Proceeding Paper

World Structuration and Ontological Information †

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Abstract: Based on the general theory of information (GTI), we study ontological information, which is complementary to the concept of mental information in general and epistemic information in particular.

Keywords: information; ontological information; mental information; epistemic information; physical energy; psychic energy; general theory of information

1. Introduction

Diversity of realms where people encounter information resulted in overlooking many kinds and types of information without a unifying concept and consent about the essence of the information phenomenon. Some researchers have even predicted the impossibility of finding such a unifying concept. However, in spite of all difficulties with understanding information, the general theory of information (GTI) was elaborated, giving the all-encompassing definition of information and comprising the variety of existing information theories [1,2]. This definition predicted not only a variety of specific kinds and types of information that were observed before, but also clustering of these kinds and types into a much bigger classes. Regardless of this prediction and observations of biologists, researchers continued to associate information with knowledge, either directly by ascribing them the same nature or indirectly by implying that information is epistemic (or epistemological), and thus, being a mental phenomenon.

According to the GTI, the second approach gave a correct but still incomplete image of information. The situation changed when Roman Krzanowski discovered the existence of the class of ontological information, which is complementary to the concept of epistemic information [3–5]. Here, based on the GTI, we further develop the concept of ontological information. To understand this discovery in the context of the existing knowledge in the domain of information in general and the GTI in particular, we start with the description of the global structure of the world and then continue with discussing the principles of the GTI, which describe information as an intrinsic phenomenon of the world. In Section 4, we explore ontological information as a natural phenomenon. In Section 5, we consider relations between ontological information and physical energy. In Section 6, we contemplate relations between mental information and mental energy.

2. The Existential Triad of the World

With the advance in science, scientists began reducing the whole world to the physical (material) reality and rejecting religious views of other realities as nonscientific fantasies. Only some outstanding thinkers were able to see further than this, going beyond the material domain on the rational basis. The most formidable and, at the same time, mysterious extension of the physical world was made by Plato, who introduced and defended the idea
of the world of Forms or Ideas [6]. However, for a long time, this world was not correctly understood without scientific elucidation.

Another extension of the physical world was described by René Descartes, who suggested the dualistic approach to reality, dividing the human being into the body (as a part of the Material World) and the mind (as a part of the Mental World) [7].

Karl Raimund Popper attempted to provide a unified scientific image of the ideas of Plato and Descartes in a unified triadic structure [8,9] but his representation of mental reality was essentially incomplete and his description of the world of ideas was incorrect, as other philosophers explained.

A consistent comprehensive scientific global structure of the world was described and modeled by the Existential Triad of the World [10] (cf. Figure 1).

![World of Structures](image)

**Figure 1.** The Existential Triad of the World.

In the Existential Triad of the World [10], the Physical (Material) World represents the physical reality studied by natural and technological sciences, the Mental World encompasses different forms and levels of mentality, the lower levels of which are studied by psychologists and sociologists, and the World of Structures consists of a diversity of ideal structures, which is the scientific personification of the world of Plato Ideas or Forms [11]. While the Physical and Mental Worlds are accessible by human senses, the World of Structures can be achieved only by the intellect as Plato predicted.

It is possible to learn more about the Existential Triad of the World in [10,11].

3. **Principles of Information Ontology**

In the general theory of information, the definition of information in the broad sense is given in the second ontological principle, which has several forms [1,2].

**Ontological Principle O2 (the General Transformation Principle).** In a broad sense, *information* for a system $R$ is the potentiality/cause of formations and transformations (changes) in the system $R$.

Thus, we may understand information in a broad sense as a capacity (ability or potency) of things—material, as well as mental and abstract—to change other things. Information exists in the form of portions, pieces, or instances of information.

However, the common usage of the word *information* does not imply such wide generalizations as the Ontological Principle O2 implies. To define information per se, the GTI uses the concept of an *informational system* $IF(R)$ of the system $R$ for the information definition. Elements from $IF(R)$ are called *informational elements*.

