

GENERAL THEORY OF TENSION OF BIOLOGICAL AND SOCIAL FIELDS

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The notion of tension of the field of legal liability is easily carried over to any types of social and biological fields¹.

Social field is domain of personal and collective social states characterized by a definite tension value.

Biological field is domain of personal and collective biological states characterized by a definite tension value.

Field of legal liability is domain of possible states of legal liability – tensions of the field of legal liability.

There is infinite aggregate of biological and social fields.

Types of biological and social fields:

- 1). Personal and collective biological and social fields.
- 2). Field of personal and collective self-esteem.
- 3). Fields of biological and social needs.
- 4). Field of class contradictions.
- 5). Field of ethnic contradictions.
- 6). Field of racial contradictions.
- 7). Field of religious cleavage.
- 8). Field of interstate contradictions.
- 9). Field of intergroup and interpersonal conflicts.
- 10) Field of cosmo-telluric and bio-social contradictions.
- 11) Field of language mismatch.
- 12) Field of moral and legal contradictions.
- 13) Field of pedagogical contradictions.
- 14) Field of family conflicts.
- 15) Field of business (economic) contradictions.

Total potential strength of a biological or social field (TPSBSF) is aggregate tension module of a given biological or social field, a maximally possible (potential) level of tension in the system. This is a quantitative value demonstrating aggregate distance modulus from the coherence line to coordinates mismatch in

ABSTRACT:

The aim of the article is to develop a general theory of tension of biological and social fields.

Research methods: 1) differential and integral calculus; 2) correlation and regression analysis; 3) mathematical modeling; 4) matrix analysis; 5) calculation of probabilities; 6) introspection; 7) supervision; 8) comparison; 9) deduction; 10) induction; 11) analysis; 12) synthesis.

Scientific results obtained by the author: 1) definition of social, biological field and the field of legal liability; the total potential and real field strength; field strength at a point; discrete and continuous tension of biological and social fields; concept of complex fields considered; 2) classification of biological and social fields; 3) it is proved that the higher the level of mismatch of the system, the higher the tension in this system (the relationship is positive and non-linear with constant acceleration equal to two); 4) it is proved that with coherence in the biological or social system tension module equals to zero; 5) it is proved that the field strength depends on its dimensions. General rule: the greater the dimension of the field, the greater its potential tensions; 6) matrix of tension in social fields of minimal dimension built (single social field: 3x3), and its discrete and continuous tension measured; 7) correlation matrix for the matrix of tension in social fields of the minimal dimension built (single social field: 3x3); 8) the ordinal matrix of tension size, the dimension of the matrix and the parameters of the equations describing the continuous tension of tension matrix investigated; 9) it is proved that in the tension matrix of any dimension maximum values of tensions of biological and social fields are concentrated at the ends of the inverse diagonal; 10) it is proved that in the tension matrix of any dimension minimum values of tension of biological and social fields are concentrated along the main diagonal; 11) coherence functions for matrices of large dimensions investigated; 12) integral and differential functions of normal distribution of consistency for the correlation matrix of the tension matrix 21x21 built; 13) a vector field of contradictions matrix built.

Scientific novelty: newly received scientific results.

Practical value consists in the possibility of implementation of research results in the development of the theory of biological and social fields, creating scientific public morality and law.

¹Olkov S.G. Tension of the field of legal liability//Actual Problems of Economics and Law, 2013, №4.

the matrix² of «tension» (matrix of «contradictions», matrix of «mismatch», matrix of «justice», matrix of «coherence»). In other words, it is an indicator of the value of incoherence – the incoherence module of a system; a quantitative value demonstrating distance modulus from a given coordinate (GC) of the matrix of coherence to the coordinate at the coherence line (on the main diagonal of the matrix of coherence) (CC) corresponding to GC.

We shall accept the unit of measurement of tension of biological and social fields of $1 \text{ jup} = 1j$.

Total real tension of a biological or social field (TRTBSF) is aggregate tension module of a given biological or social field, a maximum level of tension in the system in a given space-time continuum.

The higher the level of mismatch in the system, the higher tension in this system, which has been picked up by conventional wisdom in the notion of «diametrically opposed views». It is evident that individuals holding diametrically opposed views experience tension of the greatest value between them. The notion of «cognitive dissonance»³ in psychology reflects the measure of internal contradictions of a certain person, his/her coherence with himself/herself; the notion of legal or just sentence reflects the measure of coherence of judicial decisions with the legislation, inner conviction of the judges, public opinion.

