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The materials of the conference have presented the results of the latest research in various fields of science. The collection is8of interest to researchers, graduate students, doctoral candidates, teachers, students - for anyone interested in the latest trends of the world of science.

CONTENT

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**I'D LIKE TO BE A BUS CONDUCTOR,
READY TO BE TAUGHT**

V. Mayakovsky

This research is a sequel to [1] devoted to the database of a bigger size (1400 people by 23 numeric characteristics) and the additionally created database2 (396x27) including two extra characteristics calculated based on the astronomical data of a person's date, time and geography of birth.

A practicing astrologist examines particular people, one by one. But history has the example of Michel Gauquelin (1928-1991) [2] who studied the correlations between people (16000 horoscopes of famous professionals and 25000 additional horoscopes) based on a huge amount of data. He described the appearance and externals as well as the character of the military personnel, artists, sportsmen and etc. He also analyzed the frequency of certain planets that appeared to be correlating with the examined people. For instance, the military and sportsmen had a high frequency value of ascendant Mars. Michel Gauquelin studied the occurrence of the Sun, the Moon and other planets in various Zodiac signs. The results are as follows: the main author of the birth of the military and sportsmen is Mars, regarding doctors and scientists it is Saturn, actors, politicians and journalists – Jupiter, etc. In his epilogue [2] M. Gauquelin said, "Our findings are shocking: the fundamental astrological premise regarding the correlation between the planets and the baby at the moment of birth seems to us to be proved; astral symbolism itself holds, undoubtedly, thoroughly fair intuitive assumptions, but any attempt of confirming the significance of horoscopes in general, in our opinion, should fail."

In terms of mathematical statistics Gauquelin studied only one characteristic at a time (for example, the longitude of Mars). What we do in our research here [1] is that we use the methods of multivariate statistics when every person is assigned a multivariate numeric vector which includes: all the information (not just certain infomation) about the longitudes of the planets obtained from astronomical almanacs; a couple

of numeric functions based on the data obtained from the same source; the information about the time and geography of the person's birthday. And that is exactly why "the attempt of confirming the significance of horoscopes in general" has not failed. This research is the confirmation. The data were processed by the application program package STATISTICA 6.1. During the creation of the databases the author also always referred to N. Michelsen's book [3] and the Wikipedia [6].

Here is a good example for a suspicious opponent. For the experiment we will turn our database (it is structured as follows: groups from No.1 to No.7 2, 200 people each, follow one after another) into the database_chaos as follows: first seven pieces of data will be assigned the numbers of the group (these were seven units) one by one 1,2,3,4,5,6,7 and the next seven pieces of data will be assigned same 1-7 and so on until the last element of the database. The discriminant analysis result for the database_chaos is the following:

a. Classification matrix – all 1400 pieces of data are uniformly spread among the seven groups.
Classification Matrix (Page1 in tabl1-1000st chaos)
Rows: Observed classifications
Columns: Predicted classifications

Group	Percent Correct	G_1:1 p=,14286	G_2:2 p=,14286	G_3:3 p=,14286	G_4:4 p=,14286	G_5:5 p=,14286	G_6:6 p=,14286	G_7:7 p=,14286
G_1:1	24,00000	48	21	28	26	21	26	30
G_2:2	20,00000	23	40	31	28	28	23	27
G_3:3	18,00000	35	24	36	27	31	28	19
G_4:4	20,50000	23	30	29	41	33	16	28
G_5:5	24,00000	17	17	35	25	48	24	34
G_6:6	19,00000	22	18	39	25	30	38	28
G_7:7	24,50000	25	22	21	31	24	28	49
Total	21,42857	193	172	219	203	215	183	215

b. Figure (the projection of the data on the first two canonical variables) shows the total destructuring of the database_chaos

Root 1 vs. Root 2
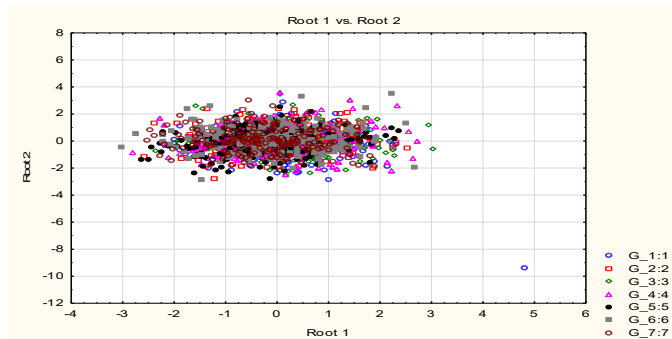
And what have we got? To what extent have our two databases structured?

Group 1 – composers, 2 – artists, 3 – sportsmen, 4 – the military personnel, 5 – politicians, 6 – scientists, 7 – antisocial elements (sex offenders).

1. Databases with the smallest set of characteristics SSC– longitudes of the planets, the Lunar Node (LN), the Black Moon (BM). Classification matrix:

Group	%	1	2	3	4	5	6	7
1	17,00000	**34**	18	27	58	13	37	13
2	27,00000	19	**54**	53	52	9	2	11
3	67,00000	12	6	**134**	2	0	1	45
4	53,00000	12	29	27	**106**	17	3	6
5	11,50000	11	27	51	74	**23**	3	11
6	25,00000	32	10	42	36	11	**50**	19
7	29,50000	12	15	78	20	5	11	**59**
Total	32,85714	132	159	412	348	78	107	164

Group 5 – the politicians, omnivorous, former military people, sportsmen and actors may occur there as well. Groups 1 and 6 are similar in creativity therefore they easily change one for another.

2. Databases with a big set of characteristics BSC – longitudes of the planets, LN, BM, indexes of the planets' stationarity

Group	%	1	2	3	4	5	6	7
1	21,50000	**43**	20	24	46	19	38	10
2	31,00000	18	**62**	39	45	16	3	17
3	60,50000	10	11	**121**	1	1	9	47
4	47,00000	8	34	23	**94**	29	5	7
5	16,50000	10	25	50	66	**33**	4	12
6	29,50000	25	18	40	28	14	**59**	16
7	29,50000	17	18	64	18	9	15	**59**
Total	33,64286	131	188	361	298	121	133	168

It may be observed that the distribution into groups has improved. Yes, indeed, the characteristics were supplemented by the indexes of the planets' stationarity indicating the planets' strength, which is the significant bonus to the planet to affect the person's fate.

Here is a figure with projections of the data on the first two canonical variables – the most distinct structuring is as follows:
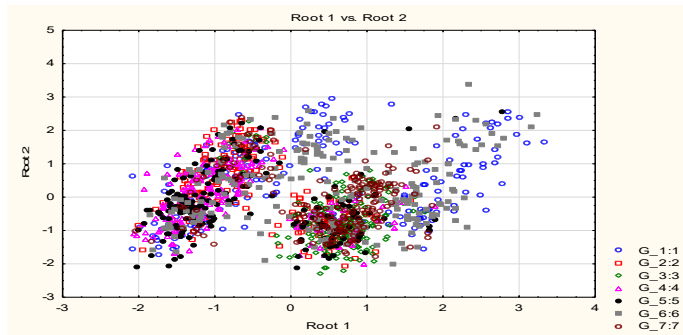
3. Database2 with SSC – longitudes of the planets, LN, BM

Group	%	1	5	6
1	55,69620	**44**	4	31
5	34,28571	10	**12**	13
6	68,47826	26	3	**63**
Total	57,76699	80	19	107

Group centers in the coordinates of the canonical variables:

Group	Root1	Root2
1	-0,181544	-0,325515
5	0,887959	0,000258
6	0,181919	-0,279420

4. Database2 with BSC

Group	%	1	5	6
1	56,96202	**45**	9	25
5	34,28571	11	**12**	12
6	67,39130	28	2	**62**
Total	57,76699	84	23	99

5. Database2 with the biggest set of characteristics – longitudes of the planets, LN, BM, indexes of the planets' stationarity and Asc, MC

Group	%	1	5	6
1	60,75949	**48**	7	24
5	40,00000	8	**14**	13
6	75,00000	21	2	**69**
Total	63,59223	77	23	106

In points 3-5 adding astronomical information, and in point 5 adding the information about time and geography the distribution becomes more distinct.

Contacts with psychologists determined that the vocational aptitude test is relevant and in-demand. I believe that usually a person chooses a profession out of two options. Let us consider some examples of results of division into two groups.

%	5	6
51,42857	18	17
94,56522	5	87
82,67716	23	104

Politicians, true to themselves, and scientists

%	1	6
64,50000	129	71
59,00000	82	118
61,75000	211	189

Creative people are often creative in different spheres (composers and scientists)

%	1	3
72,50000	145	55
82,00000	36	164
77,25000	181	219

Composers and sportsmen

%	1	4
61,00000	122	78
77,50000	45	155
69,25000	167	233

Composers and the military

The examined 19 various combinations of the groups showed that the Wilks's Lambda coefficient, expressing the nonrandomness of the differences between the groups, was statistically significant in 17 cases. One of the two remaining is clear. These are creative composers and scientists. Based on the classification matrix the two groups may be distinguished, but the data happened to be insufficient for accepting a hypothesis about the difference between the groups.

The discriminant analysis DA is also very convenient to use in the process of examining the patient who will need to provide only the information about his or her "spherical" 25-variate numeric vector. Among the output data the DA gives coefficients of linear canonical functions (their number equals to the number of groups) for each of the characteristic in the vector plus a constant. As the example we will use a composer Arnold Schoenberg, born on 13.09.1874, who is not in our databases. His "spherical" vector obtained from the astronomical almanac [5], the indexes of the planets' stationarity [4] and the place and time of his birth [5] is the following:

Birthdate	Sun	Moon	Merc	Venus	Mars	Upiter	Caturn	Uran	Neptun	Pluton	SUzel
13.09.1874	170	195	174	216	148	187	308	133	30	53	28

StMe	StV	StMa	StJ	StS	StU	StN	StP	StX	StUz	Chir	ChM	Asc	MC
-56,3	48,8	126,6	-15,5	0,7	2	2,4	-0,1	3,7	1	144	205	168	75

Here is the table showing the DA results for groups 1 and 5 from the database2 including all the 25 characteristics: classification functions (column 1 – the characteristics vector, columns 2 and 4 are correspondingly the vectors of the coefficients of the 1st and 2nd classification functions) and columns 3 (and 5), being the results of simple calculations, are the dot product of vectors – the characteristics vector and vector 2 (vector 4):

Sun	-0,0016	-0,2720	-0,0036	-0,6120
Moon	0,0180	3,5100	0,0172	3,3540
Merc	0,0091	1,5834	0,0082	1,4268
Venus	0,0116	2,5056	0,0158	3,4128
Mars	0,0234	3,4632	0,0212	3,1376
Upiter	0,0279	5,2173	0,0264	4,9368
Caturn	0,0205	6,3140	0,0210	6,4680
Uran	0,0197	2,6201	0,0198	2,6334
Neptun	0,0064	0,1920	-0,0014	-0,0420
Pluton	0,0063	0,3339	0,0047	0,2491
SUzel	0,0278	0,7784	0,0227	0,6356
StMe	0,0022	-0,1239	0,0003	-0,0169
StV	-0,0102	-0,4978	-0,0094	-0,4587

StMa	-0,0152	-1,9243	-0,0147	-1,8610
StJ	0,1397	-2,1654	0,1529	-2,3700
StS	-0,1443	-0,1010	-0,1556	-0,1089
StU	-0,6367	-1,2734	-0,5798	-1,1596
StN	0,6629	1,5910	0,6017	1,4441
StP	1,0645	-0,1065	0,9875	-0,0988
StX	0,2764	1,0227	0,2144	0,7933
StUz	4,3736	4,3736	3,8338	3,8338
Chir	0,0056	0,1232	0,0052	0,1144
ChM	0,0233	4,7765	0,0250	5,1250
Asc	0,0136	2,2848	0,0220	3,6960
MC	2,2848	171,3600	0,0222	1,6650
Constant	-22,0120	-22,0120	-22,1346	-22,1346
Calculation result		183,5735		14,0633

The last line gives the final result: ∑=183,5735 which places Schoenberg closer to group 1, while ∑=14, 0633 – to group 5. The first result is greater than the second therefore Schoenberg is closer to composers for a good reason.

