

FORMAL MODELS
OF SOME MENTAL PROCESSES
BY TAKING INTO ACCOUNT PROTENSIVE TIME INTERVALS

V.K. Buteyko, M.M. Buteyko

Voronezh State University, 1 Universitetskaya Ploshad, Voronezh-6, Russia, 394006

E-mail: mail@buteyko.vrn.ru

Obschestvo Buteyko LLC, 7 Prospect Revolyutsyi, Voronezh-00, 394000

Email: info@buteyko.ru

A new model of the work of consciousness is proposed, which is based on the optimal decision-making system in uncertain environment with inverse relations, modifying as symbols of carrying signals, as well as cost function. The 2-dimensional set of optimal criteria is built according to living. New quality characteristics of thinking were introduced and analyzed.

1. Introduction

An abundance of works of different science disciplines was devoted to human thinking research. This theme attracts attention of philosophers, psychiatrists, physiologists, researchers of artificial intelligence and other scientists. But all attempts to solve pedagogical and medical tasks on the basis of social image about the work of consciousness ([1-5] and others), known to the authors, did not bring stable positive results. Particularly, they did allow predicting change of qualitative thinking characteristics.

Consequently, building and research of new formal models of consciousness of living organisms, including a human, has become of great practical and theoretical interest.

2. Some Definitions

Firstly let's define the basic notions of the theme. Maybe these definitions could seem to be unusual at first. But we will try to demonstrate that they are quite practical.

1. **Material** – matter, field and energy in the usual sense according to opinions of natural science specialists.

2. **Formal** – information that is contained in the change (motion) of material, *including laws of Nature*.

3. **Uncertainty** – situation, when accurate prognosis of the behaviour of any object by the living being is basically impossible, for example due to the limit of mind possibilities (its power).

4. **The consciousness in a general sense** – a certain function as part of a living being, securing *control* of all the processes, including processes of adaptation, regulation, self-education, etc., that distinguishes characteristic features of living and non-living beings at the same time. I.e. consciousness *in a general sense* is supposed to be present in all living beings, starting with viruses.

5. **The operation**. Here under the notion “operation” we'll take *the process of decision making* on the basis of incoming information and information kept in memory with aim to satisfy some *criteria*. The result of operation is *the decision-making* that can bring *acts* towards change of something material and/or formal.

6. **The consciousness in a restricted sense** – a part of the *consciousness in a general sense*, operating with very complex formal objects (information).

7. **Thinking** – a part of the *consciousness in a restricted sense*, securing probability of generation of external formal objects (information) for their transmission to other creatures without direct contact. Here it is generally understood as language of communication, developed to the level of writing.

I.e. thinking is roughly a part of the consciousness in a restricted sense being a part of consciousness in a general sense – Fig. 1.

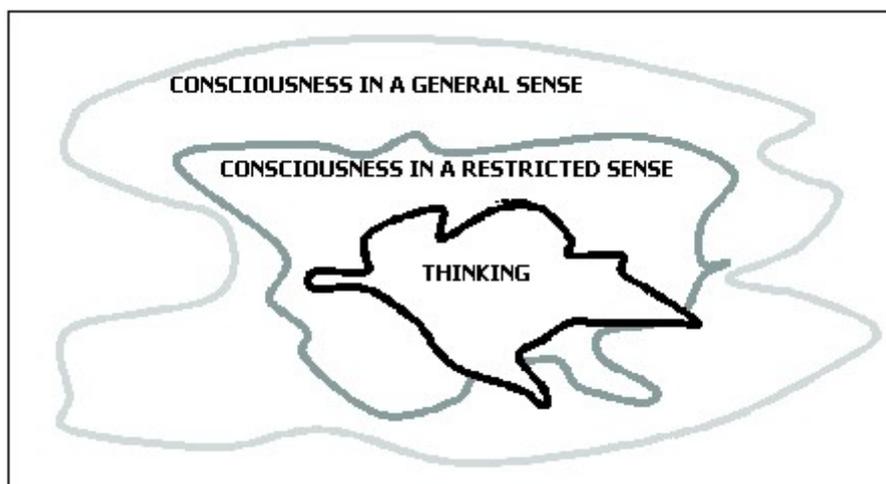


Fig. 1. Thinking as a part of consciousness

3. Decision-Making Process

Since operation is a decision-making, let's study it more closely. Two conditions are evident here. The first one – decision-making is made in the extremely high level conditions of *uncertainty*. The second one – decisions should be *optimal* in a sense.

