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SET AND POLAR CATEGORIES

Abstract: The purpose of the article is to present an analytical model of the set of a system depending on polar categories. These categories are the main governing factors of the behavior of a system. The change of the set is transition from a couple polar categories to another one. The entropy for determination of the characteristic of the new set is used. An electric model for search for a solution is presented.

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Formalization

The polar pairs categories complement each other to a systematic unity:

- reality, imaginary:

(1) $$\mathbf{Z_{RI} = Z_R \,.\, Z_I} \;,$$

where $\mathbf{Z_{RI}}$ - set Z of reality $_R$ and imaginary $_I$
$\mathbf{Z_R}$ - set Z of reality $_R$
$\mathbf{Z_I}$ - set Z of imaginary $_I$

- identity, difference:

(2) $$\mathbf{Z_{\equiv\Delta} = Z_{\equiv} \,.\, Z_{\Delta}} \;,$$

where $\mathbf{Z}_{\equiv\Delta}$ - set Z of identity ≡ and diversity of Δ
$\mathbf{Z}_{\equiv}$ - set Z of identity ≡
$\mathbf{Z}_{\Delta}$ - set Z of difference Δ

- phylogenetic, ontogenetic:

(3) $$\mathbf{Z_{G\Theta} = Z_G \,.\, Z_{\Theta}} \;,$$

where $\mathbf{Z_{G\Theta}}$ - set Z of phylogenetic G and ontogenetic Θ
$\mathbf{Z_G}$ - set Z of phylogenetic G
$\mathbf{Z_{\Theta}}$ - set Z of ontogenetic Θ

- pattern, random:

(4) $$\mathbf{Z_{\Xi\Omega} = Z_{\Xi} \,.\, Z_{\Omega}} \;,$$

where $\mathbf{Z}_{\Xi\Omega}$ - set Z of pattern Ξ and random Ω
$\mathbf{Z}_{\Xi}$ - set Z of pattern of Ξ
$\mathbf{Z}_{\Omega}$ - set Z of random Ω

- extreme, infinity:

(5) $$\mathbf{Z_{\text{⌐}\infty} = Z_{\text{⌐}} \,.\, Z_{\infty}} \;,$$

where $\mathbf{Z}_{\text{⌐}\infty}$ - set Z of extreme ⌐ and infinity ∞
$\mathbf{Z}_{\text{⌐}}$ - set Z of extreme ⌐
$\mathbf{Z}_{\infty}$ - set Z of infinity ∞

- reality, possibility:

(6) $$\mathbf{Z_{\heartsuit!} = Z_{\heartsuit} \,.\, Z_{!}} \;,$$

where $\mathbf{Z_{\heartsuit!}}$ - set Z of reality ♥ and possibility $_!$
$\mathbf{Z_{\heartsuit}}$ - set Z of reality ♥

$\mathbf{Z_!}$ - set Z of possibility $_!$

- significantly, minor:

(7) $$\mathbf{Z_{Bm} = Z_B . Z_m} \; ,$$

where $\mathbf{Z_{Bm}}$ - set Z of significant $_B$ and minor $_{(m)}$

$\mathbf{Z_B}$ - set Z of significant $_B$

$\mathbf{Z_m}$ - set Z of minor $_m$

- definite, indefinite:

(8) $$\mathbf{Z_{\square\bullet} = Z_{\square} . Z_{\bullet}} \; ,$$

where $Z_{\square\bullet}$ - set Z of definite $_\square$ and indefinite $_\bullet$

$Z_{\square\square}$- set Z of definite $_{\square\square}$

$Z_\bullet$ - set Z of indefinite $_\bullet$

- quantity, quality:

(9) $$\mathbf{Z_{Qq} = Z_Q . Z_q} \; ,$$

where $\mathbf{Z_{Qq}}$ – set of quality $_Q$ and quantity $_q$ of a system

$\mathbf{Z_Q}$ – set of quality $_Q$ of a system

$\mathbf{Z_q}$ – set of quantity $_q$ of a system

The relationship between couples and other polar categories can be formalized on this principle.

The value of the set of a system in respect of a particular category is amended within 1 to e ≈ 2.72 (Neper's number). The increase of value of category corresponds to the increase of its entropy. The reduction of the value of the category corresponds to the increase of potential to stimulate the development of the set.

The increase of the value of a polar category is complemented by a reduction of the value of other polar category.

Each category has a range of synonyms. They characterize the different values of this category. In particular a combination of two or more concepts can determine the deviation of a category from its original meaning.

Ratio between cross-categories

The complementarity of polar categories (1) ... (9) is a tool for determination of the relative share of one of them in relation to another that as a basis for comparison. Some examples as illustration are presented is used.

On the basis of (1) can be written:

(10) $$\mathbf{Z_I/_R = Z_I / Z_R} \; ,$$

where $\mathbf{Z_I/_R}$ – relative share of the imaginary Z_I in specific information in terms of its real component Z_R .

The expression (2) can be converted into the type:

(11) $$\mathbf{Z_\Delta/_\equiv = Z_\Delta / Z_\equiv} \; ,$$

where $\mathbf{Z}\ _\Delta/_\equiv$ – relative share of the difference Z_Δ in specific information in terms of its component identity $Z_\equiv$.