For application of the test it will be necessary to create subbases of professionals according to the qualifications of interest.

Conclusions:

1.   There is a correlation between the person's professional preferences and the state of the planets in the sky, the time and geography at the moment of the person's birth. The correlation is confirmed by the results of the multivariate statistical analysis methods based on a large amount of experimental material.

2.   Database2 is smaller than one third of the Database in size. For the completeness of the vector of characteristics it is necessary to know the ASC of the horoscope. The author mostly used the database of the Swiss astrological center [5]. The ASC may be easily determined knowing the time and place of the person's birth. Otherwise, the process of its determination is a time-consuming, hard and not always successful work.

3.   Considering that our research and the astrologist's work are both based on the same material, our main conclusion is that an astrologist has a scientifically substantiated right to discuss the topic of vocational aptitude.

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OBTAINING MICROSPHERES BASED ON AGGLOMERATED SILICA PARTICLES IN THERMAL PLASMA FLOW

A technique of the introduction of spherical particles, solid and hollow, in the matrix of constructional materials and coatings is being rapidly developed both in applications and science. Nano- and micro-scale hollow particles, in which gas distributes in the volume or concentrates in separate inclusions, can be synthesized by treating both precursors and different types of powders having the developed bulk structure. Heating due to melting of the condensed phase up to the formation of hollow particles is observed in both cases.

In our theoretical and experimental studies, we used silicon dioxide (SiO_2) obtained from sifted silica sand at Tuganskoe deposit due to its high SiO_2 concentration ($98 \div 99.2$ wt.%). Sifted silica sand also contained such impurities as refractory oxides Al_2O_3, Fe_2O_3, CaO, MgO and TiO_2 in the amount of much less than 1%.

The experimental plasma generator was used to treat the powder agglomeration based on sifted silica sand [1, 2]. The use of the high-energy environment was conditioned by rather a strong binding energy between structural elements of the crystal lattice of oxide materials that affected the high melting temperature of 1993 K.

Figure 1 presents a photograph of the plasma treatment of the powder agglomeration at stationary operation conditions. Plasma treatment parameters included 250 A current, 110 V voltage, 0.4 g/s and 1.1 g/s flow rates respectively for carrier gas and plasma gas, and 2.2 kg/h powder discharge.
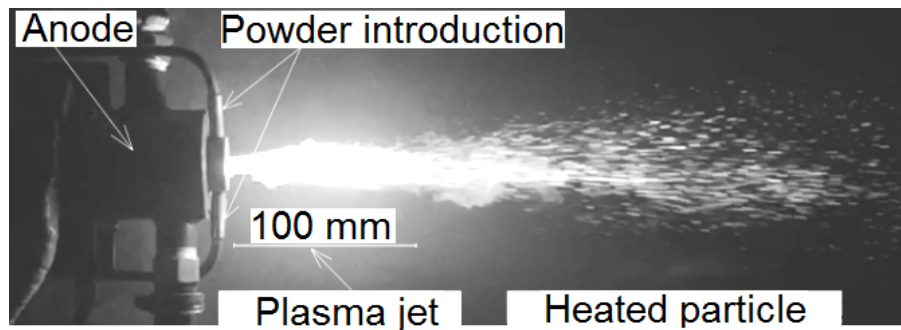
Figure 1. Photograph of powder agglomeration plasma treatment

Table 1 summarizes thermal parameters of the experimental plasma generator at carrier and plasma gas rates of 0.4 g/s and 1.1 g/s, respectively. During measurements the powder was not supplied to the plasma generator.

TABLE 1. Thermal parameters of experimental plasma generator

N	Current I, A	Voltage U, V	Power, kW	Efficiency η, %	Bulk enthalpy H_g, kJ/kg	Bulk temperature T_g, K	Flow rate u_g, m/s
1	200	97	19.4	61.4	24131.9	6100	424
2	250	94	23.5	63.1	29936.8	6700	515
3	300	90	27.0	65.6	35739.3	7300	627

According to calorimetric measurements, the specific bulk enthalpy H_g of the plasma jet at a nozzle section of the plasma generator varied from 24131 to 35739 kJ/kg that matched the bulk temperature T_g of 6100, 6700 and 7300 K.

A study of the heating and melting processes of oxide systems should begin with the analysis of phase transformations and changes in thermal parameters of condensed phase during the heating process. In the mathematical problem formulation, an assumption of a uniform or

gradientless heat transfer is usually employed. This is however unreasonable when considering particles of oxide materials having a low thermal conductivity, porous in particular. For spherical particles, in the conditions of convective heat transfer to gas flow, this assumption is true at the Biot number of $\sim\lambda_{gas}/\lambda_p \ll 1$. Hence, for solving the heat-transfer equation, there is no need to calculate the temperature distribution at every instant using the particle volume. It is appropriate to take bulk temperature of the particle. However, the Biot number for ceramic particle is ~1 that results in a higher surface temperature and a decrease in the heated gas flow [3].

In order to conduct the assessments efficiently, let us analyze thermal parameters of silicon dioxide with regard to the initial porosity of particles. Thermal conductivity is determined by the Maxwell's and Aiken relation [4]. The density of porous particles can be obtained from $\rho_p = \rho_m(1-P)$, where ρ_p is the density of porous particle, ρ_m is the density of particle material, P is the porosity. Table 2 contains thermal parameters of SiO$_2$ particles during phase transformations. In brackets we give values for obtained particles with 40 % porosity.

TABLE 2. Thermal parameters of SiO$_2$ particles during phase transformations

Modifications	Thermal stability T, K	Density ρ, kg/m^3	Specific heat c, J/kg	Thermal conductivity λ, W/m·K
β-quartz	300÷846	2650 (1590)	714.5→1109.9 (830.7→1067.9)	14.3→8 (7.2→4.0)
α- quartz	846÷1043	2530 (1518)	1109.9→1139.5 (1067.9→1085.7)	8→7 (4.0→3.5)
α-tridymite	1043÷1743	2220 (1332)	1139.5→1244.4 (1085.7→1148.6)	7→7 (3.5→3.5)
α-cristobalite	1743÷1993	2190 (1314)	1244.4→1281.9 (1148.6→1171.1)	7→7 (3.5→3.5)

As can be seen from Table 2, thermal parameters of SiO$_2$ particles change during phase transformations. The density and thermal conductivity of condensed phase show 17.3 % and 48.9 % decrease, respectively. The specific heat increases by 39%. Therefore, if phase transformations are neglected, the numerical values of the motion and heating dynamics of agglomerated particles can be overestimated.

Figure 2 presents scanning electron microscopy (SEM) observations of the individual powder particle and obtained microspheres. According to this figure, the agglomerated particle

represents a coalescence of heterodisperse particles. The shape of the agglomerated particle is considered to be oval.
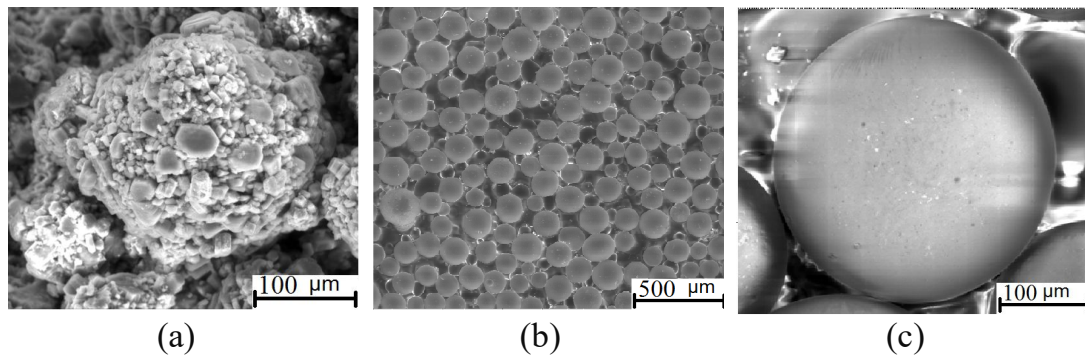

<center>(a)   (b)   (c)</center>

Figure 2. SEM images of agglomerated particles:
a – powder; *b, c* – microspheres

The formation of hollow, spherical particles from agglomerated particles in the plasma flow depends on many factors. Thus, the particle size, the thickness of their surface layer, and the structure and phase composition of this layer depend on balance forces acting on the particle from inside and outside. Balance forces include the gas pressure inside particle, the surface tension, and the external pressure. The first important point is that the outer diameter of initial particles approaches to that of obtained hollow microspheres [5, 6]. This fact is supported by SEM images presented in Figure 2. As can be seen, the size of particles before and after the plasma treatment is almost similar. Micron-sized additional particles form on the surface of the hollow particles due to the disintegration of agglomerates during their travel in the dusty plasma flow.

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SECTION II. Biological sciences

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DEVELOPMENT OF BIOSENSOR FOR DETECTION OF PHENYLACETIC ACID HERBAL PHYTOHORMONE

Preparations based on auxins are in demand in agriculture (growth regulators) and in plant cell engineering. One of auxin-like phytohormones, produced in large amounts by bacteria – plant symbionts, is phenylacetic acid (PAA) that presents itself as potentially environmentally friendly analogue of widely used chemical auxins. Our research is devoted to development of biosensor system for determination of PAA concentration. Development of biosensors for detection of herbal hormones, in particular PAA, is absolutely necessary for high-throughput screening of microorganisms able to synthesize auxins and excrete them into the environment.

The biosensor system for quantitative analysis of PAA is based on operon hpaBC (PAA hydrolase operon) and the sensitive element – HpaA from *E. coli* BL21 (DE3). *HpaA* is a transcription factor which induces promoter PhpaBC after being binded to phenylacetic acid and the genes controlled by promoter PhpaBC [1, 2].

Material and methods: In the research the following strains were used: *E. coli* BL21 (DE3), *E. coli* MG 1655 and plasmid pAc-*gfp*1 (Clonetech), containing gene *gfp1* (of green fluorescent protein) and ampicillin resistance gene –*amp*. The strains were cultivated in the known media: LB (10 g/l of NaCl, 5 g/l of yeast extract, 10 g/l of tryptone) and LA (10 g/l of NaCl, 5 g/l of yeast extract, 10 g/l of tryptone, 15 g/l of agar-agar).

Results: using PCR the construct P*hpaA*-*hpaA*-P*hpaBC* was developed using primers (Pr 2 and Pr 3, table 1) and the matrix (*E. coli* BL21 (DE3)). Then, restriction of the obtained fragment P*hpaA*-*hpaA*-P*hpaBC* and plasmid *pAc-gfp1* was carried out based on restriction sites *Pst*I (Thermo Scientific, 10 U/mcl), *Nco*I (Thermo Scientific, 10 U/mcl).