Optimality could be easily grounded, taking into account that by another equal conditions, species or class of living beings with non-optimal decision-making is doomed to failure in the evolutionary competition in comparison with species of creatures, taking optimal decisions, i.e. to die-off. It follows required *criteria of optimality*, particularly:

- persistence of all flesh,
- persistence of species,
- persistence of class,
- persistence of population,
- persistence of genus,
- persistence of family,
- persistence of creature,
-

With evident relative position of these criteria on social ladder. Besides, these criteria have evident time dimension. That is:

- persistence on the "infinite" time interval,
- persistence during several generations,
- persistence during a generation (during life cycle of a bion),
- persistence within next year, month, day, hour, minute, etc.

Hierarchy on the time base is also obvious.

In other words, the system of criteria has two dimensions: one – on "quantitative" axis, another – on time axis. As is easy to see, position in such "bidimensional" hierarchical system depends more likely on "product of" "quantity" by time duration.

Mathematical notion of *the probability* is more developed by the science for to describe *uncertainty*.

The notion of probability allows using of Bayesian approach, well-developed within *the Theory of optimal decision-making* [6]. Let's mention that this science is sometimes called as *Statistical decision theory*.

According to this approach, on the basis of input data $x(l_0, t)$, possessing true value $l_0 \in L$ of important for living being information, a set of so-called posteriori risks is formed (of average losses or average values) $R(\gamma, x)$, where γ - element of a set of possible decisions Γ . The value $\hat{\gamma}$ is taken as decision, to which minimal value of posterior risk is corresponded. $t \in T$ - parametric variable, characterizing dimensionality of input data, which can represent both discrete, and continuum (continuous), or mixed (discrete and continuum) set. In turn, $x(\cdot, \cdot)$ is element of X set that contains all possible setups of input data. No limits are set to functional relation of $x(\cdot, \cdot)$ to l . This fact is reflected in the Theory of decision-making by the condition that to describe relationship between $x(\cdot, \cdot)$ and l combined posteriori probability density $W_{PS}(x, l)$ is used.

So,

$$\hat{\gamma} = \operatorname{arg\,inf} R(\gamma, x), \quad \gamma \in \Gamma. \quad (1)$$

Posteriori risk is calculated in the following way

$$R(\gamma, x) = \int_L W_{PS}(x, l) \cdot C(\gamma, l) dl, \quad (2)$$

where $C(\gamma, l)$ is so-called loss function, or cost function, showing value of loss (cost), to which decision γ brings, if the value of useful information equals l . Discrete variant of operation (2) is shown on the Fig. 2.

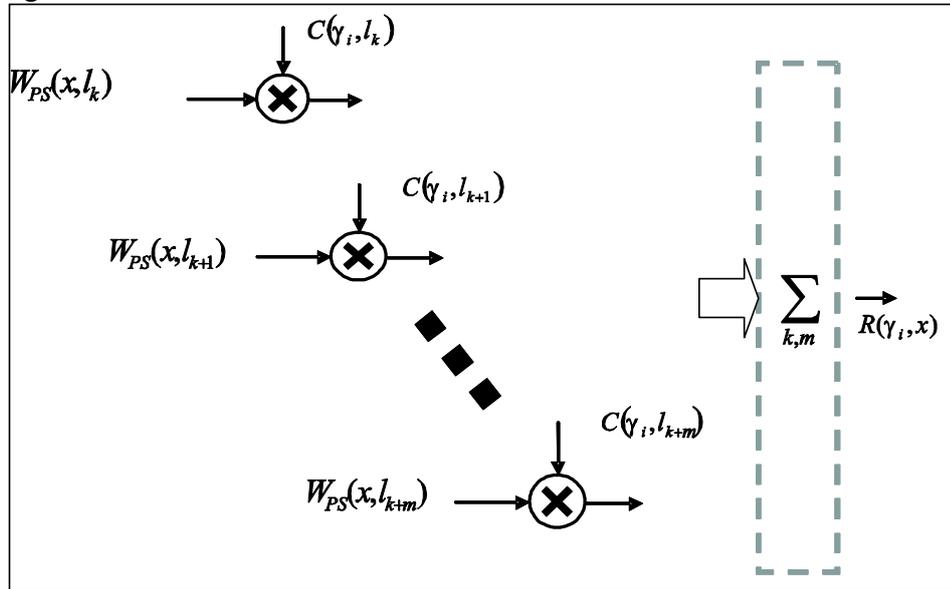


Fig. 2. Discrete variant of posteriori risk forming

In turn, posteriori probability density can be represented in the following way:

$$W_{PS}(x, l) = W(x | l) \cdot W(l), \quad (3)$$

Where $W(l)$ is a priori probability density of "useful information", and $W(x | l)$ is a so-called similarity function, showing how much one value of l is more likely than another with input data $x(\cdot, \cdot)$.

