Equation of Objects and Equation of Field

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ABSTRACT: Using the properties of space and vector potentials the equation of dimensions has been deduced. Next the equation of dimensions has been generalized for the case of the collective excitations. The equation of dimensions has been deduced for a loop. The general structure of the equation of objects has been obtained from the equation of dimension for the next excitation and from the equation of dimension for a loop, too. Postulating the analogical shape of the equation of field permitted to obtain it and it has proved the convergence of its members.

I Introduction.

1.1 In the work [1] author deduced the mass-charge equation and Dirac-Einstein equation unifying interactins and quantizing gravitation. These equation with generalized Londons' equation [2] mass of which was exchanged by matrix of complex mass create the description of foundations of Nature. Simultaneously the equations describing objects and fields lack. This gap should be eliminated by this work.
Simultaneously one should refer to E.Witten's [3,4], A. Ashtekar's [5] , M.J. Duff's [6,7], Y.Bars' [8] and by others describing in turn strings, loops , membranes and configurations of fields.
First such attempt has been undertaken by the author in the work [9]. This work is continuation of that research.

1.2 Let's introduce vector i_r expressed by the formula $\frac{\vec{r}}{|\vec{r}|}$, $\vec{r}$ leading vector, in each point of the space.

This way the vector space arises.

In this space the equation is valid:

$$\overrightarrow{rot}\,\vec{S} + \overrightarrow{grad}\,\vec{S} = \vec{D} \qquad (1)$$

$\vec{D}$ - orientated dimension.

This equation means that rotation-like and gradient-like potentials are added creating dimension. $\overrightarrow{Rot}\,\vec{S}$ corresponds with loop and $\overrightarrow{grad}\,\vec{S}$ corresponds with string, warmhole, hair etc. Orientation of dimensions is consistent with direction of circulation of loop with the sense of axis of dimension.

Let's introduce the orientation of space as lattice with determined direction of circulation of each mesh in the consistent way for each mesh.

The space is made of unorientated lattice and an object is made of orintated lattice, whose contribution to circulation of neighbouring meshes are canceled (fig 1.) and the contribution on the border remains. This way the objects arised from the space.

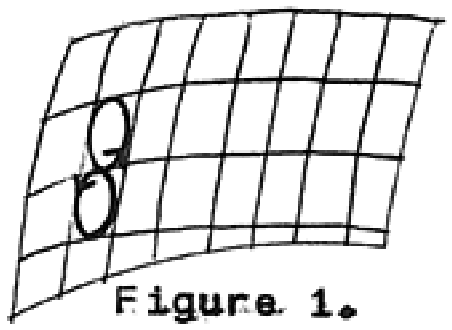

Figure 1.

For such orientated space the equation is valid:

$$\overrightarrow{rot}\,\vec{S}_{or} + \overrightarrow{grad}\,\vec{S}_{or} = \vec{O} \qquad (2)$$

$\vec{O}$ - objects

$\overrightarrow{Rot}\,\vec{S}_{or}$ there are loops of orientated structure

$\overrightarrow{Grad}\,\vec{S}_{or}$ there are tubes of oriented structure .

Let's introduce in each point the circle with the centre at this point and radius tending to zero with determined direction of circulation identival for each such circle. Let's notice that linear (vector-like) relation and circle-like relation are mutually complementary and the circle create the lattice.

It means that:

$$\overrightarrow{rot}(\vec{S} + \vec{S}_{or}) + \overrightarrow{grad}(\vec{S} + \vec{S}_{or}) = \vec{D} + \vec{O} \qquad (3)$$

which formally corresponds with adding of sides of the equations (1) and (2).

This equation is valid for any dimension, for any structure, for any space with any number of dimensions, for structures with any number of dimensions. $\vec{D}$ and $\vec{O}$ are added which means the affinity of these both beings, the rolled dimension is a loop, the dimension direct is a string.

The penetration of space and structure is described by vector sum $\vec{S} + \vec{S}_{or}$. Let's take Euclidean space. The Cartesian coordinate system must be in it. With each dimension the coordinate axis is connected, it is gradient.

Each line parallel to axis is gradient, too. We have the sum or even integral of gradients and it is so in the case of each dimension.

Let's take the dimension rolled into ring. Here gradient disappears and rotation is nonzero.

The space loop is rotation and it doesn't differ from dimension and it is an object, so the conversion of members of the right side of equation (3) is implicated.

For the loop the equation is valid:

$$rot\ \vec{O} = \vec{O} \qquad (4)$$

Simultaneously, the space is woven from loops, so we have the sum of rotations. Rotations of space-loops are weaving into the space, which is a structure and has dimensions.