After that, the obtained fragment *Pst*I-P*hpaA*-*hpaA*-P*hpaBC* –*Nco*I was ligated with the linearized vector *Pst*I-pAc-*gfp1*-*Nco*I with formation of vector pAc-P*hpaA*-*hpaA*-P*hpaBC* –*gfp1*. Using the obtained ligase mixture the competent cells *E. coli* MG1655 were transformed. Fragment P*hpaA*-*hpaA*-P*hpaBC*-*gfp1* was tested in the transformed cells *E. coli* MG1655 by PCR, using the primer, annealing at the plasmid and the primer, annealing at the fragment P*hpaA*-*hpaA*-P*hpaBC* –*gfp*1 (Pr 1 and Pr 3, table 1), visualizing the result with the aid of electrophoresis. Finally, transformant MG1655, containing plasmid pAc-P*hpaA*-*hpaA*-P*hpaBC* –*gfp1* was selected.

During the research the plasmid pAc-*gfp*1(Clonetech) was integrated by the sensitive element P*hpaA*-*hpaA*-P*hpaBC* with the chromosome of strain *E. coli* BL21 (DE3) acting as its donor. Thus, using the genetic engineering methods we obtained the plasmid pAc-P*hpaA*-*hpaA*-P*hpaBC*-*gfp1*, containing a reporter gene *gfp1*controlled by the promoter P*hpaBC*, which is activated by the transcription factor HpaA in response to PAA present in the medium.

For determination of the minimum detected concentration and the biosensor linearity range the strain MG1655 containing plasmid pAc-P*hpaA*-*hpaA*-P*hpaBC* –*gfp1* as well as the reference strains (MG1655 and MG1655, containing plasmid pAc-*gfp1* with no regulatory element) were cultivated in the medium with various concentrations of PAA and then the correlation between the PAA concentration and the fluorescence values was estimated.

Conclusion: Thus, the biosensor system for detection of phenylacetic acid based on the strain MG1655 pAc-P*hpaA*-*hpaA*-P*hpaBC* –*gfp1*was developed. Its efficiency was confirmed. The minimum detected concentration was determined and the linearity range was estimated at 0,1- 0,5 g/l of PAA (Fig.1).

Table 1. Primers used in this work

Pr$_1$	5'- CAGGAAACAGCTATGAC-3'
Pr$_2$	5'- CAAGCTGACCCTGAAGTTCA -3'
Pr$_3$	5'- TGGACAGGTAGTGGTTATCG -3'

Fig. 1. Fluorescence intensity of *E. coli* strain containing P*hpaA*-*hpaA*-P*hpaBC*-*gfp1* sensitive element in response to PAA addition to the culture medium. Experimental procedure: the cells were cultivated for 5 h in LB medium; after that 100 mkl of each culture were inoculated into 1 ml fresh LB medium supplemented with PAA and cultivated overnight over night (30oC, 1000 rpm) on the TAITEC Bioshaker M BR – 024 (Alkali Scientific, USA). 1 ml of cells was centrifuged, washed with 0.9% NaCl and resuspended in 200 mkl of the same solution. Fluorescence was measured in Greiner Bio-One 96-Well Flat Black plates at Ex/Em= 475 nm/ 505 nm by the Tecan Infinite M 200 Microplate Reader (Austria). A.u. (arbitrary units) means GFP fluorescence level at Ex/Em= 475 nm/ 505 nm normalized to biomass (OD*600*).

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ANALYSIS OF PSYCHROPHILIC MICROBIOTA OF LAKE BAIKAL SEDIMENTS[1]

Discovering new antimicrobial agents with a broad spectrum of action and a lower level of microbial resistance has both, scientific and practical value. For the last several decades the attention of researchers has been paid to antimicrobial peptides – bacteriocins which are produced predominantly by gram-positive bacteria [1, 2].

The advanced source of antibiotic microorganisms may be presented by lake sediments. Lake Baikal, the age of which is rated 20-30 million years, is a unique ecological niche [3, 4].

Sediments of lake Baikal, picked out within the coastline (town Slyudyanka, settlements Listvyanka and Kultuk) in May-June of 2018, served as the material for obtaining pure culture of extremophilic (psychrophilic) microorganisms. As a result of the research 7 isolates different in morphological properties were obtained (table 1). The temperature of all the sediment samples during the sample collection amounted to $4.0 \pm 0.5°C$.

Table 1 shows that six of 7 picked isolates are rod-shaped bacteria (bacilli) and one isolate is of spherical shape (cocci). Among rod-shaped bacteria there are both, gram-positive (isolate 1) and gram-negative (isolates 2, 3, 4, 6, 7) forms.

Table 1 – Culture and morphological properties of isolates obtained from lake Baikal sediments

Number of isolate	Colonial morphology	Microscopic properties
No.1	Colonies are flat, rough, varying from white to yellow colour, with a diameter from 2 to 5 mm.	Gram-positive spore-forming bacilli 0.5-1.5 micrometers in size, round-ended. Located solo or paired up, sometimes they form chains. The hanging drop method shows the mobility of cells.
No.2	Colonies are flat, convex, with a diameter of 1.5-3.0 mm, smoke-grey-coloured.	Gram-negative bacilli with polar flagella, not spore-forming. The hanging drop method shows the mobility of cells.
No.3	Colonies are round, flat, smooth, with a diameter from 2 to 3 mm, white, with irregular edges.	Gram-negative bacilli (straight or curved), do not form spores. The hanging drop method shows the mobility of cells.
No.4	Colonies are convex, irregular-shaped, beige.	Gram-negative bacilli (straight or slightly curved), do not form spores. The hanging drop method shows the mobility of cells.
No.5	Colonies are rounded, shining, smooth, opaque, yellow-coloured.	Gram-positive bacteria, of spherical shape, located in pairs or chains, do not form spores.
No.6	Colonies are smooth, with even edges, convex, of even consistency, with a diameter of 5 mm, cream-white.	Gram-negative bacilli. The hanging drop method shows the mobility of cells.
No.7	Colonies are round, small, shining, with even edges, colourless.	Gram-negative, thick, straight bacilli, located in pars or chains, do not form spores or flagella.

The simplicity of microorganisms' external form and their simple cell composition makes it difficult to classify them according to morphological properties. In this regard all the additional information on belonging of microorganisms, obtained from lake Baikal sediments, to a certain type was received by the molecular typing method using RAPD (analysis of polymorphism of amplified DNA fragments). Primer Lmbd – GGGCGCTG was used as the primer.

The electrophoregram of DNA fragments obtained by the RAPD-PCR method using the primer Lmbd is presented in figure 1.

The data shown in figure 1 indicate that using primer Lmbd led to formation of a great number of fragments with a size from 200 to 5000 bps. Figure 1 shows that PCR-electrophoregram of different bacteria strains vary in quantity and shape that helps to make a definite conclusion that the microorganisms under study belong to different types.
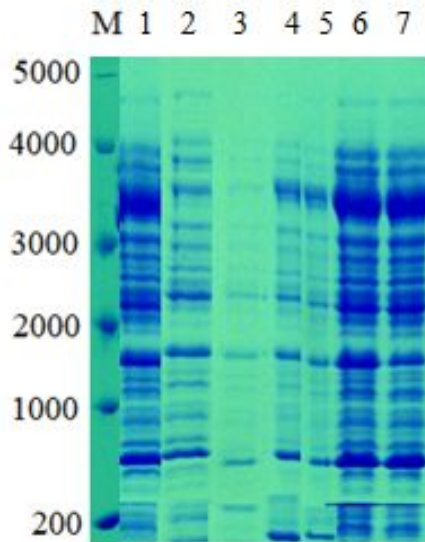
Figure 1 – Electrophoregram of DNA fragments obtained using the RAPD-PCR method: M – marker GeneRuler DNA Ladder Mix; 1 – *Bacillus megaterium* (isolate 1), 2 – *Pseudomonas fluorescens* (isolate 2), 3 – *Pseudomonas putida* (isolate 3), 4 – *Pseudomonas aeruginosa* (isolate 4), 5 – *Micrococcus luteus* (isolate 5), 6 – *Pseudomonas oleovorans* (isolate 6), 7 – *Acinetobacter calcoaceticus* (isolate 7)

Based on the analysis of figure 1 a conclusion was made regarding the type of the microorganisms obtained from lake Baikal sediments: isolate 1 – *Bacillus megaterium*, isolate 2 – *Pseudomonas fluorescens*, isolate 3 – *Pseudomonas putida*, isolate 4 – *Pseudomonas aeruginosa*, isolate 5 – *Micrococcus luteus*, isolate 6 – *Pseudomonas oleovorans*, isolate 7 – *Acinetobacter calcoaceticus*.

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SECTION III. Earth Science

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OPTIONS FOR DESIGNING EXTENDED OBJECTS

Abstract. The article introduces the methods of designing linear structures, roadways in particular. It gives description of two roadway design methods: using topographic maps and using the data of airborne laser scanning.

Key words: airborne laser scanning, roadway design, linear structures, design stages, estimate of accuracy of measurement

Nowadays the development of software products made it much easier, faster and cheaper to design roadways and it also computerized the process. However, computer-aided roadway design requires qualitative coordinate basis that meets the all the requirements, and an accurate digital terrain model (DTM).

The following conventional variant of building a DTM has become widespread:

1. Selection of a topographic map or using the data of Earth remote sensing (ERS) at the required scale [1] for a particular type of work;

2. Computer-aided digitizing of the contours and marks in the software product Easy Trace or in a similar software product (SP);

3. Contour adjustment in the software product MapInfo or in a similar software product;

4. Building a DTM in the software product AutoCad Civil 3 D (Figure 1, 2).

The drawbacks of this option are:

- the duration of works when building a DTM;

- substantial amount of cartographic data to process;

- low level of computerization, high level of manual data processing.

This approach may be compared to a modern one which involves building a coordinate basis and building a DTM according to the data of airborne laser scanning (ALS).
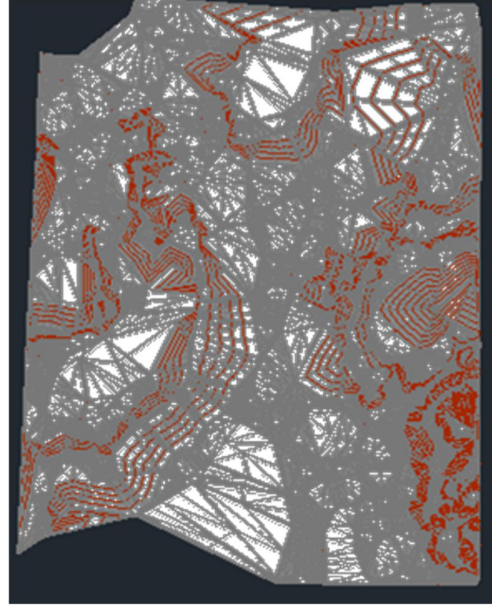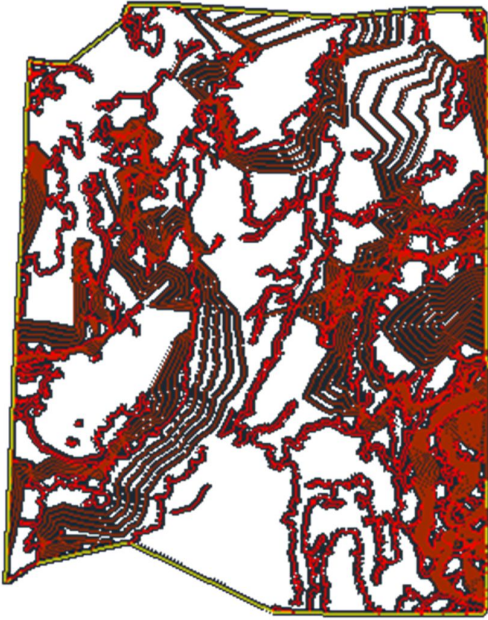
Figure 1 – a DTM built in AutoCad Civil 3 D

