, we summarize and make some remarks:

1. Our analysis shows that the information is, on the one hand, an objective phenomenon, due to the fact that it is realized through the state of real objects, but on the other hand — a subjective phenomenon, because in the process of its creation and use the consciousness is necessarily involved.

2. We offer the proposed "yet another definition" of "information" to the scientific community for further analysis and evaluation of its validity.

3. Anticipating possible criticism of some or all assertions expressed above, we would like to warn potential critics from substitution of the target object by own information models.

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