In the string the gradient is connected with each nonsliting line existing in a beam. The sum is taken from all such lines.

The string may be built of loop when it has more than one dimension. The the contribution from the loop-rotation member appears.

The generalized rotation has the shape:

$$e_{iklm}\left(\frac{\partial F_{kl}}{\partial x_m} - \frac{\partial F_{km}}{\partial x_l}\right) i_k$$

and the sum with k and for each m,l.

Gradient is generalized in the natural way as $\sum_n \frac{\partial}{\partial x_n} i_n$

II The complexity of particles and field.

2.1 The following gradation of particles and field exists. We have the particles of unempty vacuum whose the vector potential corresponds with the elementary particles excited from unempty vacuum, which correspond in turn with derivatives of potential; particles being the collective excitations of elementary particles (plasmons, magnons) which correspond to the derivative of electric field (in magnetic reresonance). This pyramid has no end.

It corresponds with the situation, in which in the first member of equation (1) one rotation may act on another rotation and may be acted on by the next rotation and the next.

The first member has the shape:

$$\underbrace{\overrightarrow{rot}\,\overrightarrow{rot}\ldots\overrightarrow{rot}}_{n}\,\vec{S}$$

and the second:

$$\underbrace{(\overrightarrow{graddiv})\ldots(\overrightarrow{graddiv})}_{m}\,\vec{S}$$

Each derivative corresponds with the next step of composition.

The space can be superposition of many fields which have topological character.

When the currant flows we have $j = \text{grad}\varphi | R$ and $\vec{j} = \overrightarrow{\text{rot}}\vec{B}$ and $\vec{B} = \overrightarrow{\text{rot}}\vec{A}$. So we have both gradient of certain field and rotation of the other.

The column of loops with common axis and decreasing radius gives rotation (loops) and gradient (decrease of radius).

The rotation of cristal lattice is equal with just this cristal lattice, becouse the cristal lattice is built of deformed unorientated loops.

$\overrightarrow{\text{Rot}}\ \overrightarrow{\text{rot}}\ \vec{S}$ is loop of loop and $\overrightarrow{\text{rot}}\ \overrightarrow{\text{rot}}\ \overrightarrow{\text{rot}}\ \vec{S}$ is the three times storeyed loop structure.

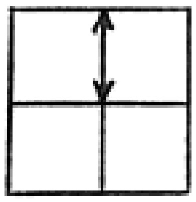

Fig.2

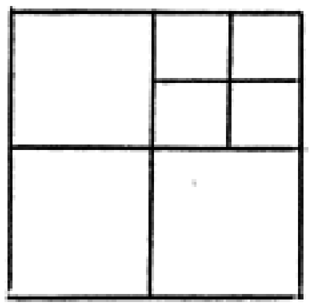

Fig.3

One can construct loops in three dimensions. Let's consider three loops inscribed in three adhering walls of a cube, which have a common point. Let's consider next three tubes, whose cross-section are these loops. The intersection of these tubes is a three-dimensional loop. Analogically the n-dimensional loopmay be defined, and orientating vector in n + 1 dimension.

The expression $\sum_n \overrightarrow{\text{rot}}^n\ \vec{0} = \vec{0}$ means that lattice is built of loops and of other superloops which have 4^n loop character.

The string is the sum of an infinite number of loops, so as rotation and gradient along the string line and the constant component too (resulted from the integration of gradient) . If the string is a tube, each its line may be presented as the sum of loops.

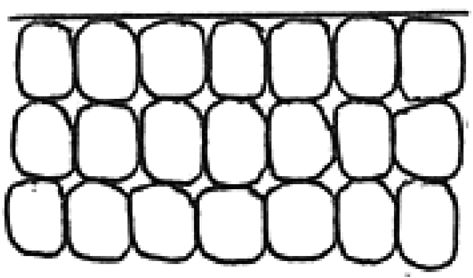

Figure 4

If the string is a half plane, which is crea d by the string in time dimension, this string may be built of three-dimensional loops touching with the lateral walls to this half-string.

III Equation of objects.

From the consideration introduced in the previous chapter the conclusion is resulted that each object may be built of m-dimensional loops. Each such loop may be built of two dimensional loops. For the two-dimensional loops an equation (4) is valid, which in these circumstances obtains the shape:

$$\sum_{n} \prod \partial^{n} \vec{0} = \vec{0} \tag{5}$$

An object is a loop, a p-brane, a string, a black-hole and a field and any its derivative. A generalized object is an object and a field created by itself. Such object is for example a topological knot.