With full coherence in a biological or social system, the tension module equals zero. With absolute mismatch, the value of the tension module depends on dimension of the matrix of the tension measure (measure of contradictions, measure of coherence, measure of mismatch, measure of justice) accepted for calculations.

Strength of a biological or social field at a point is tension module of a biological or social field at a definite point of the matrix of coherence of a given biological or social domain.

Discrete tension of a biological or social field is tension of a biological or social field accepted in modules of discrete values.

Continuous tension of a biological or social field is tension of a social or biological field accepted in modules of continuous values.

Complex biological and social fields include an amount of matrices of tension and represent aggregate matrices of tension which come out by adding plain (i) matrices of tension. In every living individual, as well as in a social group and humankind, we see an aggregate of tension, and here we need to know the mathematical theory of matrices in order to do corresponding calculations and measurements⁴.

The measure of coherence of any matrix or its elements is easily calculated with the help of correlation

coefficient, in particular, multiple coefficient of rank correlation (concordance coefficient), Pearson's linear correlation coefficient, and others. We performed such calculations for a system of judges, when it was required to find the measure of coherence of decisions in the system of judges⁵. Mathematical theory of random function⁶ will be of help here, too.

Tension of a social field depends on its dimensions. General rule: the greater dimensions of a social field, the higher its *potential tension*. We will prove it by increasing the number of lines and columns in the matrix of justice.

Table 1 clearly shows that potential discrete tension of a social or biological field of minimal dimension (*TSFMD*) makes 8 *jups*. Tension of a continuous biological or social field of minimal dimension at a point is defined by the formula: $U = x^2 - 4x + 6$, where U – tension of a social field (in *jups*), x – deviation module of the social state from the line of justice. Hence, maximum potential tension of a continuous social or biological field of minimal dimension is defined by the value of integral of the function: $U = x^2 - 4x + 6$.

If we integrate the function: $U = x^2 - 4x + 6$, in the limits from -1 to 1, we will get:

$$\int_{-1}^1 x^2 - 4x + 6 = \frac{38}{3} = 12,66667.$$

This will be the combined maximum value of tension of the *continuous* stationary biological or social field (its potential tension).

The first derivative of the function of tension of the stationary field of minimal dimension (singular dimension): $\dot{U} = 2x - 4$, shows the rate of change of tension stationary social field, and the second derivative: $\ddot{U} = 2$, acceleration in the system of tension of a social field.

² Matrix is a mathematical object recorded in the form of a rectangular table of elements of the ring of the field (for example, whole, real or complex numbers), which represents an array of lines and columns, its elements appearing at their intersections. The number of lines and columns of the matrix are defined by the size of the matrix. Although historically, for example, triangular matrices were considered, at present they speak only about matrices of rectangular shape, as they prove most convenient and common.

³ Cognitive dissonance (from Latin: *cognitio* — «knowledge» and *dissonantia* — «inconsonance, discordance, absence of harmony») — state of mental discomfort of an individual caused by collision of conflicting views in their mind: ideas, beliefs, values, or emotional reactions.

⁴ Matrices can undergo the following algebraic operations: 1) addition and subtraction of matrices sharing the same dimensions; 2) multiplication of matrices, in particular, by matrix vector or field (that is, scalar).

⁵ Olkov S.G. Analytical jurisprudence (methodology of jurisprudence). – In 2 volumes. V.2. – M.: Yurлитinform, 2013. P. 277–289.

⁶ ib. P. 274–275.

We will increase dimensions of the matrix of a social field.

Discrete tension of a social field at transfer from matrix 3x3 to matrix 5x5 grew 5-fold and made 40 jups.

Continuous tension of a social field of dimensions 5x5 is measured by the formula: $U = x^2 - 6x + 15$.

The first derivative of the function of tension of the stationary field of legal liability: $\dot{U} = 2x - 6$, shows the rate of change of tension of the stationary legal field, and the second derivative: $\ddot{U} = 2$, acceleration in the system of tension of a social field.

If we integrate the function: $U = x^2 - 6x + 15$, in the limits from -2 to 2, we will get:

$$\int_{-2}^2 x^2 - 6x + 15 = \frac{196}{3} = 65,333 \text{ jups.}$$

For the matrix 11x11, we will get:

$U = x^2 - 12x + 66$. By integrating it in the limits from -5 to 5, we get:

$$\int_{-5}^5 x^2 - 12x + 66 = \frac{2230}{3} = 743,3333.$$

Dimensions of the matrix of tension

Selection of dimensions of the matrix of tension is a matter of taste. In fact, in order to fully describe any biological or social field, even an identity matrix is quite sufficient, as we can work with continuous and not discrete values. In this case, the distance between one and minus one covers and endless multitude of dots describing any theoretically possible state of a field.

