Information ecology and the concept of information

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Abstract
In the paper, the author presents that information ecology can be considered to be a theoretical reaction on the inquiry into the character of the concept of information, especially on the solving of so called Capurro's trilema. The trilema consists in the answering the question of whether information is an univocal, analogical, or equivocal concept. In the paper, there is introduced what does univocity, analogy and equivocity of the concepts mean and there is presented some conceptions according to which the concept of information is considered to be an univocal, analogical and equivocal concept. There is also shown that a development of information ecology is possible only if we could consider information to be an analogical concept.

Keywords
information ecology, the concept of information, Capurro's trilema, paradigms of information science

Introduction

Information ecology (see for example Steinerová 2010) is a concept that attempts to unite and harmonize the different approaches in information science (technical, cognitive and social paradigms) and which at the same time respects the specificities of each of these approaches. As the name suggests, the concept of information ecology is inspired by the science about living organisms and their environment (ecology). Information ecology studies the "information ecosystem" that consists of elements of various nature - information (intangible entities), technology (non-living systems), users of information (living systems) and also communities of users (social macro-system). As in the classical ecosystem, so in the information ecosystem, each element has its own unique place and the elements of various kinds are not transferable to each other.
This article aims to show that the concept which is defended by information ecology is closely connected with a certain philosophical conception of the notion of information and that this new and fruitful approach (information ecology) is meaningful only in the frame of this philosophical conception.

1 The nature of the concept of information

There are many definitions of the concept of information that has been created in various scientific fields (see Capurro, Hjørland 2003). Rafael Capurro brought into this chaotic situation light by asking the fundamental question about the nature of the term of information. Rafael Capurro formulates this basic question as follows:
Information may mean the same at all levels (univocity), or something similar (analogy), or something different (equivocity). (Capurro, Fleissner, Hofkirchner 1999, p. 9)
Capurro has been inspired by the traditional Aristotelian and scholastic philosophy which dealt with the nature of the concept of being (see for example Dvořák 2007). The concept of being is the highest term that encompasses everything that exists or can exist. For this reason, this is a concept that has the greatest possible scope, but the lowest possible content (it is the most abstract concept). Because of this concept includes everything that exists (or can exist),

it means that there are entities of different categories in the range of this concept (Aristotle distinguish one category of substance and nine categories of accidents). However, the categories differ from each other by means of contradictory properties. For this reason, the question is whether the concept of being is assigned to all entities in the same sense (univocity) or in the similar sense (analogy) or in the totally different sense (equivocity). Aristotle and his followers (Thomas Aquinas and others) assert that the concept of being is an analogical concept because it necessarily has to include what is common to each category, but also what makes individual cathegory different from each other. On the contrary, Duns Scotus and his followers believe that the concept of being is an univocal concept what means that this term is assigned to all entities in the same way. These philosophers believe that the concept of being is so abstract that it contains no differences through which things differ from each other. The last group consists of nominalists (William of Ockham and others) who were convinced that the concept of being is equivocal. According to them, the world consists of items which have nothing in common. Therefore, the concept of being which is assigned to all items does not contain anything that could be allocated to all items together. It's just a word.
The situation is similar in the concept of information because this term can be understood as something that belongs to everything that exists (everything that exists has its own measure of the degree of organisation, i.e. information). The concept of information is associated with the concept of matter (Stonier 1990), with the concept of self-organizing systems (Maturana, Varela 1980), as well as with the cognition of living systems and with the communications between these systems and also with the communication technology. For this reason, we can use for the inquiry into the concept of information the same criteria as for the exploration of the concept of being and we can examine the arguments of the various philosophical schools which have expressed to the issue of the concept of being (see Stodola 2010).
In information science, there are different paradigms according to which information is either an univocal or equivocal or analogical term. Let us introduce some of them and try to inquiry into their relationship to information ecology.