Figure 2 – a DTM built based on the surface TIN in AutoCad Civil 3 D

The following steps should be carried out:

1. To select the "clean ground" out of the points of laser reflections (PLR). It may be performed in such program software as TerraScan, TerraMath, TerraPhoto;

2. To filter noisy and error points [2];

3. To build contours based on the surface (figure 3)
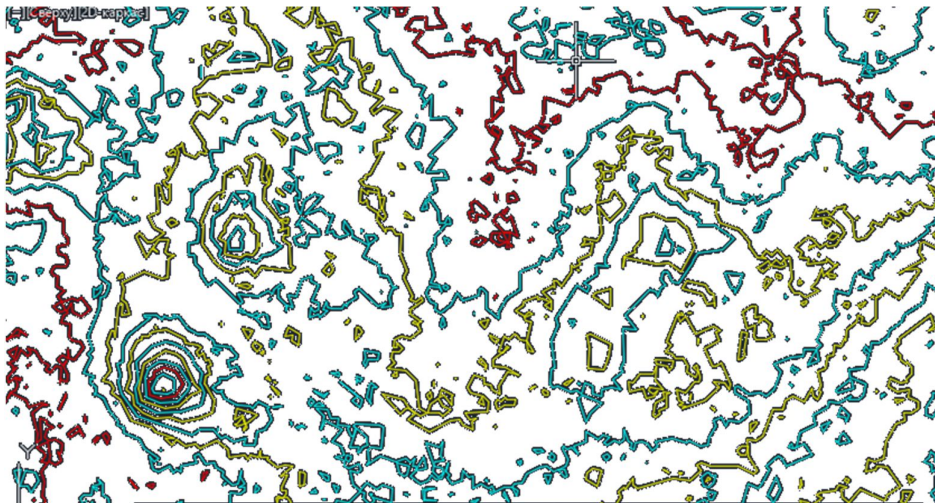
Figure 3 - Contours built based on the terrain surface in TIN format

4. To build a cartographic base in the software product AutoCad Civil 3 D (figure 4).
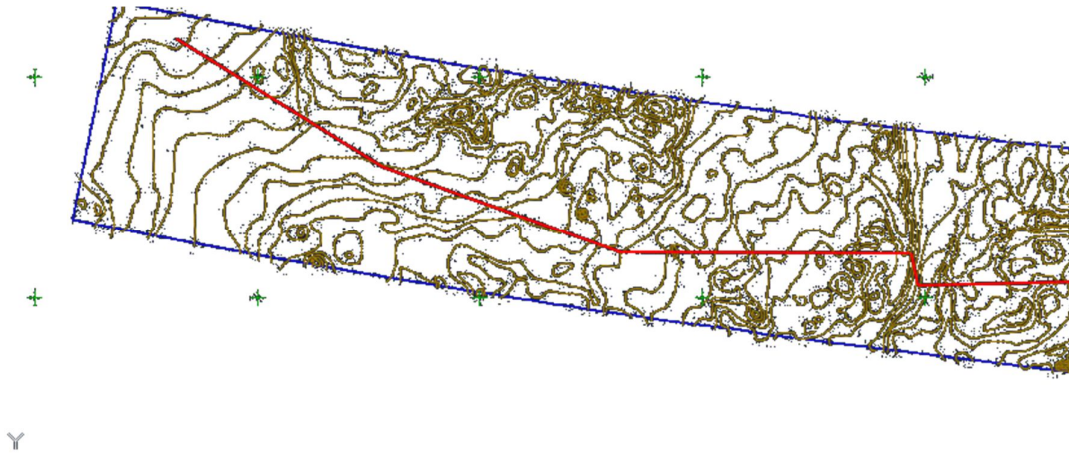
Figure 4 – Cartographic base in AutoCad Civil 3D

At this stage the geodetic support is completed.

The next stage will be the automatic railroad design based on the digital terrain model created in the software product AutoCad Civil 3D, building profiles, estimating the scope of ground works and other activities.

Using airborne laser scanning leaves some questions to be answered:

1. Scanning of complex areas (bridge crossings, interchanges, complex drainage segments). Complex areas are scanned at scale 1:500 or 1:200. Here arises the question whether laser scanning provides accuracy at scale 1:500 or 1:200. In order to provide such accuracy tacheometric survey is used.

2. The accuracy of the obtained data is affected by different factors which depend on the measuring equipment and conditions as well as on their processing. First of the steps that needs to be performed is to evaluate the coverage of the surveying area by scans and photoprints. Then adjustment of the scanning data should be carried out.

The advantages of this method are: the amount of time spent for building a DTM and processing the ALS data considerably shortens; high validity of the obtained results.

Based on the aforesaid the following conclusion may be drawn:

Using ALS gives an opportunity to improve the promptness of making decisions regarding efficient design of linear objects (roadways) and remove labour-consuming geodetic surface works on area plan forming. At the same time, the crucial task is to determine the methods of controlling the accuracy and quality of the scanning data [3].

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THE DETERMINATION OF OPTIMAL PARAMETERS OF STOPES DURING THE MINING OF SOFT ORES

Introduction

Properties of rocks in the massif due to its complexity and fracturing in different directions are different, they vary in time (rheological changes) and according to the nature of the applied loads. The massif load is determined by natural factors (the dead load of the rocks, the pressure water, the swelling of rocks, etc.) and technological impacts (additional load of equipment, blasting and other works). Mine workings are affected by the forces arising from the upset of the isostatic balance in the rock massif caused by the creation of an artificial hollow in it. They appear as the rock pressure. All of that creates a number of problems that require an innovative approach and solutions.

Among the main problems associated with the maintenance of mine workings in the mining of ore bodies, there are dynamic manifestations of rock pressure, rock bumps (micro-bumps, etc.), leading to a sharp sudden collapse of the roof and sides of the workings.

In mining practice, there is experience in implementing various ways to increase the bearing capacity of unstable rocks. But to solve the problems it is necessary to carefully study and conduct a comprehensive study of the stability of rocks.

Method

In this article, we will present the evaluation of the stability by the Matthews–Potvin method for chamber systems with sublevel breaking and the subsequent filling.

The method is based on calculation of two parameters: resistance index N and the shape factor S. The resistance index N characterizes the geological conditions and spatial orientation of the stope, it includes: rating characteristics of rock fracturing RQD; parameters which take into account the number of crack systems, the shape and roughness of the cracks, the changes of cracks, J_n, J_r, J_a respectively; the factors A, B, C, which take into account the stress-strain state of the massif, the orientation of fractures and slope exposure respectively. It is calculated by the following formula:

$$N = \frac{RQD}{J_n} \cdot \frac{J_r}{J_a} \cdot A \cdot B \cdot C$$

The form factor is an expression of geometrical parameters of a separate surface of the stope (roof, hanging wall, bottom wall, sides). It is calculated as the ratio of the surface area to its perimeter.

The Matthews–Potvin graph (figure 1) is divided into three areas: stable, unstable, and collapsible. The criteria for matching the areas are as follows:

Stable (in figure 1, the points displayed as a black square and above the green line) is considered to be an unfixed stoping zone with a probability of stability >60% and a probability of instability <40%. The possibility of collapse is excluded.

Unstable (in figure 1 the points displayed as a transparent triangle between the red and green lines) is considered to be an unfixed stoping zone with a probability of stability within 8≥60%, a probability of instability 40≤46%, a probability of collapse 0≤46%. In figure 1, the points are displayed as a black square and above the green line.

The unfixed stoping zone is considered collapsible (in figure 1 the points displayed as a black circle and below the red line) if the probability of stability is ≤8%, the probability of instability is ≥46% and the probability of collapse is ≥46%. The stability of working is excluded.

This evaluation system was carried out in a number of leading gold mining companies in Russia.
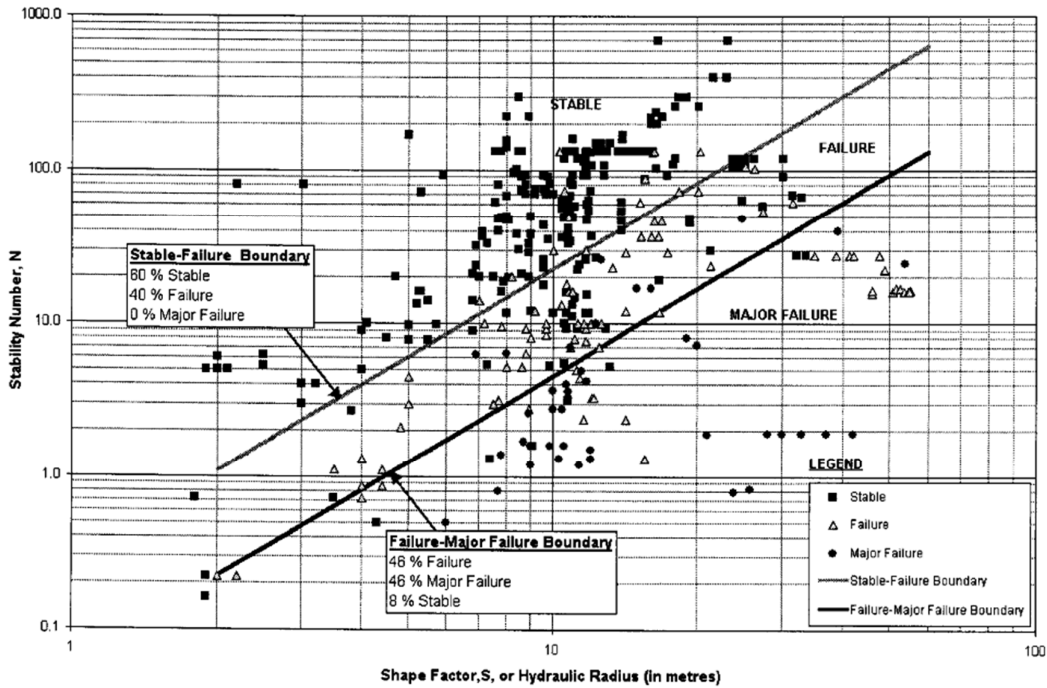
Figure 1. The Matthews–Potvin graph of stability based on linear regression

The order of evaluation:
1. Establish the maximum span of the chamber along the strike.

$$b_{\text{пр}} = \sqrt{\frac{2m\sigma_{\text{p}}}{\gamma}}$$

Setting the maximum span of the camera to the dip.

$$a_{\text{пр}} = \varepsilon\sqrt{\frac{m^2}{4} \cdot \text{tg}^2\,\alpha + \frac{2m\sigma_{\text{p}}}{\gamma\cos\alpha}} - \frac{m}{2} \cdot \text{tg}\,\alpha$$

m – power
γ – dead load
α – angle of incidence of the hanging wall
2. Establish the span equivalent. (The span equivalent can be defined for the chamber, stoped-out area, filled stope, collapse zone).

$$L_{\text{э}} = \frac{a \cdot b}{a + b}$$

• If one size of the chamber (exposure) exceeds the second size in 2 or more times, the stability of the roof is determined by the smaller size of the chamber.

3.   Establish the hydraulic radius of the chambers.

• The chambers of different configurations have the same roof stability.