For convenience of use (to increase vividness, and to escape small fractional numbers), fields of large dimensions can be considered.

In the matrix of contradictions of any dimension, maximum values of tension of biological and social fields are concentrated at the ends of the inverse diagonal, which is clearly seen in the diagram of tension and the matrix itself. In its turn, minimal tension of the matrix goes along the main diagonal.

Continuous tension of the matrix of contradictions of dimensions 21x21 will make:

$$\int_{-10}^{10} 0,999x^2 - 21,99x + 231 = 5286 \text{ jups, and}$$

discrete tension, 3079.

Coefficient of variation:

$$V = \frac{\sigma}{\bar{x}} \cdot 100 = \frac{33,47309}{146,619} = 22,8\%$$

Conclusions

- 1) definitions of social, biological field and field of legal liability; total potential and real tension of a field; tension of a field at a point; discrete and continuous tension of biological and social fields; the notion of complex field is considered;
- 2) classification of biological and social fields;
- 3) proved that the higher the level of mismatch of the system, the higher tension in this system (positive and non-linear relationship with constant acceleration equal to two);
- 4) proved that with full coherence in a biological or social system, the tension module equals zero;
- 5) proved that tension of a field depends on its dimensions. General rule: the greater dimensions of a field, the higher its potential tension;
- 6) matrix of tension of a social field of minimal dimensions (singular social field: 3x3) built, its potential discrete and continuous tension measured;
- 7) correlation matrix for the matrix of tension of a social field of minimal dimensions (singular social field: 3x3) built;
- 8) ordinal matrix of tension size, dimensions of the matrix, and parameters of equations describing continuous tension of the matrix of tension studied;
- 9) proved that in a matrix of tension of any dimensions, maximum values of tension of biological and social fields are concentrated at the ends of the inverse diagonal;
- 10) proved that in the matrix of tension of any dimensions, minimum values of tension of biological and social fields are concentrated along the main diagonal;
- 11) functions of coherence for matrices of large dimensions studied;
- 12) integral and differential functions of normal distribution of consistency for the correlation matrix of the matrix of tension 21x21 built;
- 13) vector field of the matrix of contradictions built.

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Table 1.

Matrix of tension of a social field of minimal dimension (singular social field: 3x3).

		Judge №1			
Judge №2	standard	-1	0	1	Total
	-1	0	1	2	3
	0	1	0	1	2
	1	2	1	0	3
	Total	3	2	3	8

Table 2.

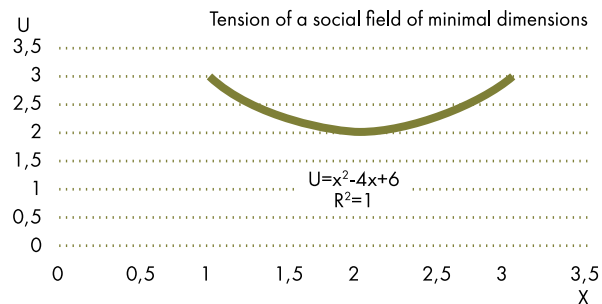
Correlation matrix for matrix of tension of a social field of minimal dimension (singular social field: 3x3)

	Column 1	Column 2	Column 3
Column 1	1	0	-1
Column 2	0	1	0
Column 3	-1	0	1

Table 4.

Correlation matrix for the matrix of tension of a social field of dimensions 5x5

	Column 1	Column 2	Column 3	Column 4	Column 5
Column 1	1	0,83205	0	-0,83205	-1
Column 2	0,83205	1	0,419314	-0,53846	-0,83205
Column 3	0	0,419314	1	0,419314	0
Column 4	-0,83205	-0,53846	0,419314	1	0,83205
Column 5	-1	-0,83205	0	0,83205	1

**Fig. 1.**

Formula and diagram of tension of a social or biological field of minimal dimension.

Table 3.

Matrix of tension of a social field of dimensions 5x5

	-2	-1	0	1	2	Total
-2	0	1	2	3	4	10
-1	1	0	1	2	3	7
0	2	1	0	1	2	6
1	3	2	1	0	1	7
2	4	3	2	1	0	10
Total	10	7	6	7	10	40

Table 5.

