Information field

Victor Yakovlevich Tsvetkov

Moscow State Technical University of Radio Engineering, Electronics and Automation MSTU MIREA, Vernadsky Prospekt, 78, Moscow, 119454, Russia

Abstract. The theme of the present article concerns the information field. It is stated here that information field may be discrete or continuous. Information field includes two types: natural information field and artificial information field. Information field is the basis of data organization. Information field is the basis of information models building and information modeling. In this article it is described that information field as well as information models have common elements, which are information units. It is stated that information field possesses a plenty of varieties.
[Tsvetkov V.Y. **Information field.** *Life Sci J* 2014;11(5):551-554] (ISSN:1097-8135). http://www.lifesciencesite.com. 83

Introduction

In many scientific spheres and subject areas the term "field" is used to describe the real world. This concept is usually associated with continuous or discrete set of values that reflect the property of the world. Sometimes a combination of such aggregates is used as a discrete-continuous one. Topological fields are an example of such a combination. Widespread use of the field concept in many sciences gives the reason to use this concept within the sphere of information sciences. It should be noted that different terms, including the term "field", are actually used within the sphere of information sciences. Therefore, the information field investigation and particular features of its usage as a tool for the outside world cognition should be considered relevant.

Methods

In the present article, the information field studying can be performed from the side of different aspects or different points of view. The first research aspect is the aspect of describing the outside world. Within the frame of descriptive aspect we suppose that the information field is a reflection of the properties and characteristics of the surrounding world. This view allows to regard a plenty of well-known fields as variations of information field.

The second research aspect is the human impact on the formation of the information field. Within the frame of this aspect it is believed that during the real world description there are implemented two types of data fields: natural and artificial.

The third research aspect is a system-based one. Within the frame of this aspect it is supposed that the world is a combination of nested systems.

Information field, being considered as a reflection of the outside world, includes the world systemization. Within the frame of the system-based aspect it is believed that the information field itself has systemic symptoms. We assume that there are elements of the information field, which should be called "elementary information units". For the purpose of this aspect it is supposed that there is a complex structure of the information field, which should be called "complex information units".

The fourth research aspect is an applicable one. Within the frame of this aspect it is believed that the information field is a shared, multi-valued concept. Therefore, the value of this concept is revealed and confirmed in a particular subject area. For the purpose of this aspect we suppose that within the applied areas, data collection and organization are based on the information relations and information links existing inside the information field.

The fifth research aspect is an informational one. Within the frame of this aspect it is believed that numerous objects of the information field are considered as information-oriented ones. This assumption gives grounds for application of information modeling and information models used for describing and analyzing information field.

The main part

External environment is an objective world in which there are real objects. These real objects interact with the environment and between themselves. Real-world objects are in different states and different relations between themselves. Objects are composed of parts, which are also in certain relations to one another. Properties of objects and relationships can change over time. At various time

points the changes in relations cause events that can trigger other events.

Reflection of the external environment and the set of states of real objects is an information field. In this field, the images are reflections of real objects - "Information objects". A person examines a user-accessible information field and solves a local problem. He creates a model, which is an artificial information field. A person examines a user-accessible information field and solves further global task. Within the frame of the global problem, he creates a picture of the world. [1] It is advisable to compare the information field with other fields in order to understand its content and features.

In general algebra the field is defined as the algebraic structure with the algebraic operations defined for its elements [2]. The simplest field is the "field of rational numbers." This field has the elements; meanwhile the field elements are not necessarily the integers. It may be discrete or continuous.

Physical field is presented as a certain dynamical physical quantity [3] (called as a "field variable"), which is defined at all points of space and changes with time. It has elements and more often appears to be a continuous one. In the quantum field theory, a "field variable" can be formally considered as a spatial coordinate, and this field variable is associated with a corresponding operator [4]. The main feature of the "field variable" in physics is that it is often determined by physical dependency, i.e. by mathematical formulas. Field variable is often defined as a function.

Satellite technology is now currently used for the study of terrestrial space. In the course of these studies there is used the "navigation field" term.

"Navigational field" [5] is a real space in which each point with the help of a special receiving equipment it is possible to determine the location and the time of that location determining. It has elements and is considered to be continuous.

In the sphere of education and artificial intelligence there is applied the concept of "field of knowledge." "Field of knowledge" is defined as an abstract space associated with real space and information defining characteristics. It has elements and often is discrete.

The investigation of the Earth's information space led to invention of the "infosphere" concept [6]. The subject of infosphere generates its information field or information-functional space [7], localizing internal information processes and leads to an external information interaction. Such a field has elements and most often is considered to be discrete.

