8. A Field of judgements of dialectical logic. Circulations and semi-circulations of dialectical judgements

8.1. Isotropic and anisotropic fields of judgements

Let a contradictory oppositus $S(z) = u(z) + i\upsilon(z)$ describes an arbitrary field of affirmation $u(z)$ and negation $i\upsilon(z)$ in the space of the argument $z = x + iy$ by the components of affirmation x and negation iy. Possible partial derivatives of the opposite are as follows:

$$\frac{\partial u}{\partial x}, \quad \frac{\partial u}{i\partial y}, \quad \frac{i\partial \upsilon}{\partial x}, \quad \frac{i\partial \upsilon}{i\partial y}, \tag{1.167}$$

where the first and fourth derivatives are elements of the affirmation, and the second and the third derivatives are elements of the negation. The field of judgements at the point z will be referred to as <u>isotropic,</u> if the elements of affirmation and negation are equal:

$$\frac{\partial u}{\partial x} = \frac{\partial i\upsilon}{\partial iy}, \quad \frac{\partial u}{\partial iy} = \frac{\partial i\upsilon}{\partial x}. \tag{1.167a}$$

If

$$\frac{\partial u}{\partial x} \neq \frac{\partial i\upsilon}{\partial iy}, \quad \frac{\partial u}{\partial iy} \neq \frac{\partial i\upsilon}{\partial x}, \tag{1.167b}$$

the field of judgements at the point z is called anisotropic.

Equalities (1.167a), which are called the Cauchy-Riemann conditions in the theory of complex numbers, allow us to find the negation-affirmation derivative of the opposite *S(z)*:

$$S'(z) = \frac{\partial u}{\partial x} + i\frac{\partial \upsilon}{\partial x} = \frac{\partial \upsilon}{\partial y} - i\frac{\partial u}{\partial y}. \tag{1.168}$$

8.2. Lines of constant affirmation and negation

Curves that satisfy the conditions: $u(z) = const$, $i\upsilon(z) = iconst$ will be called lines of constant affirmation and constant negation of the oppositus *S(z)* in the space of the argument z (Fig. 1.14).

As lines of quantity and quality, etc., these lines are mutually orthogonal at isotropic points in the space of argument of the oppositus:

$$\frac{\partial u}{\partial x}\frac{\partial \upsilon}{\partial x} + \frac{\partial u}{\partial y}\frac{\partial \upsilon}{\partial y} = 0. \tag{1.169}$$

The vector **A** of space rate of change of the affirmation $u(z)$, or the affirmation gradient, is directed along the tangents to the negation lines:

$$\mathbf{A} = grad(iu) = \frac{\partial u(z)}{\partial z}\mathbf{n}, \tag{1.170}$$

where ∂z is the change of the argument along the normal **n** to the affirmation line.

The vector *iB* of space rate of change of the negation *iv(z)*, or the gradient of the negation, is directed along the tangents to the affirmation lines:

$$i\mathbf{B} = grad(i\upsilon) = \frac{\partial i\upsilon}{\partial z}\tau\,, \qquad (1.170a)$$

where ∂z is the change of the argument along the normal τ to the negation line.

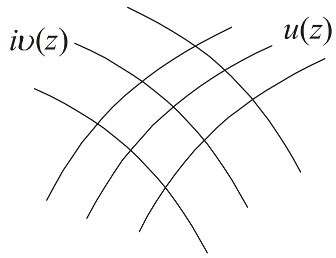

Fig. 1.14. A field of a judgement.

Both vectors, $\mathbf{A}$ and $i\mathbf{B}$, define one contradictory gradient of the affirmation-negation field $\hat{\mathbf{C}} = \mathbf{A} + i\mathbf{B}$ with the scalar measure determined by the formula

$$C = A \; + iB, \qquad (1.170b)$$

where *A* and *B* are the scalar measures (see (1.27)) of the vectors.