Ordinal matrix of tension size, dimensions of the matrix and parameters of equations describing continuous tension of the matrix of tension, as well as values of potential discrete and continuous tension

Ordinal matrix of tension size	Dimensions of the matrix of tension	Free term	Derivative	Acceleration	Ud	Un
1	3x3	6	2x-4	2	8	12,67
2	5x5	15	2x-6	2	40	65,33
3	7x7	28	2x-8	2	112	186,00
4	9x9	45	2x-10	2	240	402,67
5	11x11	66	2x-12	2	440	743,33
6	13x13	91	2x-14	2	728	1236,0
...						
10	21x21	231	2x-22	2	3079	5286

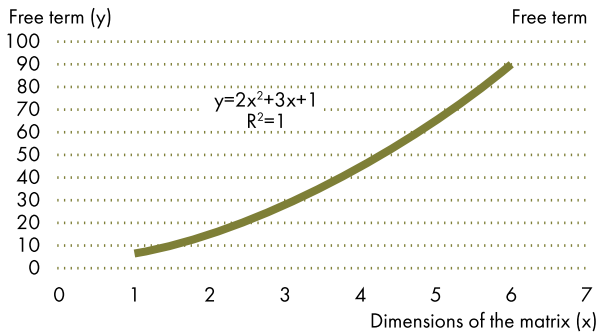


Fig. 2. Dependence of the free term in the equation of tension of the matrix of coherence depending on ordinal matrix of coherence size.

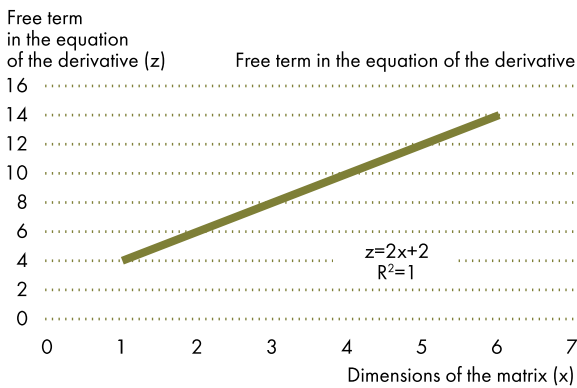


Fig. 3. Dependence of the free term in the equation of the derivative in the equation of tension of matrix of coherence depending on ordinal matrix of coherence size

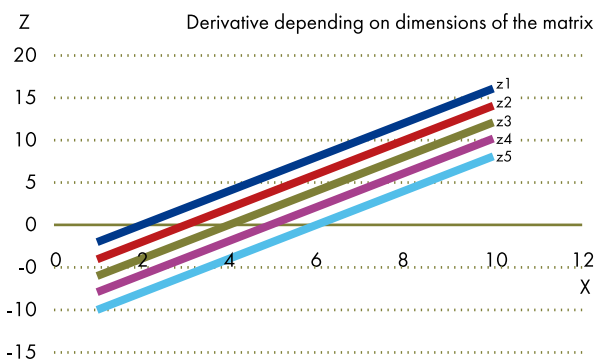


Fig. 4. Derivative depending on ordinal matrix of coherence size

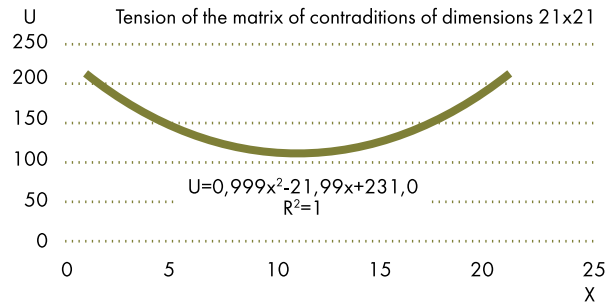


Fig. 5. Function of tension of the matrix of contradictions of dimensions 21 x 21

Ud
210
191
174
159
146
135
126
119
114
111
110
111
114
119
126
135
146
158
174
191
210

Table 6. Final values of tension by lines of the matrix of tension of the 10-th order

Table 7. Descriptive statistics for discrete tension of the matrix of the 10-th order

Descriptive statistics	
Mean	146,619
Standard error	7,304427
Median	135
Mode	210
Standard deviation	33,47309
Sampling variance	1120,448
Excess	-0,81639
Asymmetry	0,673056
Span	100
Minimum	110
Maximum	210
Sum	3079
Count	21