4. Calculate the Matthews–Potvin stability index.

$$N = \frac{RQD}{J_n} \cdot \frac{J_r}{J_a} \cdot A \cdot B \cdot C$$

RQD (*Rock Quality Designation*) is an indicator of the quality of the massif on the core of geological exploration wells; the ratio of the total length of all pieces of core of more than 10 cm long to the total length of the core;

J_n – number of crack systems;

J_r – roughness of cracks;

J_a – adhesion of crack surfaces;

A – factor that takes into account the strength and stress state of rocks (Rock Stress/Strength)

B – factor that takes into account the orientation of cracks (faults);

C – factor that takes into account the angle of incidence (slope) of exposure.

Results

For mining the main part of the deposit in the project a chamber system of mining with backfilling the mined-out area was used.

As the evaluation of stability using the Matthews–Potvin method the following parameters of the basic stope are shown below: Inputs:

H, depth of location, 350 m

h, sublevel height 15 m

a, the span to the dip, 10 m

b, span along the strike, 12 m

α and β – angles of hanging and bottom walls, 45°

σc, strength limit on uniaxial compression of 60 MPa

K – factor of transition from vertical to horizontal stresses, 1.4

angle of incidence of the prevailing system of cracks, 45°

The stability assessment showed that the roof is collapsible and the hanging wall is unstable. Optimization of geometry with the existing mining system indicates a decrease in the span along the strike to 6 m, respectively, the standard chamber must be divided into two. At the same time, the optimization helps to minimize the risk of instability, but it does not exclude it completely. The recommended parameters are: the height of the sublevel is 15 m, the span to the dip is 10 m, the span along the strike is 6 m.

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**THE BENEFITS OF APPLYING LINEAR CONSTRAINTS
IN CONSTANT MODULUS NLMS ALGORITHM
FOR ADAPTIVE ANTENNA ARRAY IN MATLAB SIMULATION**

Abstract. This paper studies the benefits of applying linear constraints in digital adaptive antenna array based on constant modulus criterion. The three algorithms: linearly constrained normalized least mean squares adaptive arrays LC NLMS AA, constant modulus normalized least mean squares adaptive arrays CM NLMS AA and linearly constrained constant modulus normalized least mean squares adaptive arrays LC CM NLMS AA are presented and compared via MATLAB simulation. It is demonstrated, that LC CM NLMS AA is a simple way to overcome the problem of constant phase shift in the array output signal, caused by desired signal orientation and array weights.

Keywords: Adaptive array, adaptive beamforming, smart antenna, constant modulus, LC NLMS, CM(2,2) NLMS, LC CM(2,2) NLMS, linear constraints

1. INTRODUCTION

Today the adaptive antenna array is the superior to the performance of a switched-beam system and it improves many drawbacks that are found in switched-beam like its inability to place the desired signal at the maximum of the main lobe of its directional pattern and its inability to fully reject the interferences. The adaptive antenna array systems (AAAs) can track and locate the signals and dynamically adjust the antenna pattern to increase the desired signal while minimizing interference by using signal processing algorithms, because of its ability to control the overall receiving pattern.

Many adaptive beamforming algorithms are based on minimizing the error between a reference signal and the array output. The reference signal is typically a training sequence used to train the adaptive array or a desired signal based upon an a priori knowledge of nature of the arriving

signals. In the case where a reference signal is not available one must resort to an assortment of optimization techniques that are blind to the exact content of the incoming signals [7].

If the reference signal is not provided, then the linearly constrained (LC) adaptive algorithms could be used [11] or Constant Modulus (CM) criterion ones [8].

The blinding algorithms which are using linearly constrained adaptive algorithms or Constant Modulus (CM) criterion ones are sensitive to the interferences coherent with the desired signal [12].

An important problem in digital communications is the recovery of the data symbols transmitted through a distorting medium. The constant modulus (CM) criterion is the most widespread blind channel equalization principle [14, 15].

Some examples of CM signals are frequency and phase modulated signals ones: FM, PSK, FSK and QAM. This being the case, the amplitude of the signal should ideally be a constant. Thus the signal is said to have a constant magnitude or modulus [7].

It was shown in [13] that if the direction of the desired signal source is known, then the implementation of the linear constraints to CM adaptive algorithm allows Adaptive Array to operate efficiently, even in the presence of coherent interferences. In this case, the constraints keep the main lobe of directional pattern in the direction of the desired signal source during adaptation.

2. PROBLEM FORMULATION AND SOLUTION

This paper considers the implementation of linearly-constrained NLMS algorithms in Constant Modulus (CM) criterion Adaptive Arrays (AA).

CM criterion adaptive algorithms are used for processing of signals with constant modulus envelope [2]. CM criterion is formulated as [1-7]:

$$J(p,q) = E\left[\left||s^p - |y(k)|^p|\right|^q\right] \tag{1}$$

where p and q − parameters, which are used in the designation of CM-algorithms and their objective functions, the adaptive CM algorithms are denoted as CM(p,q); E[ ] − is averaging operation, and J indicates the objective function [8]; $s = |a_i| = \sqrt{a_i^* a_i} = const$ − the value of module information symbol, the superscript «*» means complex conjugation, The value of s is known in the receiver. $y(k) = \mathbf{h}_N^H(k)\mathbf{x}_N(k)$ − is the array output signal as shown in fig. 01; k − is the index of the iteration that is equal to the number of the processing symbol of the signal;

$\mathbf{x}_N(k) = [x_1(k),...,x_n(k),...,x_N(k)]^T$ − the input vector of the antenna array, which represents the space-time sampled signals; $\mathbf{h}_N(k) = [h_1(k),...,h_n(k),...,h_N(k)]^T$ − is the weight vector of antenna array; the superscripts T and H denote transposition and Hermitian transpose of a vector or a matrix. Vectors and matrices are denoted by bold lowercase and uppercase characters, respectively; the character N in subscripts indicates vector (N) or square matrix (N×N) dimensions. Here N is the number of antennas in AAA.
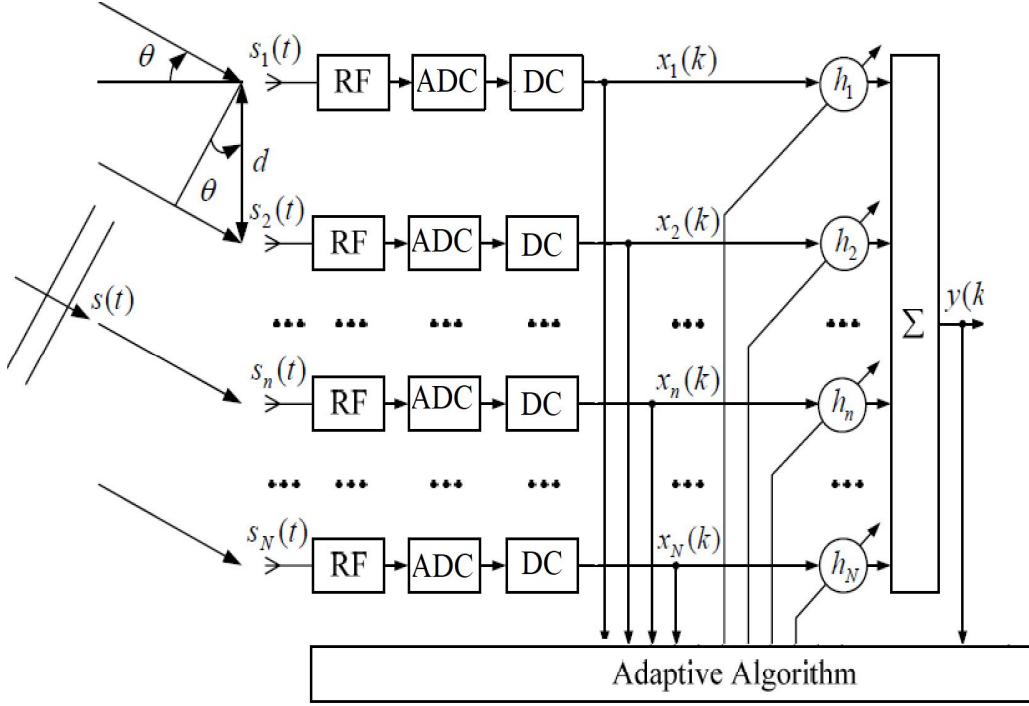
Fig 01. Adaptive array: RF is radiofrequency amplifier,
DC is down converter and ADC is analog to digital converter

In the work [9], it was shown that if $p = q = 2$, then the multi-extremal function (1) can be transformed into a quadratic unimodal function as following [1]:

$$J'(2,2) = E\left[\left|s^2 - \mathbf{h}_N^H(k)\mathbf{z}_N(k)\right|^2\right] , \qquad (2)$$

where

$$\mathbf{z}_N(k) = \mathbf{x}_N(k)\mathbf{x}_N^H(k)\mathbf{h}_N(k-1) = \mathbf{x}_N(k)y^*(k) . \qquad (3)$$

Using $\mathbf{z}_N(k)$ requires minimum arithmetic operations (2N multiplications and N additions) [2]. And the transient response of the adaptive algorithm is also minimal.

So to minimize the function (2), we can use some known modified adaptive algorithms, in which the desired signal is determined as $d(k) = s^2$, and the vector $\mathbf{z}_N(k)$ is used instead of the vector of input signals $\mathbf{x}_N(k)$.

Table 1 presents CM(2,2) NLMS AA algorithm [4].

Table 1. CM(2,2) NLMS AA algorithm

Initialization

$$\mathbf{X}_N(0) = \mathbf{0}_N \ , \ \mathbf{h}_N(0) = \left[1, \mathbf{0}_{N-1}^T\right]^T \tag{4}$$

Calculations

For $k = 1, 2, \ldots K$

$$\mathbf{z}_N(k) = \mathbf{x}_N(k)\mathbf{x}_N^H(k)\mathbf{h}_N(k-1) \tag{5}$$

$$\alpha_N(k) = s^2 - \mathbf{h}_N^H(k-1)\mathbf{z}_N(k) \tag{6}$$

$$\tilde{\alpha}_N(k) = \left[\mathbf{z}_N^H(k)\mathbf{z}_N(k) + \delta^2\right]^{-1}\alpha_N^*(k) \tag{7}$$

$$\mathbf{h}_N(k) = \mathbf{h}_N(k-1) + \mu\mathbf{z}_N(k)\tilde{\alpha}_N(k) \tag{8}$$

End for k

As the directional pattern of the antennas is assumed to be omnidirectional, $\mathbf{h}_N(0) = \left[1, \mathbf{0}_{N-1}^T\right]^T$ means that all the signals are received by antenna 1 at the beginning of the adaptation (in the first iteration).

3. LINEARLY-CONSTRAINED CM(2,2) NLMS

The goal of the linearly-constrained least square filtering is to minimize the energy of the errors $s^2 - \mathbf{h}_N^H(k)\mathbf{z}_N(k)$, i.e. to minimize the cost function (2) under the constraint :

$$\mathbf{C}_{NJ}^H\mathbf{h}_N(k) = \mathbf{f}_J \tag{9}$$

where $\mathbf{C}_{NJ} = \left[c_N^{(1)}, c_N^{(2)}, \ldots, c_N^{(j)}, \ldots, c_N^{(J)}\right]$ is the matrix of the vectors of the phases (vector of limitations) $\mathbf{c}_N^{(j)}$, and $\mathbf{f}_J$ is the vector of J linear constraints.

As shown in fig. 01 the plane wave $s(t)$ is received by adaptive array AA from the direction θ; the distance between the antennas in linear adaptive array is d, which is usually chosen as a half of the wave length λ of the carrier frequency f, i.e. $d = 0.5 \times \lambda = 0.5 \times v/f$, where v equals to the velocity of light.