In the broad sense, the vector $\hat{\mathbf{C}}$ of an affirmation-negation field is the vector of a judgement. Vectors $\hat{\mathbf{C}} = \mathbf{A} + i\mathbf{B}$ and $\hat{\mathbf{C}} = \mathbf{A} - i\mathbf{B}$, scalar measures $C = A + iB$ and $C = A$ — iB, oppositi-judgements $\hat{S} = u + i\upsilon$ and $\hat{S} = u - i\upsilon$ will be called the conjugate vectors. Mutually conjugate vectors, scalars, oppositi, and, generally, any measures of affirmation-negation if it necessary to note we will denote as $\hat{D}$ and $\hat{D}^*$, where the symbol "*" is the sign of conjugation. It is evident that $(\hat{D}^*)^* = \hat{D}$.

Three directions characterize the vector of the affirmation-negation field. The first direction, defined in terms of the vector $\mathbf{A}$, is the direction of affirmation; the second direction, prescribed by the vector $i\mathbf{B}$, is the direction of negation; and the third direction of affirmation-negation or the module direction of the vector $\mathbf{C}$ is defined by the vector $\hat{\mathbf{C}} = \mathbf{A} + \mathbf{B}$. The first direction is quantitative, material, etc., whereas the second direction is qualitative, ideal, etc.

8.3. Fluxes of a judgement vector of affirmation-negation

An elementary flux $d\hat{N}$ of the affirmation-negation vector $\hat{\mathbf{C}}$ through the vector of the elementary area $dS\mathbf{n}$, in a general case of the three-dimentional field, is equal to the longitudinally-transversal scalar product

$$d\hat{N} = (\hat{\mathbf{C}} \cdot dS\mathbf{n})\,. \qquad (1.171)$$

The meaning of the flux is determined by the contents of the judgement vector $\hat{\mathbf{C}}$.

The space of the judgement field has the inside and outside of the boundary. The outside can be infinite and the inside is finite. The latter consists from quasispheric surfaces bounding the volumes or material points, in which motators are localized.

Let fluxes through the inside S_k and outside S_v surface of the field's boundary are equal in value and opposite in sign:

$$\oint_{S_v} (\hat{\mathbf{C}} \cdot d\hat{\mathbf{S}}) = -\sum_k \oint_{S_k} (\hat{\mathbf{C}} \cdot d\hat{\mathbf{S}}), \qquad (1.172)$$

where k is the number of motator.

Then the judgement flux through the whole boundary of the field is zero,

$$\oint_S (\hat{\mathbf{C}} \cdot d\mathbf{S}) = \oint_{S_v} (\hat{\mathbf{C}} \cdot d\mathbf{S}) + \sum_k \oint_{S_k} (\hat{\mathbf{C}} \cdot d\mathbf{S}) = 0. \qquad (1.173)$$

These are the fields of closed exchange, consisting of unclosed fields of exchange of individual motators.

Local fluxes determine powers $\hat{Q}_k$ *of* the motators generating the judgement fields:

$$\hat{Q}_k = -\oint_{S_k} (\hat{\mathbf{C}} \cdot d\mathbf{n}). \qquad (1.174)$$

Consequently, the judgement flux through the outside surface is equal to the sum of the motators' powers:

$$\oint_{S_V} (\hat{\mathbf{C}} \cdot d\mathbf{n}) = \sum \hat{Q}_k = \hat{Q}. \qquad (1.175)$$

Directing the vectors of elementary areas of the inside surfaces into the space of the affirmation field, we have

$$\hat{Q}_k = \oint_{S_k} (\hat{\mathbf{C}} \cdot dS\mathbf{n}). \qquad (1.176)$$

8.4. A vector of a judgement ffux

The main dialectical types of elementary motators or monopoles of a judgement are:

a) monopoles of affirmative Yes (Yes>0) of the power $+Q$;
b) monopoles of negative Yes (Yes<0) of the power $-Q$;
c) monopoles of affirmative No (iNo>iO) of the power $+i\Gamma$;
d) monopoles of negative No (iNo<iO) of the power $-i\Gamma$;
e) contradictory monopoles of affirmation-negation (Yes+iNo) of the power $Q + i\Gamma$.

All these motators exist in the nature usually in the form of monopole systems of various degree of complexity.