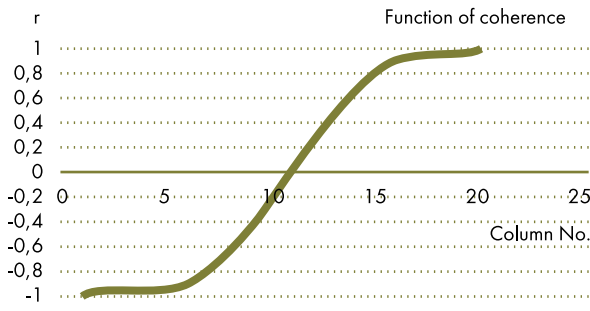


Fig. 6. Function of coherence built by correlation coefficients in the last line of the correlation matrix for matrix of tension 21x21

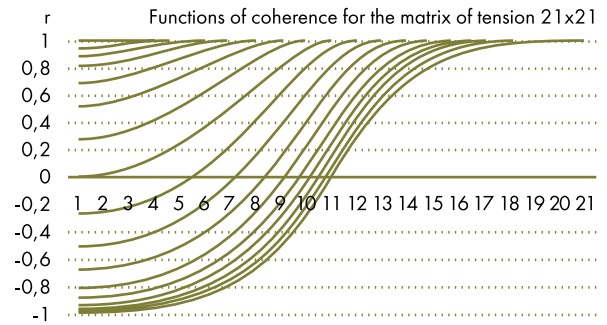


Fig. 7. Functions of coherence for the matrix of tension 21x21

Table 8. Integral and differential functions of normal distribution of consistency in the first column of the correlation matrix of the matrix of tension 21x21 ($m=0$; $\sigma=0,840345$)

r	F(r)	f(r)
1	0,882974	0,273348
0,997756	0,882449	0,273527
0,989595	0,880523	0,274186
0,972008	0,876298	0,27563
0,940625	0,868501	0,278298
0,889279	0,855025	0,282913
0,80904	0,832163	0,290746
0,687768	0,793446	0,303995
0,512325	0,728956	0,325879
0,27735	0,629316	0,358651
-1,8E-17	0,5	0,397721
-0,27735	0,370684	0,430725
-0,51232	0,271044	0,450674
-0,68777	0,206554	0,46061
-0,80904	0,167837	0,465362
-0,88928	0,144975	0,467724
-0,94062	0,131499	0,468959
-0,97161	0,123799	0,469613
-0,9896	0,119477	0,469962
-0,99776	0,117551	0,470114
-1	0,117026	0,470155

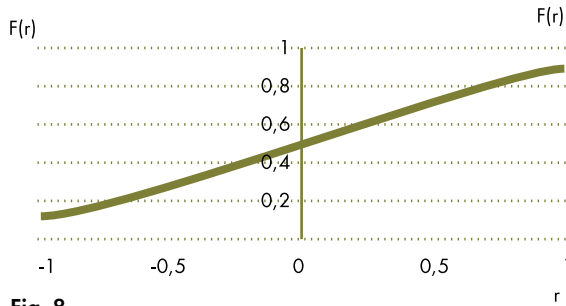


Fig. 8. Integral function of normal distribution of consistency in the first column of the correlation matrix of the matrix of tension 21x21 ($m=0$; $\sigma=0,840345$)

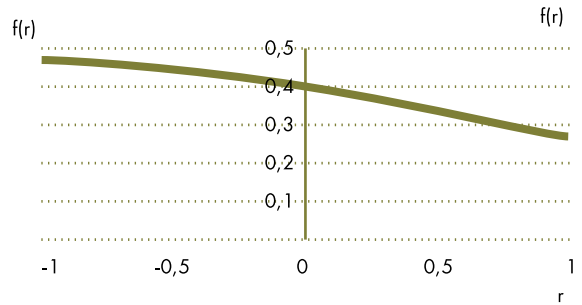


Fig. 9. Differential function of normal distribution of consistency in the first column of the correlation matrix of the matrix of tension 21x21 ($m=0$; $\sigma=0,840345$)

$$U := \begin{pmatrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 2 & 1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 3 & 2 & 1 & 0 & 1 & 2 & 3 & 4 & 5 \\ 5 & 4 & 3 & 2 & 1 & 0 & 1 & 2 & 3 & 4 \\ 6 & 5 & 4 & 3 & 2 & 1 & 0 & 1 & 2 & 3 \\ 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 & 1 & 2 \\ 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 & 1 \\ 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \end{pmatrix}$$

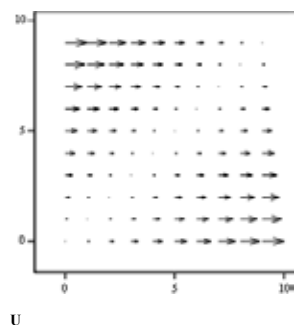


Fig. 10. Vector field of tension of the matrix of contradictions