There is the concept of "hypothetical field". This term refers to fields that describe the new theories that do not contain internal contradictions. Hypothetical field does not contradict with the observations and allows obtaining of the observable consequences. Hypothetical field usually gives new knowledge or new information in comparison with the known theories and fields. Information field can be attributed to such a hypothetical field.

In practice, we can create any number of fields and hypothetical theories. In order to exclude many potentially possible but useless theories, there is applied the principle of "Falsifiability" [8]. This criterion was formulated by K.R. Popper in 1935 [9]. The theory satisfies the Popper's criterion (it is falsifiable i.e. scientific) if there is a methodological opportunity to refute it by setting up an experiment, even if such an experiment has not yet been delivered.

Thus, the information field appears as one of the varieties of fields. On the other hand, all of the above mentioned fields can be considered as information fields, like "private information fields" descriptions of the external world. This suggests the understanding of the "information field" concept more general rather than particular.

In the information field, the world appears not only substantially, as information objects, phenomena, processes, models, but is determined by the information ratio, information forms, forming, self-organization, self-development [10]. From this perspective, the information field can be regarded as an attributive characteristic of the world. Therefore, when using the term of information field, it should be complemented by a clarifying language construction that allows us to specify the information field with the application area.

The information field definition can be formulated on the basis of the analysis.

Information field [11] is the field at each point of which there is defined one or more information-definable parameters. This evidence may be dichotomous [12], spatio-parametric [13], spatial, geographical [14], intelligent [15], etc. It is necessary to emphasize the difference from physical fields. A "field variable" is often a function in physical fields. The "information parameter of the field" is either an argument or an indicator in the information fields.

The coordinate system is an example of the spatial field. Kriging [16] is an example of how to create a spatially-parametric field. Due to the wide spread of remote and virtual education, there appeared the term of a "virtual information field" [17]. Due to the wide spread of information systems, there are appearing different variations with the term of "information field" not only as a medium, but even as a kind of infrastructure [18].

The information field is often associated with real space. It defines its kind of "spatial information field."

Information field allows connecting different indicators into a single system. Therefore, the information field serves as the basis of communication between the different empirical data. In mathematics there are used functional relations between different quantities. Information field specifies the information links between data that can subsequently be described by different functional constraints.

Information field is the basis of data organization. One of the important principles of data organization is an organization of links between data. Main theoretical principle applied for organization of such links in the information field is the reference. Within the spatial information fields, the reference is replaced by georeference. This is an example of a discrete information field. Another organization principle is to form a topological spatial relations or topology. This is an example of a discrete-continuous information field.

Information field is the basis for information models building and information modeling. Elements of the information models and information field are the information units. Information units are considered to be the means of objects displaying. Thus, the information field sets one or a complex of information related indicators. It may be discrete or continuous. It has units, which are referred to as information units [19].

Information field, the same as information, is a polysemous (multivalent) concept. In order to distinguish information fields with the same names but different meanings, their names should be expanded by adding **descriptions.** For instance, a field of knowledge can be transformed into *semantic network* [20], or into the *field of knowledge translation* [21].

A person examines the world, studying the information field of the world, and creates a model, which is an artificial information field. A person lives in a world filled with information. Information is divided into two kinds: natural and artificial. Natural information is a kind of information corresponding to the natural information field. Natural information does not depend from a man. It objectively reflects a naturally occurring objects, laws, processes, relations, relationships, and interaction.

Artificial information is a kind of information created by a man. Artificial information corresponds to the artificial information field. During the activity process, a person obtains information from the surrounding environment and personally creates a new one. Hence artificial information can be divided into two categories: natural reflection and information created by a man. It is not always possible to draw a clear line between them.

Artificial information may be a reflection of the natural information and may be the result of a human intelligence. For example, projects of artificial structures, bridges, pipelines, houses, cars, etc. – all these refers to the artificial information.

During the research process a man is using instruments and personal assessments of the world. Therefore, an artificial information field often contains field of random errors.

People interpret the surrounding world based on their attitudes and methods of representation. Inadequate interpretability of the information field objects may result in credible information that is not true and may lead to errors.

The information field may be continuous or discrete, depending on the organization. An example of a discrete information field is a field of terms or a field of concepts.

The description of the world's object and the process can be regarded as models of different information fields. The external information environment, in which real objects are submerged, serves as a basis to obtain information. Reflection of real objects and relations are the information models and information relations. Information relations play an important role in the information field. Information is divided into two kinds: descriptive and meaningful. For example, a person can see a text written in a foreign language (see description), but do not understand its contents. In addition, some descriptions of the symbol constellation type, such as a list of alphabetic letters, do not bear any content, but sentences and texts composed of these letters contain semantic message and transfer knowledge.