If the judgement field is generated by a motator of a positive or negative affirmation, then, according to (1.176), the vector of judgements A at the point of the field, determined by the vector **r**, becomes

$$\mathbf{C} = \frac{Q\mathbf{n}}{4\pi|\mathbf{r}-\mathbf{a}|^2}, \tag{1.177}$$

where Q is the scalar power of the motator of affirmation or briefly, the scalar power of affirmation; $\mathbf{n}$ is a unit vector parallel to the vector $\mathbf{r}-\mathbf{a}$ and $\mathbf{a}$ is a position vector of the motator. Along with the scalar power of affirmation, we will operate with the vector power of affirmation, determining it by the vector $\mathbf{Q} = Q\mathbf{n}$.

Now the expression (1.177) can be written as

$$\mathbf{A} = \frac{\mathbf{Q}}{4\pi|\mathbf{r}-\mathbf{a}|^2}. \tag{1.177a}$$

If the field of judgements is generated by a motator of the +*No* or - *No* negation with the scalar power of negation $i\Gamma$, the judgement vector of negation is

$$i\Gamma = \frac{i\Gamma\boldsymbol{\tau}}{4\pi|\mathbf{r}-\mathbf{a}|^2}, \tag{1.178}$$

where $\boldsymbol{\tau}$ is a unit vector that perpendicular to the vector $\mathbf{n}$, the direction of the vector $\boldsymbol{\tau}$ is determined by the field of the negation motator.

Introducing the vector of the power of negation $\boldsymbol{\Gamma} = i\Gamma\boldsymbol{\tau}$, we will have

$$i\Gamma = \frac{\Gamma\boldsymbol{\tau}}{4\pi|\mathbf{r}-\mathbf{a}|^2}. \tag{1.178a}$$

Combining both vectors, we will have one contradictory affirmation-negation vector or briefly, the vector of affirmation-negation

$$\hat{\mathbf{C}} = \frac{i\mathbf{Q}}{4\pi|\mathbf{r}-\mathbf{a}|^2}, \tag{1.179}$$

where

$$\hat{\mathbf{Q}} = Q\mathbf{n} + i\Gamma\boldsymbol{\tau} \tag{1.179a}$$

is the vector of the affirmation-negation power.

The contradictory affirmation-negation vectors are simultaneously the judgement flux vectors or briefly, the flux vectors, definable by powers of motators.

If vectors $\mathbf{n}$ and $\boldsymbol{\tau}$ are directed uniformly, the vector Q of affirmation-negation power is

$$\mathbf{Q} = \hat{Q}\mathbf{n}, \tag{1.179b}$$

where $\hat{Q} = Q + i\Gamma$ is the scalar power of affirmation-negation.

Two motators with powers, equal in value and opposite in sign, located at one material point form a dipole which defines approximately the judgement flux vector

$$\hat{\mathbf{C}} = \frac{\hat{\mathbf{P}}_1}{4\pi|\mathbf{r}-\mathbf{a}|^3}, \tag{1.180}$$

where $\hat{\mathbf{P}}_1$ is the vector of dipole power.
A set of *n* dipoles or a 2n-pole generates the field described approximately by the judgement vector

$$\hat{\mathbf{C}} = \frac{\hat{\mathbf{P}}_n}{4\pi|\mathbf{r}-\mathbf{a}|^{2+n}}, \tag{1.181}$$

where $\hat{\mathbf{P}}_n$ is the vector of 2*n*-pole power; $n \geq 1$.

The volumes of motators are finite, therefore $|\mathbf{r}-\mathbf{a}| \geq \rho_k$, where ρ_k is the effective radius that determines the sphere of the interior boundary of the field, in the space of which the motator is localized.

It is evident that a flux of the 2*n*-pole vector through the outside boundary is zero because every dipole is characterized by two powers equal in value and opposite in sign.

In a general case the judgements flux vector of a complex system of motators can be described approximately by the series:

$$\hat{C}(r) = \sum c_n |r-a_k|^n + \sum \frac{\hat{q}_k}{4\pi|r-a_k|^2} + \sum \frac{\hat{p}_k}{4\pi|r-a_k|^m}, \tag{1.182}$$

where c_n is the vector constants of the judgement fields; 4π is the coefficient of the spherical symmetry; $\hat{q}_k$, $\hat{p}_k$ is powers of multipoles in point a_k and $m > 2$.