**Ontological Principle O2a (the Special Transformation Principle).** *Information in the strict sense; proper information; or, simply, information* for a system $R$, is the potentiality/cause of formations and transformations (changes) of the structural informational elements from an informational system $IF(R)$ of the system $R$.

Information in the strict sense is stratified according to the global structure of the world represented by the Existential Triad of the world, which is composed of the top-level components of the world as a unified whole reflecting the unity of the world. This triadic structure is rooted in the long-standing tradition coming from Plato and Aristotle and consists of three components: the Physical (Material) World, the Mental World, and the World of Structures [10,11]. The Physical (Material) World represents the physical reality studied by natural and technological sciences, the Mental World encompasses different forms and levels of mentality, and the World of Structures consists of various kinds and types of ideal structures.
4. Ontological versus Mental Information

All living organisms are autopoietic and cognitive. Autopoiesis refers to a system where The Existential Triad entails the differentiation of information into two comprehensive classes: ontological information and mental information.

Ontological information is the potentiality/cause of formations and transformations of structures in the physical world, i.e., of physical systems. As ontological information functions in the physical world, it is natural to treat it as a natural phenomenon [3].

Mental information, e.g., epistemic information, is the potentiality/cause of formations and transformations of structures in the mental world, i.e., of mental systems. Ontological information is orthogonal and complementary to mental information. Epistemic information, which has been studied by different researchers, is a type of mental information and, thus, it is orthogonal to ontological information.

It is possible to ask the question of how information belonging to the World of Structures can act on physical systems. To solve this puzzle, we introduce two levels of ontological information: information $IO$, which belongs to the World of Structures, and ontological information $O$, which belongs to the Physical World and is studied in [3–5].

Connections between these two levels of ontological information are explained utilizing two more ontological principles of the GTI—the Embodiment Principle O3 and the Representability Principle O4. They postulate existence of representations and carriers of information, which in particular, can belong to the Physical World. In this framework, we see that information $O$ is a physical (material) representation of information $IO$. Information $IO$ is embedded in physical objects becoming information $O$ and acquiring the ability to act on physical systems. In the same way, the mind embedded in the human body is able to operate in the physical world.

5. Ontological Information versus Physical Energy

According to the general theory of information, (physical) energy is a kind of generalized information, which is situated in the physical world, being a potentiality/cause for changing or preserving physical systems. Ontological information is the genuine information but it is also a potentiality/cause for changing or preserving physical systems because it acts in such a way on physical systems. In spite of this similarity, there is an essential difference between energy as generalized information and ontological information—namely, energy directly acts on physical systems while ontological information acts only on physical systems having a physical representation and being embedded in a physical carrier. In particular, ontological information can have physical energy as its representation.

6. Mental/Epistemic Information versus Mental/Psychic Energy

A similar relation exists between mental information and mental/psychic energy. According to the general theory of information, mental/psychic energy as generalized information in the mental world is a potentiality/cause for changing or preserving mental systems. Mental information, e.g., epistemic information, is the genuine information but is also potentiality/cause for changing or preserving mental systems because it acts in such a way on mental systems. In spite of this similarity, there is an essential difference between mental/psychic energy as generalized information and mental information—namely, mental/psychic energy directly acts on mental systems while mental information acts only on systems with a mental representation and embedded in a mental carrier. An example of such mental systems is knowledge situated in the mentality (mind) of people. In particular, mental information can have mental energy as its representation.

7. Conclusions

The concept of ontological information in the context of the general theory of information clarifies and resolves several problems that have plagued many previous studies of information, including the question of the relations between physical carrier and epistemic
information, the nature of the relations between energy and information, the nature of causality of information in mental and physical worlds, and the fusion of information with meaning in physical systems [1,2].

Moreover, the proposed conceptual framework provides a reliable basis for further studies of information ontology, information causality, and information processes as computation in natural systems.

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