The delay between the signals at the inputs, for example, the first and nth antennas, which, in the case of the same distance d between the antennas, in the linear array is defined as

$$\tau_n = d(n-1)\sin(\theta)/v . \tag{10}$$

The phase is defined as

$$\omega\tau_n = 2\pi d f (n-1)\sin(\theta)/v = 2\pi d(n-1)\sin(\theta)/\lambda = \psi_n. \qquad (11)$$

Based on these equations, the columns of the matrix $\mathbf{C}_{NJ}^H$ in the equation (9) are defined as:

$$\mathbf{C}_N^{(j)}(\theta) = \left[c_1(\theta_j),...,c_n(\theta_j),...,c_N(\theta_j)\right]^T = \left[e^{i\psi_1^j},...,e^{i\psi_n^j},...,e^{i\psi_N^j}\right]^T. \qquad (12)$$

Equation (9) means that $F(\theta_j) = \mathbf{c}_N^H(\theta_j)\mathbf{h}_N(k) = \mathbf{f}_j = \left|\mathbf{f}_j\right|e^{i\psi_i^j}$, i.e. $F(\theta_j)$ of adaptive array in the direction θ_j equals to the j-th element of the constraint vector $\mathbf{f}_j$. Since we are interested in receiving only one desired signal from the direction θ, so the constraint matrix becomes a vector $\mathbf{c}_N(\theta)$ and the vector of constraints becomes a scalar f.
The LC NLMS AA algorithm is shown in Table 2 [10].

Table 2. LC NLMS algorithm

Initialization

$$\mathbf{X}_N(0) = 0_N \;,\mathbf{Q}_N = \mathbf{c}_N\left(\mathbf{c}_N^H\mathbf{c}_N\right)^{-1}\;,\mathbf{h}_N(0) = \mathbf{Q}_N f \qquad (13)$$

Calculations

For $k = 1,2,...K$

$$\alpha(k) = d(k) - \mathbf{h}_N^H(k-1)\mathbf{x}_N(k) \qquad (14)$$

$$\tilde{\alpha}_N(k) = \alpha(k)\left[\mathbf{x}_N^H(k)\mathbf{x}_N(k) + \left\{\mathbf{x}_N^H(k)\mathbf{Q}_N\right\}\left\{\mathbf{c}_N^H\mathbf{x}_N(k)\right\} + \delta^2\right]^{-1} \qquad (15)$$

$$\mathbf{h}_N'(k) = \mathbf{h}_N(k-1) + \mu\mathbf{x}_N(k)\tilde{\alpha}^*(k) \qquad (16)$$

$$\mathbf{h}_N(k) = \mathbf{h}_N'(k) + \mathbf{Q}_N\left[f - \mathbf{c}_N^H\mathbf{h}_N'(k)\right] \qquad (17)$$

End for k

The LC CM(2,2) NLMS AA algorithm is shown in Table 3 [4].
Table 3. LC CM (2,2) NLMS AA algorithm

Initialization

$$\mathbf{x}_N(0) = \mathbf{0}_N \qquad (18)$$

where $\mathbf{x}_N(k) = \left[x_1(k),...,x_n(k),...,x_N(k)\right]^T$ − the input vector of antenna array, T − transpose operation of a vector or matrix

$$\mathbf{q}_N = \mathbf{c}_N\left(\mathbf{c}_N^H\mathbf{c}_N\right)^{-1} \qquad (19)$$

where $\mathbf{c}_N$ − vector of the limitations, H − operation of complex conjugation of a vector.

$$\mathbf{h}_N(0) = \mathbf{q}_N f \qquad (20)$$

where $\mathbf{h}_N(k) = [h_1(k), ..., h_n(k), ..., h_N(k)]^T$ − weight vector of antenna array, f − a real positive number equal to the desired value of the modulus of the radiation pattern in the direction of the source of the desired CM signal.

Calculations

For $k = 1, 2, ...K$

k − iteration number of the adaptive filtering algorithm, coinciding with the reference number of the processed signals.

$$\mathbf{z}_N(k) = \mathbf{x}_N(k)\mathbf{x}_N^H(k)\mathbf{h}_N(k-1), \tag{21}$$

$$\alpha_N(k) = s^2 - \mathbf{h}_N^H(k-1)\mathbf{z}_N(k), \tag{22}$$

where $\alpha_N(k)$ − error signal, $s = |a_i| = \sqrt{a_i^* a_i}$ − the value of the module of information symbols a_i, known at the receiving side;

$$\tilde{\alpha}_N(k) = \left[\mathbf{z}_N^H(k)\mathbf{z}_N(k) - \{\mathbf{z}_N^H(k)\mathbf{q}_N\}\{\mathbf{c}_N^H\mathbf{z}_N(k)\} + \delta^2\right]^{-1} \alpha_N^*(k) \tag{23}$$

where $\delta^2 \geq 0.01\sigma^2$ − used to regularize the division, σ^2 − dispersion (power) of noise in the channels [1] ,* − operation of complex conjugation by scalar variable.

$$\mathbf{h}'_N(k) = \mathbf{h}_N(k-1) + \mu\mathbf{z}_N(k)\tilde{\alpha}_N(k), \tag{24}$$

where μ − the step of convergence of gradient adaptive algorithms.

$$\mathbf{h}_N(k) = \mathbf{h}'_N(k) + \mathbf{q}_N\left[f - \mathbf{c}_N^H\mathbf{h}'_N(k)\right] \tag{25}$$

End for k

4. SIMULATION RESULTS

The efficiency of the proposed algorithms LC CM (2,2) NLMS is demonstrated via simulation. The desired signal is QPSK with $|a_i| = 1$. The desired signal direction is $\theta_S = 0°$, and the two interferences are placed at $\theta_{J_1} = 24°$ and $\theta_{J_2} = -30°$. Correlated interference J_1 is a copy of the desired signal S delayed by two information symbols, while the interference J_2 is simulated by white noise (as not CM criterion interference), the level of which is 30 dB higher than the desired signal. SNR in channel is −20 dB.

Algorithm parameters are: the number of the antennas in adaptive antenna array (AAA) − $N=8$, the initially regularization parameter $\delta^2=0.01$ and the step size scale for NLMS algorithm mu=0.0005. All computations were conducted in floating point arithmetic.

To provide the mentioned delay of correlated interference, the information symbol is sampled twice per duration. The number of iterations is $K=10^5$.

Three algorithms are considered: CM(2,2) NLMS AA algorithm, LC NLMS AA algorithm, and LC CM(2,2) NLMS AA algorithm.

The simulation results, Fig.2 – Fig.7, demonstrate the property of a linearly-constrained CM(2,2) NLMS algorithm comparing to linearly-constrained NLMS and CM(2,2) NLMS algorithms.
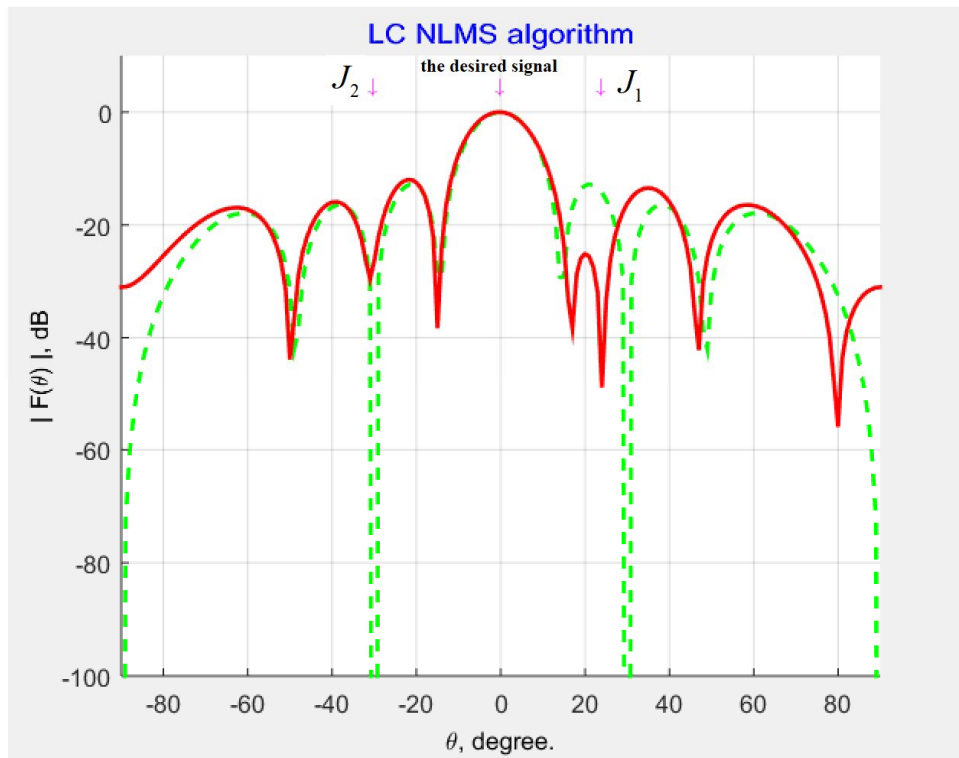
Fig.2. Directional pattern (simulation result):
linearly-constrained NLMS AA

Fig. 2 shows that a linearly-constrained NLMS algorithm provides the constraint $f = 1$ in the direction $\theta s=0°$ and suppresses correlated interference in the direction $\theta_{J_1} = 24°$. The suppressing of uncorrelated interference in the direction $\theta_{J_2} = -30°$ is insufficient. The final directional pattern is destroyed, and signal constellation at AAA output is destroyed as well, see Fig.3.
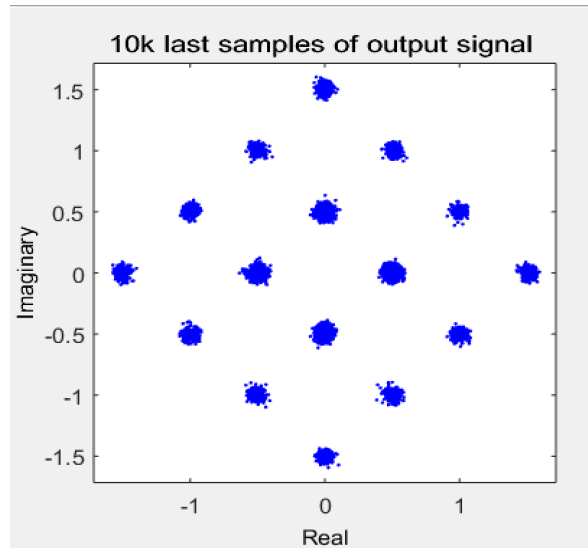
Fig. 3. Constellation of the received signal: linearly-constrained NLMS AA