The expression (3) can be converted into the type:

(12) $$\mathbf{Z_\Theta/_G = Z_\Theta / Z_G} \; ,$$

where $\mathbf{Z_\Theta/_G}$ – relative share of the ontogenetis Z_Θ in specific information in terms of its phylogenetic component Z_G .

The expression (4) can be converted into the type:

(13) $$\mathbf{Z_{\Omega}/_{\Xi} = Z_{\Omega} / Z_{\Xi}} \ ,$$
where $\mathbf{Z_{\Omega}/_{\Xi}}$ – relative share of the random Z_{Ω} in a specific pattern Z_{Ξ} .

The expression (5) can be converted into the type:

(14) $$\mathbf{Z_{\infty}/_{\neg} = Z_{\infty} / Z_{\neg}} \ ,$$
where $\mathbf{Z}_{\infty}/_{\neg}$ – relative share of the information about the infinity Z_{∞} in information for a specific extreme $Z_{\neg}$.

The expression (6) can be converted into the type:

(15) $$\mathbf{Z_{\cap}/_{\heartsuit} = Z_{\cap} / Z_{\heartsuit}} \ ,$$
where $Z_{\cap}/_{\heartsuit}$ - relative share of the option $Z_{\cap}$ in respect to specific reality $Z_{\heartsuit}$.

The expression (7) can be converted into the type:

(16) $$\mathbf{Z_{M/B} = Z_{M} / Z_{B}} \ ,$$
where $\mathbf{Z_{M/B}}$ – relative share of the minor information Z_{M} in terms of significant information Z_{B} .

The expression (8) can be converted into the type:

(17) $$\mathbf{Z_{\bullet}/_{\square} = Z_{\bullet} / Z_{\square}},$$
where $\mathbf{Z_{\bullet}/_{\square}}$– relative share of the indefinite information $Z_{\bullet}$ in respect to definite information $Z_{\square}$

The expression (9) can be converted into the type:

(18) $$\mathbf{Z_{q}/_{Q} = Z_{q} / Z_{Q}} \ ,$$
where $\mathbf{Z_{q}/_{Q}}$ – relative share of the quantity (for example: price) Z_{q} in terms of quality Z_{Q} (for example: the relative deviation from the desired value of the main factor).

The ratio between the categories "condition" and "relation" expresses the variable set of a system. In principle, it is possible the relationship between polar categories (10) … (18) to express different aspects of the behavior of the variable set of a system.

For example the categories "space" and "time" form a systematic unity: the individual development of the space has the biggest duration is the most long in comparison with its subsystems.

Interaction between two polar categories

We look at two couples polar categories AB and CD that determine the behavior of the set of a system:

(19) $$\mathbf{Z_{AB} = Z_{A} \,.\, Z_{B}},$$

(20) $$\mathbf{Z_{CD} = Z_{C} \,.\, Z_{D}} \ ,$$
where $\mathbf{Z_{AB}}$ - set of categories $_{A,\ B,}$
$\mathbf{Z_{CD}}$ - set of categories $_{C,\ D,}$
$\mathbf{Z_{A}, Z_{B}, Z_{C}, Z_{D}}$ – sets of categories $_{A,\ B,\ C,\ D}$ of the system, presented as dimensionless relative values.

There is an equality between sets Z_{AB} and Z_{CD} in the period of transition of the set of a system of polar categories AB to polar categories CD.

If the values of the sets Z_{A} , Z_{B} and Z_{C} are known and the value of the set Z_{D} is not known, from (19) and (20) can be determined:

(21) $$\mathbf{Z_D = Z_A \,.\, Z_B \,.\, Z_C^{\,-1}}.$$

The equality (21) illustrates the ability for transition from one to another system of categories, that characterizes the set of a system. The search for a solution may be heading in a more perspective direction by deficiency of opportunities in one direction.

It follows from (19) and (20), that the values of sets Z_A **,** Z_B **,** Z_C **,** Z_D may be amended in narrower limits than the values of the set Z.

The logarithm of the set of a system expresses the value of its entropy. If you are taking logarithms of both sides of the equality (21), you will obtain:

(22) $$\mathbf{H_D = H_A + H_B - H_C}\,,$$

where $\mathbf{H_A}$ **,** $\mathbf{H_B}$ **,** $\mathbf{H_C}$ **,** $\mathbf{H_D}$ **-** entropy of the sets of categories $_{\mathbf{A, B, C, D}}$ of a system.

The value of entropy is taken to vary in the range of 0 to 1. The final values characterize the transition to a new quality. Therefore for practical purposes the range between 0.1 and 0.9 can be used.

A postulate: the positive categories have entropy from 0 to 0.5 and the negative categories have entropy from 0.5 to 1.

In order to simplify the calculation of the entropy values in the range of 1 to 9, i. e. a tenfold more extensive scale can be used.

For example, if $H_A = 2$, $H_B = 7$, $H_C = 3$, it $H_D = 6$. Accordingly the set Z_D can be determined by antilog by 0.1 H_D , i. e. $Z_D = 1.825$.

