

Development Methods and Tools to Study Information Balance in Medical Applications

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Abstract

The present paper is dedicated to the hypothesis about dependence between the mode of human's information feed and his health condition. The analogies between informational feed and a usual human's meal are drawing. The source of such hypothesis is the axiom of informational balance: the information, that is in interaction of human with an environment should be equivalent to the information, that is in internal structure of this human. Questions, that are also discussed in the paper: quality of human's informational feed; possible human's behaviour to change informational balance; distortion of human's recognition of environment. The research stages for this problem further development are discussed. The meta-statistical tools are offered to be used in experimental research on investigation of the balance.

1. Introduction

The main focus of this paper is to apply the fundamental philosophic principle of balance between internal and external semantics of any World object, including human beings, to medicine. We use and further develop the formalism of metasemantic algebra (Puuronen & Terziyan [9]), (Bondarenko et al. [1]), (Grebenyuk et al. [3]) to describe internal and external semantics of any single or compound object in a network and the formal use of the law of semantic balance analysing a human state of health. The goal of the research presented in (Grebenyuk et al. [3]) is to develop formal tools that benefit the law of semantic balance. The assumption is used that a situation inside the object's boundary in some world should be in balance with a situation outside it. It means that continuous cognition of an object aspires to a complete knowledge about it and knowledge about internal structure of the object will be in balance with knowledge about relationships of the object with other objects in its environment. It is supposed that one way to discover incompleteness of knowledge about some

object is to measure and compare knowledge about its internal and external structures in an environment. If there exist differences between the internal and the external semantics of an object, then these differences can be used to derive more knowledge about the object to make knowledge complete. The refinement process is done step-by-step as a continuous evolution of a knowledge base. Each step consists first automatic analysis of semantic balance which is then followed by attempts to derive knowledge that will balance differences between internal and external semantics of the object. The algebra was used also to describe some of medical applications in (Grebenyuk et al. [2]).

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2. Balance Studies in Oriental Medicine

Questions concerning the role of balance in functioning human body and in human environment have been already deeply studied and apply in Oriental Medicine. Ayurvedic Medicine (Leeuwen-Smith L. & E. [4]) is quite possibly the oldest medical system in the world, dating back to about 3000 BC. It focuses upon balance and keeping a person free of disease. From India, it may have influenced development of other Oriental medical systems and like Chinese medicine, Ayurvedic Medicine views a human as a microcosm of the universe. It considers "Life Force" or "prana" and if one or both of these are unbalanced, disease may

follow. Three doshas (force) determine the proper balance needed by the human system. These include Pitta (Heat and Energy), Kapha (Water and Tides), and Vata (Linked to the Wind). Their subtle alignment to body, mind and spirit produce health. To achieve this balance, dietary changes, yoga, meditation, herbs, massage, and possibly chanting are usually recommended.

Bio-Energetic Synchronization Technique (Leeuwen-Smith L. & E. [5]) was developed as a painless relaxation technique restoring a patient's natural energy field. It is believed that emotional, mental and physical upsets change the course of energy flow, which then leads to disease. Here again we see the fact of the body in an unbalanced state.

Indigenous Medicine (Leeuwen-Smith L. & E. [6]) is from a strong belief by Native Americans that illness results from the body's harmony with nature has been disrupted. This is quite logical as almost everything, even things manufactured, have a certain vibrational level or influence; and our bodies especially. In this approach herbs are used to guide and assist healing. In this natural approach the use of a "sweat Lodge" is often employed to assist in the cure as well as drumming, dance ceremonies and chanting.

Visualisation Therapy (Leeuwen-Smith L. & E. [7]) can be traced back to the Bible and probably earlier. While not scientifically documented, visualisation therapy is used not only with cancer patients but also with those needing to view themselves as competent individuals, dealing with life's problems or achieving what they want in life. There are many ways to use visualisation; through tapes, self-hypnotic suggestion, meditation or thinking focused about something.

China's herbal tradition (Leeuwen-Smith L. & E. [8]) dates back some 4,000 years. Like Ayurvedic Medicine the Chinese system promotes prevention, maintaining optimum health which requires that chi or qi, the same as prana, flows properly along the body's internal energy meridians. Proper flow can only be maintained if the body's opposing principles of yin and yang are balanced.

Functioning of the internal organs and systems, the patient's lifestyle, psychological state, and diet are also considered important factors.

3. Interaction of Human and Environment by Informational Exchange

The recognition of information occurs through bodies of recognition, such as hearing, smelling, touching and etc.. Also source of information is own intelligence of a person. For example, we do not see the subject, but we can make assumptions of its presence, its properties. Our assumptions are based on indirect sources of information. It is so-called indirect identification (by set of attributes). Because of imperfection of a person's recognition bodies, and also during the analysis of environmental world information the distortion of environmental world takes place. As a result, the environment, recognised by a human, has essential differences with the real environment. This is shown in Figure 1.