Information relations conditioned upon the objective relations and connections between the objects of the information field. Information relations reflect the direct, indirect, primary and secondary relationships between real objects and their parts. Identifying and using of the information relations and connections enable the exposure to real-world objects and management of these objects.

There should be also emphasized another difference between the information field and many other fields. For example, the fields in physics define relationships. Information field specifies the first information relations. Such a condition is not rigid and allows you to build in future a variety of functions and dependencies, and find connections, based on the information relations.

Conclusions
Application of the "information field" concept expands the possibilities of the surrounding

world studies. Information field meets the criterion of falsifiability according to Popper, so it is a scientific category. The main function of the information field is the description of the surrounding world and the individual subject areas. Information field specifies the information description of the parameters and relations that further serves for building of functional or analytical relationships. Unlike many other fields, the "information field" is a polysemous concept. Therefore, it is necessary to clarify the type of information field in the practical activity. The term "information field" enables the interdisciplinary knowledge transfer. Information field is a relatively new concept. Information field is the basis for the surrounding world perception, and helps to create a scientific picture of the world.

Acknowledgment

Corresponding Author:

Dr.Tsvetkov Victor Yakovlevich
Moscow State Technical University of Radio Engineering, Electronics and Automation MSTU MIREA
Vernadsky Prospekt, 78, Moscow, 119454, Russia

References

1. Tsvetkov, V.Y., 2014. Worldview Model as the Result of Education. World Applied Sciences Journal, (issue 31 (2)): 211-215.
2. Dumas, J.G., Gautier, T., and Pernet, C., 2002. Finite field linear algebra subroutines. Proceedings of the 2002 international symposium on Symbolic and algebraic computation: 63-74.
3. Landau, A.D. and Lifshitz, E.M., 2001. Field Theory, edition 8: 534.
4. Bogolubov, N.N., Logunov, A.A., and Todorov, I.T., 1975. Introduction to axiomatic quantum field theory. Reading, Mass.
5. Moorehead, S. et al, 1999. Autonomous navigation field results of a planetary analog robot in Antarctica. Artificial Intelligence, Robotics and Automation in Space, T. 440: 237.
6. Ivannikov, A.D., Tikhonov, A.N., Soloviev, I.V., and Tsvetkov, V.Y., 2013. Infosphere and infology: 176.
7. Soloviev, I.V., 2012. About information object and subject. Distance and virtual learning, # 05: 80-84.
8. Raoult, D., 2009. Creationism-remember the principle of falsifiability, T. 372, # 9656: 2095-2096.
9. Karl Popper. Stanford Encyclopedia of Philosophy.
10. Savinykh, V.P. and Tsvetkov, V.Y., 2005. Synergetics and Geoinformatics. Geodesy and photographic aerial survey, # 4: 112 -118.
11. Ivannikov, A.D., Kulagin, V.P., Mordvinov, V.A., Naykhanova, L.V., Ovezov, B.B., Tikhonov, A.N., and Tsvetkov, V.Y., 2008. Knowledge gaining for educational information resources generating: 440.
12. Tsvetkov, V.Y., 2014. Opposition Variables as a Tool of Qualitative Analysis. World Applied Sciences Journal, (issue 30 (11)): 1703-1706.
13. Mayorov, A.A. and Materuhin, A.V., 2011. Geoinformation approach to the problem of development of the mass valuation instruments of real estate. Geodesy and photographic aerial survey, # 5: 92-98.
14. Câmara, G., Freitas, U.M., and Cordeiro, J.P., 1994. Towards an algebra of geographical fields.
15. Kudz, S.A., Soloviev, I.V., and Tsvetkov, V.Y., 2014. Spatial Knowledge Ontologies. World Applied Sciences Journal, (issue 31 (2)): 216-221.
16. Stein, M.L., 1999. Interpolation of spatial data: some theory for kriging.
17. Tatiana Ozhereleva, 2013. Geodetic Education. European Researcher, Vol. (40), # 2-1: 268-272.
18. Bacon, C.J. and Fitzgerald, B., 2001. A systemic framework for the field of information systems. ACM Sigmis Database, T. 32, # 2: 46-67.
19. Tsvetkov, V.Y., 2012. Semantic Information Units as L. Floridi's Ideas Development. European Researcher, Vol. (25), # 7: 1036-1041.
20. Havasi, C., Speer, R., and Alonso, J., 2007. Concept Net 3: a flexible, multilingual semantic network for common sense knowledge. Recent Advances in Natural Language Processing: 27-29.
21. Davis, D., 2006. Continuing education, guideline implementation, and the emerging transdisciplinary field of knowledge translation. Journal of Continuing Education in the Health Professions, T. 26, # 1: 5-12.

5/1/2014