CM(2,2) NLMS algorithm is demonstrated in Fig. 4, and it could be shown that this algorithm suppresses both interferences at $\theta_{J_1} = 24°$ and $\theta_{J_2} = -30°$. But during the adaptation process it could be noticed that the main lobe of directional pattern in the direction of the source $\theta s = 0°$ is more wide.
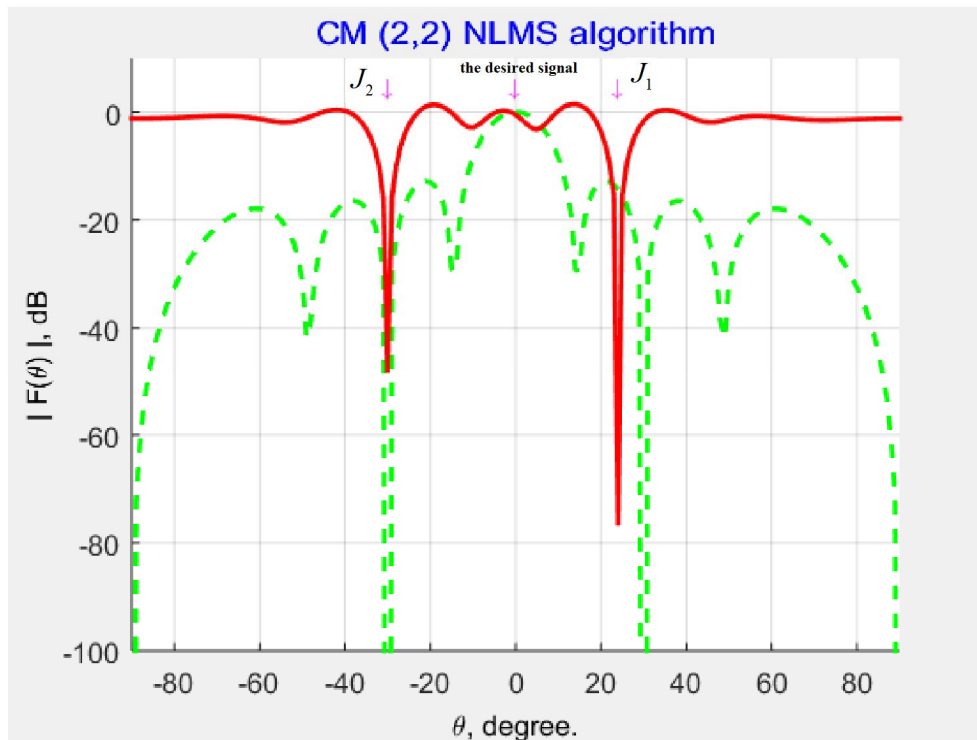
Fig.4. Directional pattern (simulation result): CM(2,2) NLMS AA

The constellation at CM(2,2) NLMS output has a fix phase shift $\varphi_s = arctg\dfrac{\text{Im}\left[F(\theta_s)\right]}{\text{Re}\left[F(\theta_s)\right]}$, as shown in Fig 5. The phase shift leads to wrong detection of information symbols and has to be removed [2]. The removing is usually done by an additional phase-locked loop [2, 8].
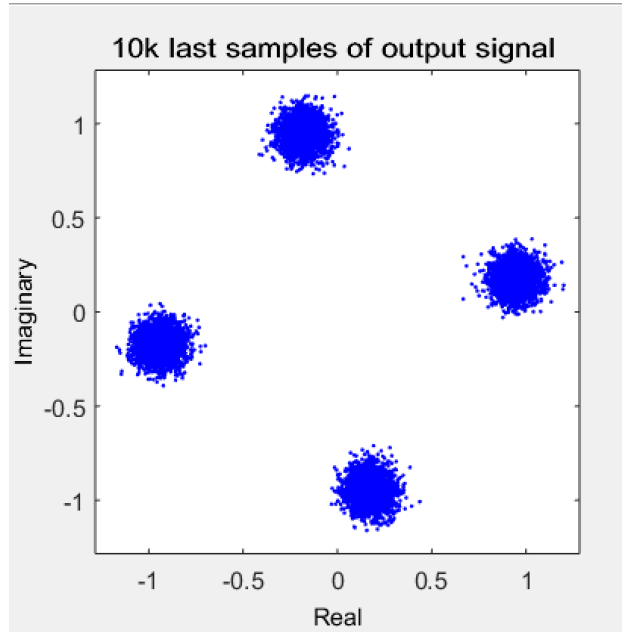
Fig. 5. Constellation of the received signal: CM(2,2) NLMS AA

By using linear constraints in CM(2,2) NLMS algorithm, it is possible to compensate the above mentioned phase shift in a simple way. It can be done if the constraint f is real-valued, i.e. $F(\theta_s) = \mathbf{h}_N^H \mathbf{c}_N(\theta_s) = |f_s|$.

Fig. 6 demonstrates the simulation results of LC CM(2,2) NLMS, and could show that if the desired signal direction θs is known, the linear constraint $f = |fs|$ ensures the required orientation of the directional pattern main lobe.

Fig. 7 shows the correct orientation of the LC CM(2,2) NLMS AA output constellation which coincides with the transmitted data alphabet.
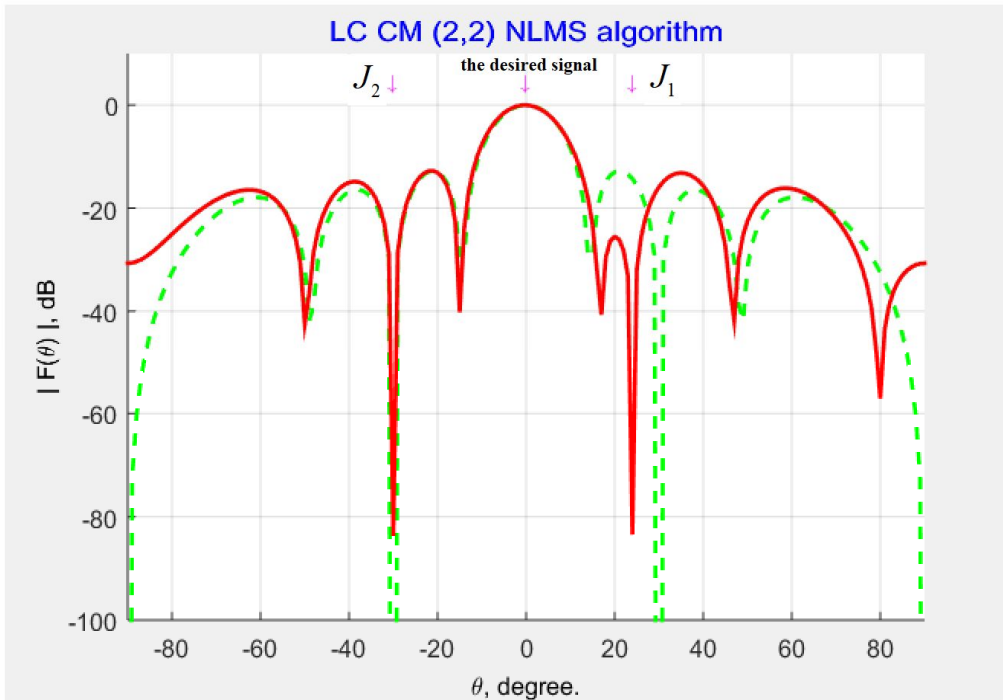
Fig. 6. Directional pattern (simulation result):
linearly-constrained CM(2,2) NLMS AA
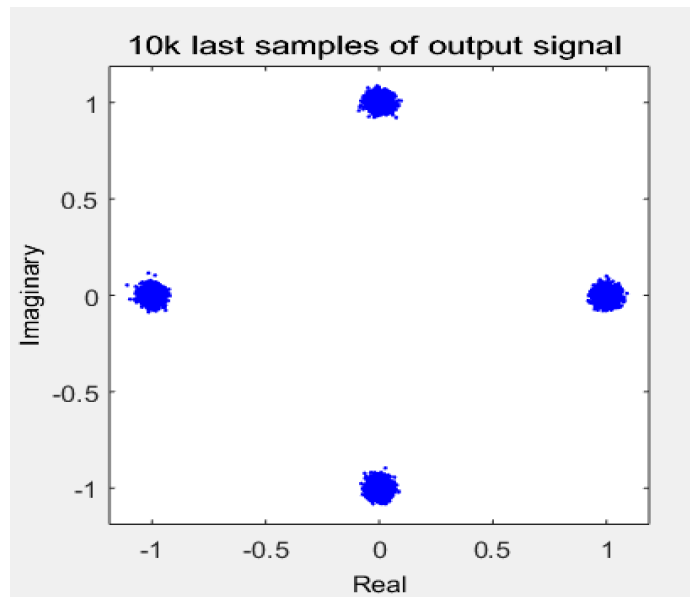
Fig. 7. Constellation of the received signal:
linearly-constrained CM(2,2) NLMS AA

5. CONCLUSION

This work studies the effects of applying linear constrains in constant modulus and least mean squares criteria AA, so three adaptive algorithms are considered: CM(2,2) NLMS, LC NLMS and LC CM(2,2) NLMS. The MATLAB simulation was used to compare the performance

of these algorithms, the simulation demonstrates the efficiency of the technology in adaptive antenna receiving a QPSK-4 modulated signals.

If the direction of the desired signal source is known, the implementation of a simple linear constraint to CM(2,2) NLMS allows to efficiently suppress white noise (here it is the type of incoherent interference) and coherent interferences, prevents the capture of coherent interferences and recompenses constant phase shift in AAA output signals.

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PIGMENTED YEASTS IN CANCER THERAPY[1]

Oncological diseases represent one of the main mortality causes on Earth [1]. The advanced enzyme preparation for cancer therapy is L-phenylalanine ammonia-lyase (PAL) [2, 3, 4].

The phylogenetic analysis of gene *pal* sequences of the examined pigmented yeasts strains and the reference strains of the genetic sequence database GenBank (table 1) was carried out.

After multiple sequence alignment (CLUSTAL Omega) and their editing (cutting the intron) the sequences were translated using the program BioEdit 7.0.0. For further analysis various amino acid substitution models were tested using the service ProTest 3.

For the yeast types under study the matrix of amino acid sequences identity was drawn (table 2).

Table 1 – Percent identity of nucleotide sequences of the gene *pal* fragment of chosen pigmented yeasts strains

Aureobasidium pullulans								
Candida glabrata	93							
Candida maltosa	96	93						
Cystofilobasidium capitatum	95	93	94					
Phaffia rhodozyma	76	80	78	77				
Rhodotorula glutinis	86	89	90	92	58			
Rhodotorula rubra	80	82	84	85	51	87		
Saccharomyces cerevisiae	91	94	91	95	74	91	86	
Tremella foliacea	95	92	94	95	76	93	87	95
	Aureobasidium pullulans	*Candida glabrata*	*Candida maltosa*	*Cystofilobasidium capitatum*	*Phaffia rhodozyma*	*Rhodotorula glutinis*	*Rhodotorula rubra*	*Saccharomyces cerevisiae* *Tremella foliacea*

Table 2 – Percent identity of amino acid sequences of the gene *pal* fragment of chosen pigmented yeasts strains

Aureobasidium pullulans								
Candida glabrata	86							
Candida maltosa	91	87						
Cystofilobasidium capitatum	88	82	89					
Phaffia rhodozyma	63	63	60	65				
Rhodotorula glutinis	91	85	91	93	53			
Rhodotorula rubra	87	81	87	88	60	100		
Saccharomyces cerevisiae	94	89	87	93	63	93	88	
Tremella foliacea	90	86	91	91	65	95	90	93
	Aureobasidium pullulans	*Candida glabrata*	*Candida maltosa*	*Cystofilobasidium capitatum*	*Phaffia rhodozyma*	*Rhodotorula glutinis*	*Rhodotorula rubra*	*Saccharomyces cerevisiae*	*Tremella foliacea*

Tables 1-2 show that the percent identity of nucleotide and amino acid sequences for certain types of yeasts is rather high and amounts to 93-100%. Thus, the phylogenetic analysis showed the belonging of the examined gene to the *pal* family and it also helped to evaluate the similarity of these sequences.