The first sum in (1.182) describes the influx-outflow of the judgement field at the points determined by vectors $\mathbf{a}_k$. The flux C of the judgements vector through the outside of the field boundary is determined only by the second sum since the first and second sums give a zero flux.

If the space of the judgement field is cylindrical and the affirmation-negation lines lie in parallel planes, it seems reasonable to analyze the judgement fields in cylindrical domains of a small height *dh* (Fig. 1.15).

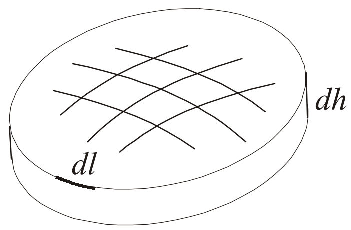

Fig. 1.15. An elementary domain of a cylindrical field of judgements.

Then, equality (1.175) becomes

$$\oint_z (\hat{C}ds)dh = \sum_k d\hat{Q}_k = d\hat{Q}, \tag{1.183}$$

where $\oint_z (\hat{\mathbf{C}} d\mathbf{s})$ is the linear density of the flux which will be called also the linear flux or briefly, the flux.

Introducing the linear power $\hat{L} = d\hat{Q} / dh$, we will obtain the linear density of the judgement flux through the outside contour of the boundary

$$\oint_z (\hat{C} d\hat{s}) = \sum_k \hat{L}_k = \hat{L}, \tag{1.183}$$

where $\hat{L}_k = \oint_{\gamma k} (\hat{\mathbf{C}} d\mathbf{l})$ is a linear power of the k-th motator.

Integration over the outside contour of the boundary is performed counterclockwise and the integration over the inside contours of the boundary γ_k is clockwise.

According to (1.183) the vector of the flux of a cylindrical field of the motator is equal to

$$\hat{\mathbf{C}} = \frac{\hat{\mathbf{Q}}}{2\pi(\mathbf{r} - \mathbf{a})}, \tag{1.184}$$

where $\hat{\mathbf{Q}}$ is the linear vector density of the affirmation-negation power.

A set of n dipoles or a 2n-pole generates a cylindrical field with the judgement flux vector equal to

$$\hat{\mathbf{C}} = \frac{\mathbf{P}_n}{2\pi(\mathbf{r} - \mathbf{a})^{1+n}}. \tag{1.185}$$

In planes of a cylindrical field of affirmation and negation lines, the coordinate axises x and y will be described, respectively, by the affirmation and negation algebra and any point of the plane is determined by $z = x + iy$.

Description of a judgement field is considerably simplified if the longitudinally-transverse scalar product, determining the linear scalar flow $d\hat{N}$, will be represented in the following way:

$$(\hat{\mathbf{C}} d\mathbf{l}) = \hat{C} dz, \tag{1.186}$$

where $dz = dx + idy$; $\hat{C} = A - iB$ is a conjugate scalar measure of the flux vector $\hat{\mathbf{C}}$.
It is convenient, in many cases, a complex set of motators represent by the flux vector in the following form:

$$\hat{C}(z) = \Sigma c_n |z - a_k|^n + \Sigma \frac{\hat{q}_k}{2\pi i |z - a_k|} + \Sigma \frac{\hat{p}_m}{2\pi i |z - a_k|^m}, \tag{1.187}$$

where $\hat{c}_m$ are constants of the field of judgements; $2\pi i$ is the coefficient of circular symmetry of the field of an elementary linear motator; $\hat{q}_k$ are powers of exchange of motators-monopoles; $\hat{p}_m$ are powers of exchange of complex motators-monopoles; $m > 1$.

It is evident that for any oppositus represented by series (1.187) the formula is valid

$$\oint_z \hat{C}(z) dz = 2\pi i \sum_k \hat{b}_k = \sum_k \hat{Q}_k, \tag{1.188}$$

where $\hat{Q}_k = 2\pi i \hat{b}_k$ is the power of exchange of motators-monoles.

8.5. The integral representation of judgements

Motators are sources of space-time relations and fields of exchange. In a general case exchange is the complex process of exchange between motion and rest, mass and space, information etc.

The field of exchange is exchange in space and time going on between the motators. The space of localization of a motator is the particular domain of the space of the exchange field or the particular material point of this exchange field. The space of the particular point is the exterior space of the field of exchange.