Besides, the process of forming posteriori probability density in many known cases is illustrated by equivalent diagram. For example, if the information is a presence or an absence of deviation of specified shape by equal priori probabilities, and operation $x(\cdot, \cdot)$ comes to adding to deviation of white Gaussian noise, functional logarithm of conditional (with fixed l) posteriori probability density is proportional to output signal of linear filter, characteristics of which follow the form of carrying signal $S(t, l)$

$$\ln[W(x | l)] \approx \int_T x(l_0, t) \cdot S(t, l) dt. \quad (4)$$

Moreover, realization of such a filter as a multichannel correlator has the same structure shown on Fig. 2, if values of posteriori density were replaced with values of input data, and values of risk were replaced with values of function $S(t,l)$. Here attention should be brought to the function $S(t,l)$ being in memory, which at "high" level of "intellectuality" could be interpreted as "image" of transmitter of information, important for a bion. Naturally we will consider that "images" in memory of living beings are formed on the basis of the same principle of decision-making in conditions of uncertainty, particularly decisions are made as of what to consider "important" information, and what – "noise".

Symmetry of the task about a sign, assigned to loss (cost) function, is also obvious. I.e. if to consider wins instead of losses (apply sign of function $C(\gamma,l)$), criterion of minimum average losses should be replaced with criterion of maximum average wins.

Now it remains to complete the scheme with natural inverse relations (Fig. 3), and we would have a model of the work of consciousness on the basis of decision-making principle. Moreover, according to the name of the present work, one of relations should be highlighted, because it clearly reflects inclusion of cause-and-effect relations to the model, i.e. dimension on the time axis. This relation, reflecting modification of loss values being in memory and priori data in relevance to real values, appeared as a result of acts, taken on the basis of decision made $\hat{\gamma}$.

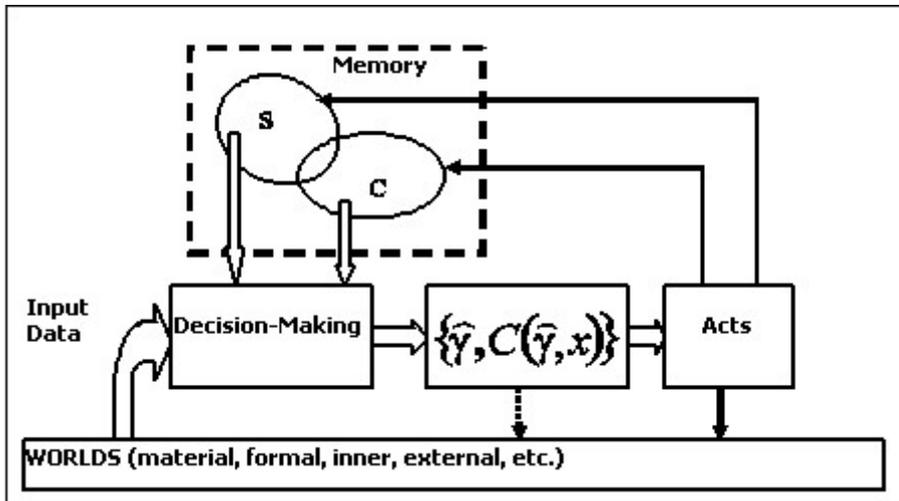


Fig. 3. Model of consciousness

One more *important* [7] function, being realized through inverse relations is consistency check of information kept in memory.

Let's note, that relation of thinking processes with principles of optimal decision making in the conditions of uncertainty were studied by other researched [5, 8].

4. Properties of Model

Let's compare properties of the present model with properties of living beings known to us.