2 Information as an univocal concept and information ecology

Paradigms which is based on natural science and technics has a tend to consider information to be an univocal concept. This situation is caused by the reductionism of natural science which does not distinguish between different levels of reality. This is especially apparent in the physical view of information (Gackowski 2010) according to which information is a "pattern in form", i.e. a kind of pattern that is portable from one system to another. For this transfer, we need not to distinguish systems of different levels. This means that what we call information has the same content for all of the apparent levels of reality – in this conception, information is an univocal concept.
In the physical view presented in this paper, information is anything in form that can be communicated (in contrast to factors in substance). Information, as factors in substance, affects operations and their results. A pattern, whether in form or in substance, is also represented by physical states of matter and energy. As such, information is as objective as other factors in substance. [...] *If information denotes anything in form, then informing can be defined as nothing more than developing and spreading patterns in form that are represented by physical states.* (Gackowski 2010, pp. 36-38)
For this view of information, information ecology is unnecessary. Communication between systems of various levels of reality is without trouble because there do not exist any levels. But this conception is untenable. According to this view, there could exist only one science - physics (with its own principles like matter, energy and information). Every other science like chemistry, biology, psychology (and also transdisciplinary sciences like information science) could be reduced to physics. Even if some philosophers of science have such a opinion, it is

untenable. An assertion that everything that exists is of physical character is contradictory. It is a result of the metaphysical reasoning which must assume that exist something non material for example principles of thinking (see Fuchs 2004). Such a conception must be rejected.

3 Information as an equivocal concept and information ecology

The concept of information as an equivocal concept is associated mainly with the postmodern philosophical approaches (see for example Wersig 1993). According to postmodern philosophy, there exists many different descriptions of the world (discourses), each of them is so different then the other that one approach can not be measured by means of one another. The main goal of information science is to study these discourses (see Frohmann 1994), but it is not possible to find a unifying perspective through which we could unite the different meanings of the concept of information that are associated with different disciplines and approaches. Information is an equivocal term that has its own meaning in various fields and nothing common can be found.

Surprisingly, the concept of information as an equivocal term appears in philosophy which is inspired by the natural sciences - evolutionary ontology (Šmajs 2008). According to this philosophy, we should distinguish between natural information (genetic and epigenetic) which is recorded by nuclear acids (DNA) and by some other structures of the living systems and between cultural information (structural and semantic) which is encoded by human language and recorded through information technologies. First type of information is not compatible with second one. For this reason, the system of the human culture is in the opposition to the system of nature. Josef Šmajs writes:

We cannot naturally consider our sociocultural conceptual interpretation, which is also built using the nervous systems inherited from our animal ancestors, to be such a representation either. All our conceptual interpretations are tainted with our interests, not only individual and group ones, as is generally understood, but also with the species-selfish, general human interests, that are not discussed. Hence, not even experience defined by ethnic languages can ever describe the world in terms of its soft atomic and molecular architecture, of its fascinating evolutionary creativity and balance.

[...]

Nonetheless, the current crisis is related to human knowledge. How close this relationship is can only be stated here in part and as a generalization, since this is the focus of this whole work. Due to the fact that the crisis is connected with the expansion of the global anti-natural culture, it is also necessarily connected with the sense and role of the human neuronal knowledge that supports this expansion as a part of the intellectual culture. (Šmajs 2008, p. 4-6)

This naturally means that the concept of natural information has different content than the concept of cultural information. Information is an equivocal term.

But both the postmodern approach and the approach of evolutionary ontology must be rejected, because they shall be considered to be internally contradictory conceptions. Postmodernism asserts general statements about the impossibility of a general approach. It is a general approach about impossibility of a general approach (this is typical example of contradiction). Evolutionary ontology considers that its own claims about reality are true, even as it declares that we cannot achieve an objective knowledge through human language. It is a statement in human language (considered to be true) about impossibility of the human language to describe reality (this is also a contradictory assertion).

According to these conceptions, information ecology is impossible. According postmodernism, we cannot find any unifying approach for the interconnection of different paradigm in information science (technical, cognitive, social) and it is also not desirable. According evolutionary ontology, the human nature and human culture is in the relationship

of the opposition. It for example means that human abiotic technics (cultural information) and human genome (natural information) are incompatible. Evolutionary ontology cries for new biotic information of the human culture, but according to its own bases, there is not any possibility to achieve this.

4 Information as an analogical concept and information ecology

There exist paradigms in information science according to which information is an analogical concept. For exemplar, we can introduce two of them: the multi-stage model of information (Fleissner, Hofkirchner 1996) and philosophy of information based on the Aristotelian philosophy (Stodola 2010). In this paper, we focus only on the multi-stage model of information.