The fields of exchange as aperiodically-periodical contradictory processes are described by the infinite series of the affirmation-negation elementary oppositi:

$$\hat{S} = \sum_{0}^{\infty} c_m e^{p_m z}, \quad (1.189)$$

were $p_m = \sigma + imk$ is the generalized frequency of affirmation-negation; $\sigma < 0$, $k = \frac{2\pi}{L}$; L is the periodic component of the judgement and $m \in N$.

Using the integral

$$\int_0^L \hat{S}(z) e^{-p_n z} dz = \int_0^L \sum_0^{\infty} c_n e^{p_m z} e^{-p_n z} dz = L \cdot c_n$$

and the differential of the parameter p_n

$$\Delta p_n = \frac{2\pi i(n+1)}{L} - \frac{2\pi i n}{L} = \frac{2\pi i}{L},$$

we have

$$c_n = \frac{1}{2\pi i} F(p_n) \Delta p_n, \quad (1.190)$$

where

$$\hat{F}(p_n) = \int_0^L \hat{S}(z) e^{-p_n z} dz. \quad (1.191)$$

Thus, series (1.189) is expressed by the indiscrete integral

$$\hat{S}(z) = \frac{1}{2\pi i} \sum_{\sigma}^{\sigma + i\infty} \hat{F}(p_n) e^{p_n z} \Delta p_n. \quad (1.192)$$

If $L \to \infty$, the indiscrete sum becomes continuous

$$\hat{S}(z) = \frac{1}{2\pi i} \int_{\sigma}^{\sigma + i\infty} \hat{F}(p) e^{pz} dp, \quad (1.193)$$

where

$$\hat{F}(p) = \int_0^\infty \hat{S}(z)e^{-pz}dz\,. \quad (1.194)$$

Integrand expression $\hat{S}(z)e^{-pz}dz$ represents the elementary wave dze^{-pz} modulated in accordance with the amplitude by an oppositus-judgement $\hat{S}(z)$. In this sense, the integrand expression is the elementary wave of a judgement $\hat{S}(z)e^{-pz}dz$ carrying in the space of an argument z the differential pulse of information or briefly, the differential information of an oppositus. For this reason, the elementary wave of a judgement we can call the information wave.

Electromagnetic waves modulated in accordance with an amplitude, carrying the specific information, are the analog of it.

In that case, the oppositus $\hat{F}(p)$, as sum of elementary waves of the judgement, is the integral information or the integral pulse.

If the information wave becomes zero on the outside infinite boundary of the affirmation-negation field, that is quite natural for real processes, integral (1.193) will be equal to the integral over the closed contour of the outside boundary of the field of the argument p (Fig. 1.16).

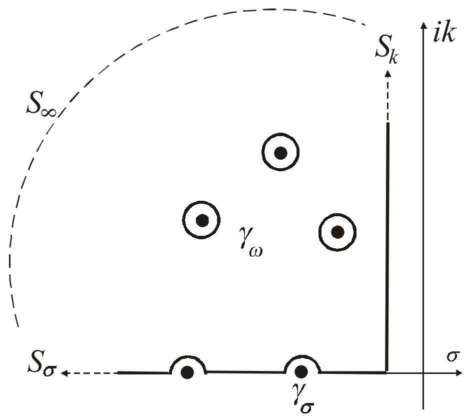

Fig. **1.16.** An intrinsic domain V of the field of the argument p limited by vertical s_k and horizontal s_σ beams and by the infinitely far boundary s_∞; γ_ω are the intrinsic boundaries-circles of localization of motators; γ_σ are the intrinsic boundaries-circles of motators situated on the axis σ.