1. Consciousness within the framework of model proposed is the distributed structure. Indeed, it's clearly seen that structures, shown on the figures, can be distributed by means of adding analogue structures. In turn, output set of posteriori risks can be presented to the input of the structure alike as input data for decision-making in section of a new dimensionality within another loss (cost) function, correct, for instance, to another level of optimality criterion hierarchy. Consciousness of living being possesses the same property. Since even in a brain it's impossible to distinguish any fixed fields, which would be responsible for certain thinking acts. Besides, some examples exist, that show presence in the work of thinking other organs besides brain. We mean an example, when a woman after heart transplantation suddenly started to feel an occasional need to drink vodka and

- have a bite of pie. It turned out that it was characteristic of the donor – young man that had died in a car accident.
2. Nothing is required for the work of thinking within a framework of the proposed model on the lowest (cellular, physical and chemical) level, except of **the operations of convolution and nonlinear transformation**. Particularly, no logical operators, characteristic for tries of intellect analysis on the basis of various «algorithmic» approaches, are required. Moreover, it's clearly seen that logical, discrete and other «exact» operators are a kind of possibilities, realized by the proposed model by means of using connections, resembling some non-analytic functions (Heaviside, Dirac delta, etc.) as loss function and priori distribution, i.e. only by means of peculiar properties of information, stored in memory. Figuratively speaking, to try to study consciousness and thinking within a framework of "algorithmic" models is like to try to understand patterns of differential and integral calculus, remaining within a framework of notion of Boolean mathematics. Consequently, it can be assumed, that such "intellectual" objects like ***logics, formal operations, etc. are just a result of the work of consciousness***, but not its basis.
 3. Obviously, convolution operations within a human being are carried by **the analogue method**. In this case, speed of information processing particularly doesn't depend on the volume of input data, and is defined, mainly, by the speed of the behaviour of physical and chemical processes. For example, lens manages to converse an image during light-wave propagation to a screen surface, what is beyond the scope of the most powerful supercomputer. In other words, such an analogue (can be called as parallel one) method of operation performance placed demands only on the "power" of the set of elements, participating in it. But, for living systems it is a weak constraint, because it is known that even in one protein molecule, number of such elements can be really high.
 4. It's clearly seen that in case of informative object *l* complication, carrying signal or interference presence, each element of the structures shown on the figure can be realized in the view of the same structures. I.e. within a framework of the proposed model, consciousness should possess **fractal properties**. In other words, proposed principle of the work of consciousness (model) is applicable during researching different "scales", or levels of "intellectuality", starting with unicellular organisms.
 5. **The multiplicity of consciousness**. Obviously, in the consciousness lots of "subconsciousness" – processes of decision making - work in parallel. For example, processes temperature regulation, digestion, processing of tactile, acoustic, and visual information, move of creature and other simultaneous miscellaneous processes, both connected one with another and relatively independent. Separate groups of parallel processes can be cohered and dissociated according to the structure of "processed" complex information objects.
 6. **The dynamic range** – is the ration between possible level of signal and level of noises, which are present in the system. In this case we mean values of formed posteriori risks. It's clearly seen that distribution of dynamic range just can't be reached by means of "parallel connection" to the process of decision-making of additional structures that use equal "images" and loss functions. Good example is possibilities of relatively quick adaptation of vision and hearing sense to the very wide range of levels of corresponding values. Besides, these ranges of levels are inaccessible or hard to access by means of technical relevant instruments.
 7. We think it is important to draw your attention to the fact that amplitude sensibility dependences of living beings are goodly approximated with **logarithmic dependences**. I.e. decision about the number of new elements, included to the process, is made with the valuation of the number of already existing ones. Besides, densities of many, practically meaningful, types of probability distribution are subject of exponential dependences, what, as mentioned above, lets restrict decision-making procedures to simple convolution operations.

8. Resource saving on the basis of ***the similarity and universality principles***. No matter how great is power of sets of elements, realizing decision-making operations and keeping “images” and loss functions, they are severely limited in comparison with almost unlimited variations of external and inner worlds. Besides, long evolutionary competition has to form in consciousness such properties, which by limited number of component elements could allow solving maximum number of tasks. As a result, it’s naturally to assume that one and the same "intervals" of similarity and loss (cost) functions should be used for solving completely different tasks. Truly, everyone felt that sound vibrations heard for the first time (for example, music) can evoke visual or mental associations with an object of completely different kind, for example images. Another example can be psychosomatics in the medicine [9], when change of information, seemingly not connected with physiology, leads to health change.