In the composition of the object its initial layer is taken, which is differentiated. So, to create it again the first derivative must be integrated. It can be generalized for the series of integrals. So we obtain the equation:

$$\sum_{n} \prod \partial^{n} \vec{0} + \sum_{m} \prod \int^{m} \vec{0} = \vec{0} \tag{6}$$

We managed to write the features of field and fundamental objects, using easy symbols.

An object can be presented as the sum of integrals and derivatives by many possible means. We have to take the sum of all possible compositions of integrals and derivatives describing the object in purpose to obtain a complete picture of objects.

Equation (6) may be generalized taking under consideration the mixed members:

$$\left(\sum_{n,m} \prod_{i,j} \frac{\partial^{n}}{\partial x_i} \int^{m} dy_j \right) \vec{0} = \vec{0} \tag{7}$$

This equation contains the extreme members written earlier in equation (6) too and it is the most general shape of equation of objects. Equation of objects describes in all dimensions the transformation of certain objects into others with the deformation of all primary objects, too. Equation of objects describes bubbles, bubbling universes, mitosis of universe, blind branch of universe, Megauniverse.

IV Equation of fields

This equation is obtained from the postulate that derivatives and integrals don't change the mathematical expression of field

$$\partial G \sim G' \quad ; \quad \int G d\tau \sim G''$$

$\sim$ means identity with the coefficient.

In the equation (7) we replace the integrals and derivatives by the function of field G:

$$G\vec{Q} = \vec{0} \qquad (8)$$

There is the conjugation field-source, for example a supermembrane-supergravitational field.

Let's create the series of G dependent on the field G.

$$\left(\sum_{n\in N} a_n g^n + \sum_{n\in N} \frac{b_n}{g^n} + \ln g + C + \sum_{n\in N} C_n \int^n \ln g dg\right)\vec{Q} = \vec{0}$$

This equation fulfils the condition that integral and derivative of field part give the same expressions Separating the field from the object we have:

$$\sum_{n\in N} a_n g^n + \sum_{n\in N} \frac{b_n}{g^n} + \ln g + C' + \sum_{n\in N} C_n \underbrace{\int\ldots\int}_{n} \ln g \underbrace{dg\ldots dg}_{n} = 1$$

and at last:

$$\sum_{n\in N} a_n g^n + \sum_{n\in N} \frac{b_n}{g^n} + \sum_{n\in N\cup\{0\}} C_n \underbrace{\int\ldots\int}_{n} \ln g \underbrace{dg\ldots dg}_{n} =$$

$$= \text{const} \qquad (9)$$

Generally g is a complex number, lng is determined for g negative. The members of integrals of natural logarithm countermand divergences with suitable choice of coeffcient and are again responsible for creation the members $\frac{1}{g^n}$, when we take their derivative. The constant integral is changed during integration into linear member, but the integral creates the constant again during the integration which conserves the shape of field expression.

We transform each member of natural logarithm integral into power series of g. Then there is the coefficient at g^k compare (9).

$$\left(a_k + \sum_m c_m d_{km} \right)$$

a_k may be chosen this way that the bracket is equal zero becouse the sum $\sum_m c_m d_{km}$ gives certain finite number, becouse the number of members of series is finite, what is seen next:

$$\ln x = \sum_n f_n x^n$$

$$\underbrace{\int \dots \int}_{j} \ln x \underbrace{dx \dots dx}_{j} = \sum_n \frac{f_n}{(n+1)\dots(n+j)} x^{n+j}$$

If $j>k$ then for every n there isn't contribution to coefficient at g^k. We will prove analogically the lack of divergence of members $\frac{1}{g^k}$. The integral member is joined into series of $\frac{1}{g^k}$.

$$c_k \underbrace{\int \dots \int}_{k} \ln g \underbrace{dg \dots dg}_{k} = \sum_n c_k d_{kn} \frac{1}{g^n}$$

At the n-th member the coefficient stands

$$\left[b_n + \left(\sum_{\substack{n \\ k \leq n}} c_k d_{kn} \right) \right]$$

The sum in the round bracket has finite number of members, so it is finite for every n. We may choose b_n so that the square bracket is equal zero.
So we have the series of coefficients convergent when $g \to 0$ and more in the point $y = 0$ we have an indefinite symbol $\frac{0}{0}$ which has change to give constant.
In the equation (9) coefficients a_n and b_n are functions of coefficients c_n. Equation (9) can be solsolved this way that one gives the coefficients c_n and finds field g or vice versa. g may be any dimensional matrix, for example matrix representing metric tensor in general relativity. If g is matrix, the coefficients are matrices too. For the tangled configuration of field, the integral member of equation (9) is responsible.

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