Since the judgement fluxes of the information pulse through the outside and inside boundaries of the judgement field should be equal, the integral over the outside boundary of the field is determined by the powers of motators:

$$\hat{S}(z) = \frac{1}{2\pi i}\oint_v \hat{F}(p)e^{pz}dp = \frac{1}{2\pi i}\sum_k \hat{Q}_k\,. \quad (1.195)$$

Let us consider the conjugate oppositi

$$\hat{S} = \sum_0^\infty c_m e^{p_m z} = u + i\upsilon \qquad \hat{S}^* = \sum_0^\infty c_m^* e^{p_m^* z} = u - i\upsilon\,.$$

The half-sum of them is equil to their affirmation component u

$$S_m(z) = \frac{\hat{S}(z) + \hat{S}^*(z)}{2} = \frac{1}{2}\sum_0^\infty (c_n e^{p_n z} + c_n^* e^{p_n^* z})\,.$$

The component of affirmation can be written as

$$S_m(z) = \sum_{-\infty}^{+\infty} \frac{1}{2} c_n e^{p_n z} = \frac{1}{2\pi i} \sum_{-\infty}^{+\infty} \frac{1}{2} \hat{F}(p_n) e^{p_n z} \Delta p_n \,, \tag{1.196}$$

where

$$c_n = a_n + ib_n \,,\; c_{-n} = c_n^* = a_n - ib_n \,,\; p_n = \sigma + ink \,,\; p_{-n} = p_n^* = \sigma - ink \,.$$

For $L \to 0$ we have

$$S_m(z) = \frac{1}{2\pi i} \int_{\sigma-\infty}^{\sigma+\infty} F(p_n) e^{pz} dp \,, \tag{1.197}$$

where

$$F(p) = \frac{1}{2} \hat{F}(p) \,. \tag{1.198}$$

Function F(p) is the Laplace transform of the affirmation component of the oppositus. With the affirmation component of the transform *F(p),* which is half as large as the affirmation-negation transform, we can determine the complete oppositus by the formula

$$\hat{S}(z) = \frac{1}{2\pi i} \oint_v \hat{F}(p) e^{pz} dp = \frac{1}{2\pi i} (\sum_k \hat{\Gamma}_\sigma + \sum_l \hat{\Gamma}_\omega) \,, \tag{1.199}$$

Here, the first sum in brackets is the sum of semi-circulations γ_σ and the second sum is the sum of full circulations γ_ω.

Resume

In this chapter the bases the differentially integral logic and philosophy of physical processes, both continuous and discontinuous are considered. This system is named as the dialectic analysis, or dialectics, as the series of its axioms belongs to Hegel's dialectical phylosophy and logic. As a special case, Hegel's dialectics includes Aristotle's logic and metaphysics.

Methods of dialectical analysis possess the broad conceptual and mathematical apparatus which contains both classical derivatives of continuous processes and discrete derivatives of discrete processes.

The mathematical basis of dialectics is the *quantitatively qualitative numerucal field,* which includes, as a specific and very limited case, the field of complex numbers. The quantitatively qualitative numerical field is more genuine and obvious than the field of complex numbers. In the definite sense, the numerical field is analogous to the electromagnetic field.

The numerical field of dialectics and its logical apparatus make it possible to describe and solve many problems in the simplest and most comprehensive way, such as-: physical, technical, technological and those which could not be solved by classical analysis.

The field of quantitatively qualitative numbers allows us to consider two principal types of continuity and discreteness: additive and multiplicative. Therefore, this field considers both the classical differentials, derivatives, and integrals of continuous sums and the multiplicative differentials, derivatives, and integrals of continuous products. Although the multiplicative differentially integral calculus can be expressed by the classical additive differentially integral calculus, the two calculuses differ in principle. The multiplicative calculus allows us to see a great many facts which would be impossible to find by the classical additive calculus.

The logical algebra of dialectics operates discontinuous, continuous and discontinuously continuous judgements, whereas the mathematical logic is based on two elementary constant judgements with measures 1 and 0. This means that dialectical analysis makes it possible in principle to develop new structures of microprocessors and effective methods of computer programming. They will allow us to adequately model (describe) intellectual processes first of all on the intuitive level where the logic of thinking is most effective. Note that the laws of the intuitive level of thinking are concerned with the level of the Universe.

The fields of quantitatively qualitative differentially integral judgements and numbers are the "Physics" of logical thinking, i.e. the mathematical image of real logical processes. Therefore, without dialectical analysis, it is impossible to create an artificial intellect in the deep sense of the word. It is also impossible to make the essential theoretical and practical progress for understanding of the atomic and elementary particles structure where superhigh frequencies and vast speeds play a role.

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