5. Two Types of Information

The present model shows fantastic possibilities for understanding the work of consciousness and thinking due to strict division of information kept in memory into two completely different classes. One class is images. Another one is loss functions (cost functions). At that, we think it is important to draw the attention to the second class. Since this very information provides ***individualization*** – distinguishing feature of one kind (class, order, etc.) of living beings from another, of one bion from another one, etc. Truly, let’s assume that one and the same cat is seen by both a mouse and a dog. It is unlikely that "images" of the cat in consciousness of the mouse are conceptually different from relevant "images" in the consciousness of the dog. But the mouse would run away from cat, and dog, vice versa, would run to it. Clearly, within the frameworks of the proposed model precisely difference of loss (cost) functions determines different behaviour of the given bions.

However, precisely loss function (cost function) represents information about cause-and-effect relations. In other words, the present function is a "reflection" of the structure of external and inner worlds in consciousness of living beings, and keeps an experience, gained in the process of adjustment.

It’s clearly evident, that information, identifying loss functions (functionality) should be different on the stability degree to changes. For example, part of information, being responsible for distinctive features of living beings (it is considered that it is coded in genes) should be much more resistant comparing with that part, which is defined by the experience, acquired during the life of a single bion.

Let’s introduce the notion ***the trajectory of decisions made***. Under such a trajectory we’ll understand sequence of decisions made on the time axis. Let’s point out that this trajectory fully determines a trajectory of acts taken. Besides, let’s acknowledge two factors – uncertainty (outside and inner [5] noises) and final accuracy of fulfilment analogue operations specified in the model. As a result we have the following: ***one and the same set of loss functions would never go through two identical trajectories of decisions made, and, consequently two identical trajectories of acts***. This circumstance fully clarifies amazing ***dialectic of balance of persistence and variability in animated nature***, which troubles philosophers for several centuries. I.e. this circumstance clearly gives answer to the question in what way a birch remains a birch for thousands of generations, meanwhile it is impossible to find two completely similar birches. We can assume that principle of decision-making within the terms of uncertainty is ***the general principle, determining move of living matter***.

So, properties of the proposed model fully correspond to known properties of living beings. Moreover, this model easily allows ***making*** biological and physiological laws that can be demonstrated on the samples of laws of protective inhibition, degradation of non-intensively used organs and functions, acquired and inborn reflexes, etc.

6. Thinking (Intellect) as "the Highest" Level of Consciousness

Now let’s approach thinking itself.

Firstly, let's compare terms, introduced in respect to the consciousness in a general sense, existing in the language for thinking processes description.

Decision made is a sense. I.e. a decision, made by any part of working consciousness, in the best way corresponds to what we call a sense.

Despite that, there is an opposition of rational and emotional notions; senses are considered to be integral part of intellect [3]. Moreover, word "sense" we use generally when the decision is made by "thinking" part of consciousness. I.e. it is realized as separate object. It is not obviously senses of pain, satisfaction or happiness. It can be informative objects, which are used as opposing to "emotional". For example, sense of correct and incorrect. Besides: "light" or "dark", "red" or "blue " – all these are senses. Moving in this direction, we come to the result that in case of thinking operations with complex information objects, decision made is some sensitive structure, for example, vector with sensitive coordinates.

As for "rational" and "emotional" notions, it is proposed to distinguish them on the fact if their sequence (trajectory) of decisions made is similar or not to the sequence of some formal operations, for example, operations of formal logics.

Everyone clearly understands that every sense is characterized by the intensity. On the other hand, according to the model proposed (1), some value of risk expected corresponds to every decision made. As a result, **the value of the risk expected is intensity of a sense.**

Obviously, values of risk expected (intensity of a sense) depend on if the act is made, brought by this decision. And if the act is made, what intensity of it will be? I.e. it is naturally to divide intensity of senses into two intervals that bring some visible acts and don't bring any visible acts correspondingly. Truly, a notion of sense exists in the language, which is inseparably connected with the act. It is a wish. I.e., **when the value of the risk, exceeds a threshold of executive function, we call this sense "a wish".**

As for loss (cost) function, almost identical notions exist in the language. I.e. **the loss function is a system of values.**

Let's take the sense as a vector within a system of coordinates of possible decisions and risks in such a way, when every possible decision is corresponded with recurrent dimension. And distance along relative axis is the value of risk. Then, within the framework of the tasks solved by the proposed model, **spirit** can be defined as a space of these vectors.

Thought (perception) is a "bunch" of trajectories of decisions made (trajectories of senses), towards which **was made a decision by thinking to refer it to independent information object.**

It is obvious from the proposed model that every step (quantum) on the decision-making trajectory is not perceived in principle.

The stereotype (in the science – the formal model) is an image in the consciousness, during identification of which, the view of the loss function resembles inversed towards low line – very wide letter "Π". At this, the low line is orthographic to the decision axis. I.e. one and the same decision would be assigned to the wide range of input data (Fig. 4).