According to the multi-stage model we can distinguish three levels of reality: 1. physical stage, 2. biotic stage and 3. cultural stage. The higher level arises from the lower one thanks to evolutionary processes, but higher level has its own new quality and therefore it can not be reduced to a lower level.

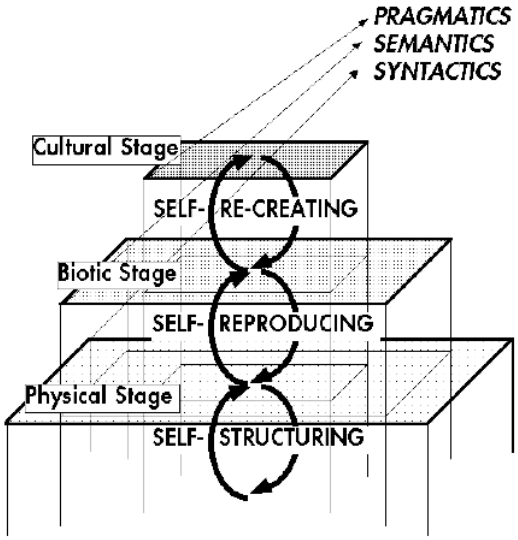

Fig. 1. The multi-stage model of information (Fleissner, Hofkirchner 1996, p. 246)

Physical stage consists of the systems which are self-structuring in the dissipative thermodynamic sense only. In this level syntactical, semantic and pragmatic sides of information are identical.

In the biotic stage, we can found systems which are self-structuring in a new sense – they are self-reproducing (autopoietic). These systems are able to obtain matter and energy from their environment and to integrate them to their own body. They are also able to analyze signals from the environment. It means that they are able to achieve knowledge and also to have an affect to their environment. In this level, there should be distinguished between syntactical and semantic side of information.

The last level is a cultural stage. This cultural system is not only self-structuring, self-reproducing but also self-re-creating. Its means that the human culture is a system which is able to rebuilt itself and also rebuilt its environment. In this level, we should distinguish between syntactical, semantic and pragmatic side of information.

We can see that property “self-organizing” and associated concept of “information” can be allocated to all levels of the model but not in the identical sense. Every level has its own concept of “self-organization” and also “information”. The term which is allocated to each

level contains something what is the same and also something what is the different. It means that, in the multi-stage model, information is an analogical concept.
Information is that part of the process of self-organisation that is responsible for generating new features in the system's structure, state, or output. In a figurative sense, information can be looked upon as the result of this process, as what is new in the structure, state, or output. And insofar as this new feature in system A may serve to stimulate self-organising (and therefore informational) processes to produce new features in system B, we can speak of information in a metaphoric sense, as if it were something to be sent from one system to another. (Fleissner, Hofkirchner 1996)
Such conception according to which there exists interconnection between different levels of reality and at the same time the one level is not reducible to other one can be the basis for the concept of information ecology. The system of a higher order consists of the elements of lower orders and even it has something extra. Human as an animal being belongs to the biotic stage of the model. But at same time, he is also a factor of cultural evolution. Although abiotic technics is a part of the cultural system, it belongs also to the physical stage to the extent to which it is a physical artefact which consists of the natural material. Self-re-creating of the technics is impossible without a human. For creation of the culture, humans use also biotic technics like domesticated animals and genetical engeneering. But also non material entities like information which can be recorded thanks to information technics belong to the culture stage. Thanks to information technics, humans can turn information into the knowledge and they can share it with other people what is the important condition for the building of the human society and for the evolution of the culture system. We can say that entities of three stages belongs to the system of culture - technics (physical), humans (biotical) and human thought, values, moral norms and so on (cultural). The goal of the information ecology which is harmonization of the information flow between system of various level can be realized only if we will able to consider information as an analogical concept. In the other case, information ecology is not necessary (if information is an univocal concept) or information ecology is not possible (if information is an equivocal concept).

Conclusion
In the contribution, we focused on the inquiry into the philosophical basis of the possibility of information ecology. We were aquainted with three main ways of the allocations of the concepts - with univocity, equivocity and analogy which is the main substance of so called Capurro's trilema. We dealt with some exemplary conceptions according to which information is an univocal, equivolal and analogical concept and we dealt with their relationship to information ecology. There was shown that information ecology is possible only in the frame of the conception according to which information is an analogical concept.

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