Electrical model

The size of the sets Z_A , Z_B , Z_C , Z_D can be represented as values of electrical resistors. In this case equality (21) may be presented as a result of the interaction of these resistors, included in the arms of the Wheatstone bridge (fig.1). The equalization of this electric bridge current that flows through the electrical resistor Z_o, which is a negligible. Respectively in the scale of values (1…e) of the set Z_o = 1. This value characterizes the maximum throughput ability of the initial set (with minimum entropy).

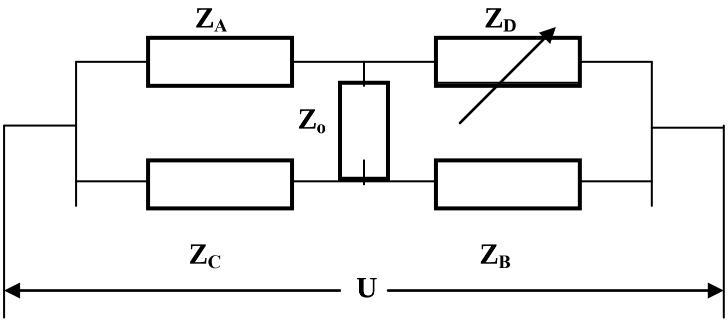

Fig.1. Electrical model (Wheatstone bridge) of interaction of Z_A = const, Z_B = const, Z_C = const and $Z_D \neq$ const of categories, respectively $_{A, B, C, D}$ of a system and of its neutral set Z_o by potential energy U

The externally applied voltage U at the Wheatstone bridge has constant value and polarity. The applied voltage U on the terminals of the Wheatstone bridge (fig.1) features a collection of differences. These differences are internal and external to the system. They form a discrepancy or problem (system of discrepancies). In order to adapt the system to the new situation it is necessary to change the field of manifestation of categories A, B, C, D, who manage the sets Z_A**,** Z_B**,** Z_C**,** Z_D. Respectively the electric current is a model of a countervailing processes between these differences.

It is necessary $Z_A \,.\, Z_B = Z_C \,.\, Z_D$ to balance the Wheatstone bridge.

On this basis we consider models of the fixed components of the variable sets as fixed values of electrical resistors, corresponding to the sets Z_A , Z_B, Z_C. Accordingly the uncertainty of Z_D is a prerequisite to consider it as a model of variable component of the variable set.

The scheme of fig.1 can be transformed into entropy values for practical calculations.

For example, if $H_A \equiv 20\ \Omega$, $H_B \equiv 70\ \Omega$, $H_C \equiv 30\ \Omega$, $H_o \equiv 0\ \Omega$, it $H_D \equiv 60\ \Omega$.

The entropy calculation of H_{CD} and after that of Z_{CD} is a means for accelerated search for a solution.

Standardization of categories

The purpose of standardization of categories is to present them as entropy values. In this way the calculation of the adjustment category is simple and easy. A linear scale of values for this purpose was developed (table 1).

For example, the problem is a pervasive negative thought. The task is to neutralize this negative quality.

The degree of deviation of "the pervasive negative thought" from the normal mental activity is greater than average. It can be defined as "an increased degree of deviation". Its entropy is $H_Q = 0.9 \pm 0.05$ (table 1).

The purpose is a balance in the system "quality-quantity".

The maximum value of entropy is $H \leq 1$. Therefore the integral feature of two polar categories cannot have greater total entropy than the maximal value 1.

If you are taking logarithms both sides of the equality (9) and then are replaced with entropy values, it is obtained:

(23) $$\mathbf{H_{Qq} = H_Q + H_q},$$

$$\mathbf{H_{Qq} \leq 1},$$

where $\mathbf{H_{Qq}}$ - entropy of a set of a system depending on the polar pair categories quality $_Q$ and quantity $_q$ of this system,

$\mathbf{H_Q}$ - entropy of a set of a system depending on the category of quality $_Q$,

$\mathbf{H_q}$ - entropy of a set of a system depending on the category of quantity $_q$.

If $H_Q = 0.9$ it follows from (23), that $H_q \leq 0.1$. This means that a quantitative adjustment (table 1) for balance of the set is required.

Table 1

Postulated entropy values of categories

Entropy of category [-]	Deviation of the entropy of category from the value at which the set of the system is in equilibrium	
	Degree of deviation	Polarity
0.01-0.05	Maximum	Positive
0.05-0.15	Increased	
0.15-0.25	Average	
0.25-0.35	Reduced	
0.35-0.45	Minimum	
0.45-0.55	Identity	Neutral
0,55-0,65	Minimum	Negative
0.65-0.75	Reduced	
0.75-0.85	Average	
0.85-0.95	Increased	
0.95-0.99	Maximum	

Conclusions

1. **A theoretical model for evaluation and interaction of polar categories that rul the set of a system is presented.**
2. **The value of the ruling category of a set by Wheatstone bridge can be quickly determined.**
3. **The standardization of the value of the entropy of a category is a means to determine its entropy.**