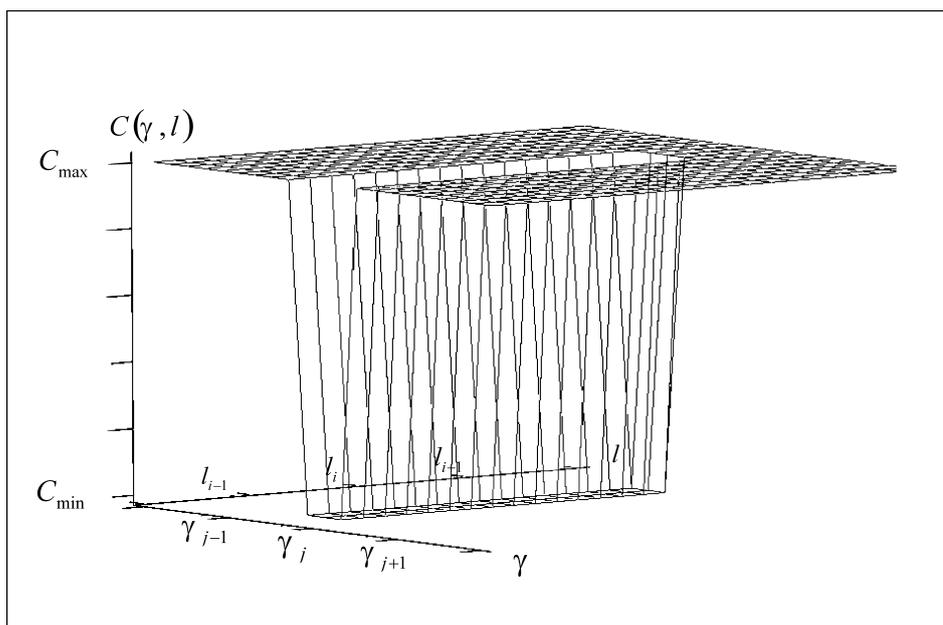


Fig. 4. A Sample of the loss function in "stereotypic" information perception.

Strength of Stereotype – amplitude ratio of loss function in the area of letter "Π" to the level outside letter "Π".

Knowledge – plurality of "images" in human's memory.

Skills, expertise – change of loss function, providing "unconsciousness" making of some decision during execution of practical and theoretical tasks.

It's clearly seen that basing on this method definitions of other terms, describing these or those properties of thinking can be easily made.

7. Qualitative Characteristics of Thinking

On the basis of the proposed model, it is obvious that the quality of thinking, as well as the consciousness in general, is defined by the following factors.

The first one is obvious. This is quality of performance of convolution operation and nonlinear transformations. Naturally, this property is defined by the quality of different physical and chemical processes execution, plurality of which in the biology and medicine is called as *the metabolism*. Also, quantitative property is known, which with sufficient for practice accuracy characterizes condition of metabolism. This is the "*control pause*" [10].

Studied model allows introducing very important, to our mind, characteristics of consciousness work, particularly, volume of areas T and L , used during formation of integrals (2), (4), and also the volume of area of possible decisions Γ , for which risks are estimated (2). Indeed, the more "distant" information objects that influent decision-making, the fuller structure of cause-and-effect relations in space of "words" can be reflected in the cost function. Moreover, according to the universality principle mentioned above, sizes of these areas should be of equal order. For to choose the most appropriate name for these characteristics, let's use the following analogy.

Let's assume that origination of the trajectory of decisions made is like a human's movement in the unknown place in different light conditions. In this case, the less effective will be movement in the full dark, when information for choosing direction of movement is based only on touches, contacts,

etc. This corresponds to the volume of areas T , L and Γ . If a person has a little flash light, his movements would be more optimal on larger space and time intervals. And so on. Let's take into account the constructions of Russian language: "просвещение" (Eng. "enlightenment") - studying, "светлый ум" (Eng. "clear intellect"), "свет знаний" (Eng. "light of knowledge"), etc. So, the most natural name of qualitative characteristic of intellect would be the term **enlightenment**.

For quantitative evaluation of this characteristic in pedagogical practice was proposed and used the following **test**.

- in the process of evaluation on any subject it is checked if a person under test remembers certain set of facts within the framework of the subject studied.
- Then the person under test is given questions, to answer on which it is needed to combine two or more factors known to him.
- for to evaluate enlightenment of thinking, maximal number of factors is used, which persons under test managed to combine in the process of answering to the question, and also time, spent by the persons for thinking on answers.