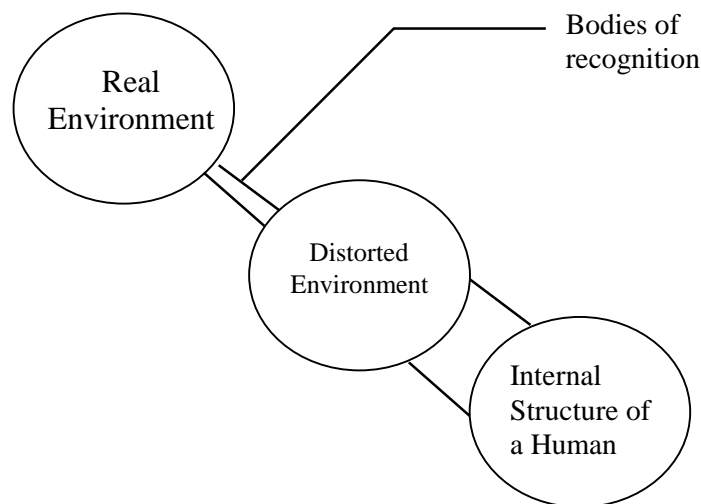


Fig. 1. Environment recognition scheme

These differences by that are more, than more imperfection of recognition bodies and process of information analysis. Let us suppose, that the absolutely healthy person, perceiving an environment without distortions, is in information balance with this environment. Thus all illnesses of person are consequences of distortion of environment recognition. By condition of informational unbalance a

person aspires to restore the equilibrium and balance with external environment. The person to restore the information balance can undertake the following actions:

- influence on the external environment;
- influence on the own internal structure;
- completely replace the environment.

4. Information Feed of Human and Health

An information feed, as well as usual meal, can be simply described at least by three basic parameters:

- Quality;
- Quantity;
- Variety (ration).

By the authors' opinion, similarly to usual meal the informational feed, consumed by a person can be measured quantitatively and qualitatively. Let's suppose, that by lack or poor quality of informational feed the determined illnesses take place, and by surplus of informational feed - the others. However it is necessary to take into account all parameters of informational feed simultaneously. For example, the quality of information can be very high, but quantity is small; high variety of feed and its poor quality and etc.. The person is healthy, when quantity and quality of informational feed correspond to the determined norm. For each individual combination of a human and environment the norm can be various. Environment dynamically change in time, thus the norm of information exchange should also be changed. The purpose of present research is just to determine the norm of informational feed of a person depending to a given environment. Well known, that in usual meal ration of human albumen, fats, carbohydrates, vitamins are presented. It is possible to determine the norm of usual meal for each person in specific environment. The absence or the surplus of any component in person's ration can result some illnesses. If to consider with the similar point of view the informational feed, it is possible to assume following:

- some components can enter the informational feed as parts of its structure (we shall designate them as I_1, I_2, I_3, \dots , etc.);
- absence or surplus of any component can result some illnesses of a person.

Comparing usual meal ration and informational feed ration of a person, probably it is possible to find informational analogues of usual food ration components.

Hence, if it to balance human's information ration, it is possible to warn a number of illnesses. First of all the speech goes about those illnesses, the origin of which is directly connected to nervous system, bodies of sight, hearing, when in circumstances of time limit a human is compelled to remember, to process large volumes of information, to choose or create new methods of problems analysis and accept decisions in circumstances of risk and uncertainty

5. The Research Stages

The following research stages of the given problem are offered:

1. Experimental - statistical analysis of experimentally obtained results. Accumulation of experimental data and also statistical analysis and forecasting.
2. Creation of mathematical apparatus, that is intended for description of information exchange between a person and an environment.
3. Revealing and mathematical description of dependence between deviations of informational ration of a human and his illnesses.
4. Creation of intelligent system, that is intended for analysis of recognition deviations of environment, making decisions to change mode of human's information feed.

In order to allow to a physician with a minimal level of statistical background to use properly such automated diagnostics system based on balance technology, a metamethod is elaborated (Puuronen et al. [10]), (Terziyan et al. [11]), (Terziyan et al. [12]). The metamethod helps a user to select certain classification method that is the most appropriate for diagnostics problem being considered. The

metamethod is intended for an automatic selection of the best method for diagnostics from the base of classification methods.

6. Conclusion

At present days it is too early to make final conclusions, as the research is going on, but the first received experimental data confirm the stated forward hypothesis. The model of the intelligent system, that is intended for analysis of recognition deviations of environment, making decisions to change mode of person's information feed, has been created and tested.

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