The present test was tested on senior students of physical department of VSU, division of Radio physics and Electronics. It is believed that this contingent has much higher characteristics of quality of thinking in comparison with other students, because it consists mainly of graduates from specialized forms that passed rather severe competition while entering the university. It turned out that majority were able to combine more than two factors in their answer without much effort. Only a part of students was able to combine three factors regularly, mainly after long time of thinking. Ability to combine four and more factors was demonstrated only by few students.

It should be mentioned that more influence on *enlightenment of thinking* would make quality of convolution operation performance, i.e. condition of metabolism. It is easy to explain this dependence through analogy with the same optical lens. Obviously, if the lens is "blurred", the number of "resolution" elements of the image will be greatly deduced, what is equivalent to the decrease of "volume" of areas T , L , or Γ .

To find this dependence by experiment is possible through curative means of metabolism improvement, for example, with the help of Buteyko method [10]. Truly, monitoring of patients, improving their metabolism through the method mentioned, has fully proved the given assumption.

The next characteristics of intellect quality also arise from the proposed model, and are shown as the most important one. This is the **degree of conformity of loss function (cost function) studied above in the system of survival criteria**. As it was already noticed, the loss function is called in respect to the human intellect as **the system of values**.

In the language a relevant word exists for describing characteristics of human system of values – **the morals**. Formulated above system of criteria allows introducing, surely, rather approximate, but what is important – quantitative measure for this notion. Particularly, in [10] a definition is given and introduced a quantitative measure of the morals within the system of criteria till the survival level of homo sapiens:

The morals is a factor of human consciousness, following from its system of values, which determines decision-making and the acts affecting the interests of other people.

The quantitative measure of morals. An act or a decision should be considered more moral, if it corresponds (or at least doesn't contradict) to the interests of a greater number of people in the greater interval of time.

Such definition and measure can be treated as notions "in the narrow sense". For their extension to the full list of criteria, obviously, it is needed to replace "people" with "living beings".

With the properties of the loss function (cost function) some private or "local" characteristics of quality of thinking functioning can be connected.

1. "Zombiness" of thinking – low ability of making new decisions, untypical tasks. Within this model, these are very low losses in favour of "ready" (kept in the memory) trajectories.
2. Fragmentarily of thinking – low (zero) values of similarity function and, correspondingly loss function, relevant to the information about the connection between "distant" arrays of information of corresponding types.
3. Egoism (Altruism) – overvalued (undervalued) losses of decisions that deal with personal conditions.
4. Indifference (exaltation) – overvalued (undervalued) cut-off of transmission of a sense into a wish (act).
5. Fanaticism, chauvinism – high strength of stereotypes towards definite circle of ideological notions.

It's clearly seen that this row can be continued without much effort.

8. Dynamics of Qualitative Characteristics of Thinking

It is comparatively easy to determine general tendency of movement of qualitative thinking characteristics of members of modern society. Truly, within the framework of the supposed approach, the consciousness is a tool (function) for survival tasks solved for kind, individual, etc. on different time intervals. On the other hand, in the modern society takes place development of civilization, i.e. increase of comfort, main component of which is *the protection against survival threat*. So, the higher level of civilization, the higher level of protection against survival threats is. Consequently, the consciousness has more rarely to solve these or those survival tasks. According to the known physiological law of degradation of non-used (rarely used) organs and functions, *the consciousness has to degrade*.

Naturally, such degradation of the consciousness should be resulted in the change of the relevant qualitative characteristics of thinking.

The picture of degradation of thinking with the development, for example, of European (or also called Christian) civilization can be easily tracked on the sample of art history. From the point of view of thinking act, art is a certain method of distribution and storage of experience, acquired by the author of the masterpiece. Moreover, the method allows distributing and storing such information kinds, which could not be transferred by any other mean.

Let's take painting, for example. On the early stages of Christian civilization, when it had fresh lessons of died antique civilization, the society perceive art pieces promoting the morals and high spirituality. Specific graphic methods were invented, that formed certain language and did not distort reality, and weren't "photographic" copy.

On later stage, realism gained popularity, i.e. public consciousness did not respond to long-lasting high spiritual and high moral values, and graphic methods tended to "photo" explication of objects depicted.

On later stages impressionism became popular, later it was followed by surrealism, avantgardism, abstractionism, and underground. It is easily seen that every new movement was marked by more extensive distortion of real forms and colours, and then inconsistency and breaking of a single, clearly formulated plot, etc., sometimes being a full nonsense, as for example, well-known "Black Square" by Malevich. "I do my best for critenization of mankind..." – once said self-critically Salvador Dali.

Obviously, these processes of thinking degradation are met among all representatives of all human activities, including scientific sphere. So, in [11] and other resources processes of scientific

view of the world of many scholars are studied now. Connection of this process with change of the system of values of these representatives is marked out.

Proposed model allows tracing details of above studied process of quality thinking degradation. Let's assume that metabolism condition gets worse due to natural factors.

Relating to the proposed model for the description of this degradation, it is allowably to use increase of "the level of own noises" [5]. Naturally, this degradation will lead that to less optimal decision made on every point of the trajectory. Distance from the decision made to the optimal one within the system of coordinates, is relevant to the information image studied. It's clearly seen that the value of mistake in every case depends on relevance signal/noise, can be accumulated during moving on the decision making trajectory and through this gaining great values while solving simple daily tasks.

Another result of metabolism breakdown can be found, if to use image analogy with optical lens again. The result of wrong metabolism can be represented as "blurring" of the lens. This would lead to decrease of number of resolution elements on both "extensional" and "brightness" coordinates, what is equal to rough "volume" decrease of areas T , L or Γ , i.e. decrease of *enlightenment* of thinking. In turn, decrease of enlightenment leads to increase of inconsistency of accumulated information, since with small areas T , L or Γ "view window" during consistency control would be little, and consciousness would not be able to control inconsistencies between "informatively distant" data.

Moreover, decrease of *enlightenment* doesn't permit thinking to take into account criteria from the upper levels of survival system during decision-making, because we need great amount of resolution elements, both on time axis, and axis of living diversity. In conditions of civilization, i.e. in terms of high level of protection against survival threads, there is no rejection of non-qualitative decisions. Consequently, such ignoring of high criteria is fixed within the system of value through inverse relations. As a result, decrease of integral characteristic of qualitative work of thinking takes place – the morals.

Further, according to the psychosomatics phenomenon, changes within the system of value destroy metabolism even more, what shuts chain of destroying inverse relation.

Let's study now dynamics of thinking characteristics, if changes start with the system of value. As an example, let's take increase of individualism, egoism, etc., what is actively promoted by modern "liberal" ideology. Such personal features, naturally, prevent recognition of own opinions, decisions, acts and behaviour. In terms of civilization, i.e. with high protection level against threads there is no rejection of non-qualitative decisions takes place. Consequently, correction of information kept in mind would be complicated and corrupted, including loss (cost) functions. These corruptions, in turn, would lead to health deterioration, i.e. deterioration of metabolism, which according to the scheme studied above would lead to greater decrease of qualitative thinking characteristics. I.e. relevant inverse relation that makes degradation process stable would be closed.

If to take inverse measures, i.e. to try to improve metabolism or increase the morals of human being, the quality of the work of thinking would be better. This was verified by experiment during the process of rendering medical assistance according to Buteyko method [10]. I.e. if the patient improved the breathing by means of conscious control (improves metabolism), appeared signs of increase of thinking enlightenment, particularly patient started to notice contradictions both in personal and public "information bases". If patient tried to change personal system of values aiming to increase the morals, was noticed the clinical picture of recovery. Particularly, so-called reactions of sanogenesis proceeded measureless in much easier form.

In the process of applying pedagogical methods, based on the model proposed, to the students, already during the study term, were observed signs of intellect quality increase.

9. Conclusion

The model, proposed above, turned to be helpful for development of pedagogical and curing methods with stable effectiveness that can increase quality of thinking and improve educational results. Besides, authors believe that the approach can be helpful in different liberal arts. The answer to the possible critics of non-sufficient explication of proposed model can be the work [12], where it was demonstrated that excessive explication can bring to unwanted results.

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Also, the major part of the material was published in the work: **Buteyko, B.K.** Model intelekta dlja reshenija zadach upravljenja kachestvom mihlenija [Model of intellect for solving tasks of quality thinking management] / V.K. Buteyko // Kibernetika i visokije tehnologiji XXI veka : IX mezhdunar. nauch.-prakt. conf. [Cybernetics and high technologies of XXI century: IX International Scientific Practical Conference], May 13-15, 2008. Voronezh: 2008; Vol. 1.; p. 28-39.