The essential property of pigmented yeasts regarding the perspectives of obtaining gene *pal* from them is the L-phenylalanine ammonia-lyase activity, the determination of which is shown in Table 3.

Table 3 – L-phenylalanine ammonia-lyase activity of pigmented yeasts chosen for the research

Strain	L-phenylalanine ammonia-lyase activity, U/mg protein
Aureobasidium pullulans Y863	0,042±0,002
Candida glabrata Y2813	0,0050±0,0003
Candida maltosa Y242	0,0140±0,0007
Cystofilobasidium capitatum Y1573	0,0090±0,0005
Phaffia rhodozyma Y1668	0,0100±0,0005
Rhodotorula glutinis Y77	0,0070±0,0004
Rhodotorula rubra Y1193	0,0170±0,0009
Saccharomyces cerevisiae Y1127	0,0180±0,0009
Tremella foliacea Y1624	0,020±0,001

Based on the data provided in table 3 it was concluded that the maximum L-phenylalanine ammonia-lyase activity is found in pigmented yeasts strains *Aureobasidium pullulans* Y863 (activity of PAL 0,042 U/mg protein), *Tremella foliacea* Y1624 (activity of PAL 0,020 U/mg protein), *Saccharomyces cerevisiae* Y1127 (activity of PAL 0,018 U/mg protein), *Rhodotorula rubra* Y1193 (activity of PAL 0,017 U/mg protein) and *Candida maltosa* Y242 (activity of PAL 0,014 U/mg protein). In this regard the strain *Aureobasidium pullulans* Y863 was chosen for further research.

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RESEARCH OF THE EFFECT OF PARAMETERS OF SODA TREATMENT OF NEPHELINE SLUDGE ON THE DEGREE OF THE BELIT CONVERSION[1]

Modern chemical and metallurgical industry is characterized by the application of technologies helping to recover a significant quantity of valuable constituents during the natural and mad-made raw material processing. Meanwhile, poor-value impurity constituents and mineral impurities are accumulated in sludges and slags in their original or chemically changed form with further storage in particular accumulators. Currently, these processes are becoming a global severe challenge and getting in a way of an opportunity to use mine-run and low-grade raw material. The problem is particularly acute for aluminum-bearing raw material. For instance, during nepheline processing using the sintering technique the waste sludges amount to 12 and more tons per a ton of alumina depending on the quality of the starting raw material [1]. In certain cases in building and binding material processing the sludges may

be subject to recovery, but at this time it brings the substantial rise in the total quantity of by-products which are not in demand in such volume. Nepheline sludge due to its chemical and mineralogical composition is of particular interest acting as the raw material for manufacturing products of extensive practical use [2, 3]. Moreover, the substantial significance in its efficiency improvement falls on conversion processes based on thermodynamic instability of calcareous compounds. Further, multiphase systems and multistage processes significantly complicate determination of efficient processing regimes and require system scientific research.

Nepheline sludge decomposition by soda liquors may be characterized by the following stoichiometric relationships which depend on the pH-value of the liquors in use:

$$2CaO \cdot SiO_2 + 2Na_2CO_3 = 2CaCO_3 + Na_4SiO_4,$$
$$2CaO \cdot SiO_2 + 2Na_2CO_3 + H_2O = 2CaCO_3 + Na_2SiO_3 + 2NaOH.$$
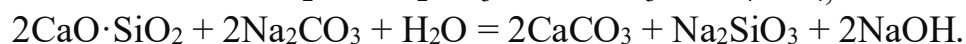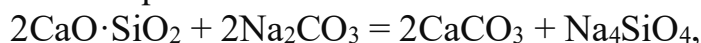
These differences in stoichiometry are related to the correlation between the ortho- and metasilicic acid stability and the medium acidity [4].

Main parameters of nepheline sludge soda conversion was carried out in laboratory conditions using the industrial sample of nepheline sludge of average composition and synthetic soda solutions according to the experiment chart expressed in Figure 1. All the research was performed using the one-pot system AutoLab, Figure 2.
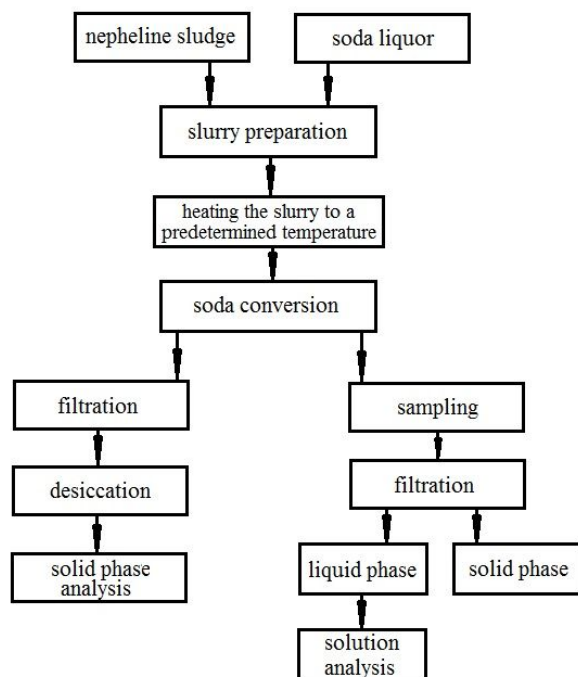
Figure 1 - Experiment chart on nepheline sludge soda conversion

Figure 2 – One-pot system AutoLab

The experimental studies on nepheline sludge soda hydrochemical treatment were carried out at the initial in-pulp liquid-solid ratio of 10:1, the temperature of the process within the range of 50-95 °C and the soda solution concentration of 52,2-233,8 g/l. Sample collection was performed throughout the experiment that allowed to study the process kinetics. Graphic processing of the obtained data on the belit conversion level is shown in Figures 3 and 4.
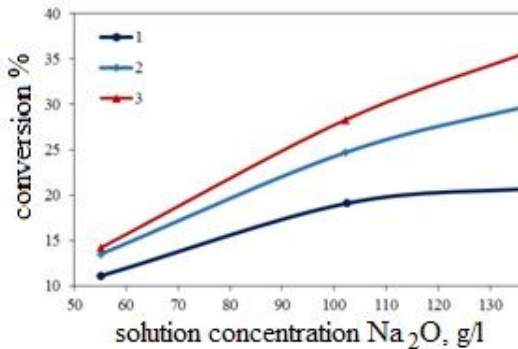
Figure 3 - Effect of soda solution concentration on the process of sludge decomposition at different temperatures: 1 – 50 °C, 2 – 75 °C, 3 – 95 °C
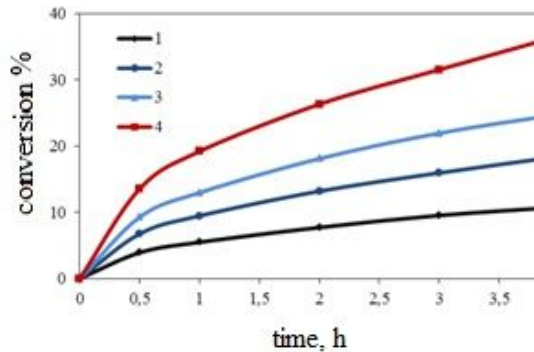
Figure 4 - Kinetics of nepheline sludge soda conversion at the concentration of Na_2CO_3: 1 – 52,5 g/l – 110,3 g/l; 3 – 187,1 g/l; 4 – 233,8 g/l

To intensify the belite decomposition process and ascertain the effect of the nepheline sludge treatment frequency the experiments on the successive decomposition of one particular nepheline sludge charge by fresh batches of soda solution were carried out. The experiment was performed at the following parameters: soda solution concentration of 187,1 g/l, in-pulp liquid-solid ratio of 10 and the process temperature of 60 °C. The performance of the experiment took from 20 minutes to 2 hours. Graphic processing of the obtained three-stage decomposition process data are given in Figures 5 and 6.

The expressed data (Figures 5 and 6) show that the maximum level of belit conversion by fresh batches of soda solution is achieved at the first stage of treatment and decelerates stage by stage. The kinetic curves' rate in Figure 7 is same as in case of one-stage treatment, and it shows noticeable diffuse process retardation.
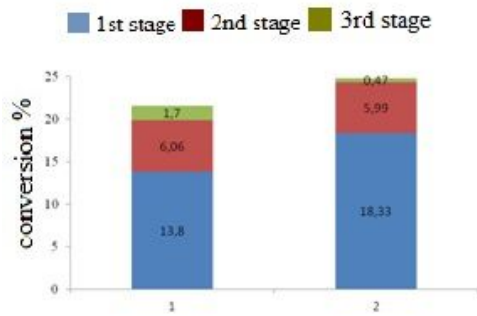
Figure 5 - Successive nepheline sludge treatment by fresh batches of soda solution, where: 1 – one-hour treatment, 2 – two-hour treatment
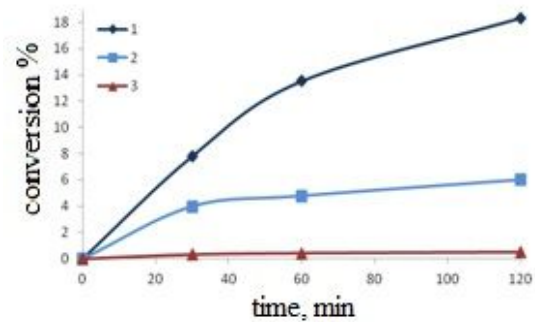
Figure 6 – Kinetics of three-stage nepheline sudge treatment ($\tau = 2$ h; l/s=10; t = 60 °C; [Na_2CO_3] = 187,1 g/l), where: 1 – first stage; 2 – second stage; 3 – third stage

The performed research has estimated that soda solution temperature and concentration are the factors that have a significant impact on the changes of phase and chemical constitution of products. Meanwhile, the kinetic curves' form shows considerable retardation of the conversion process due to diffuse resistance of the products passivating the nepheline sludge's surface. To overcome the resistance two different approaches may be applied: the first approach includes selection of the process running regime providing formation of porous structure of settlings, and the second approach deals with disintegration of passivating films. Being of scientific and practical interest both of these approaches require further experimental testing.

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DESIGNING LINEAR STRUCTURES BASED ON THE DATA OF EARTH REMOTE SENSING

Abstract. The article is devoted to the application of airborne laser scanning method for designing linear structures. It also introduces the techniques of its implementation and assessment of the quality of laser scanning results. The full-scale object being tested is presented as well.

Key words: airborne laser scanning, quality control, lidar survey, monitoring, observations, terrain model

Generally, the basis for the engineering and geodetic survey is presented by the cartographic data obtained by conventional geodetic surveys. Application of laser scanning will help to improve the promptness of making decisions regarding efficient design of linear objects and remove labour-consuming geodetic surface works on area plan forming.

It should be mentioned that the ALS method plays a special part in the comprehensive survey for designing linear structures (pipeline routes, traffic network, power transmission lines). Linear structures are frequently laid across underdeveloped hard-to-reach areas where surface methods of survey are extremely time-consuming and expensive [1].

The crucial task is to determine the methods of controlling the accuracy and quality of the scanning data. Currently, there are no standards, uniform requirements or methods on the exercise of control of the scanning results of the intrinsic convergence (from the scans adjustment data). The scale and methods of works on the independent control of field lidar survey are not determined either.

The following types of control were analyzed:
- *incoming control, inspectorial control, detailed control, - sampling control, certain operations control, instrumental control, field control, office control.*

Figures 1, 2 show the schemes field and office works control [2]. Based on the schemes the methods of assessment of quality of laser scanning data were developed. They are presented below.
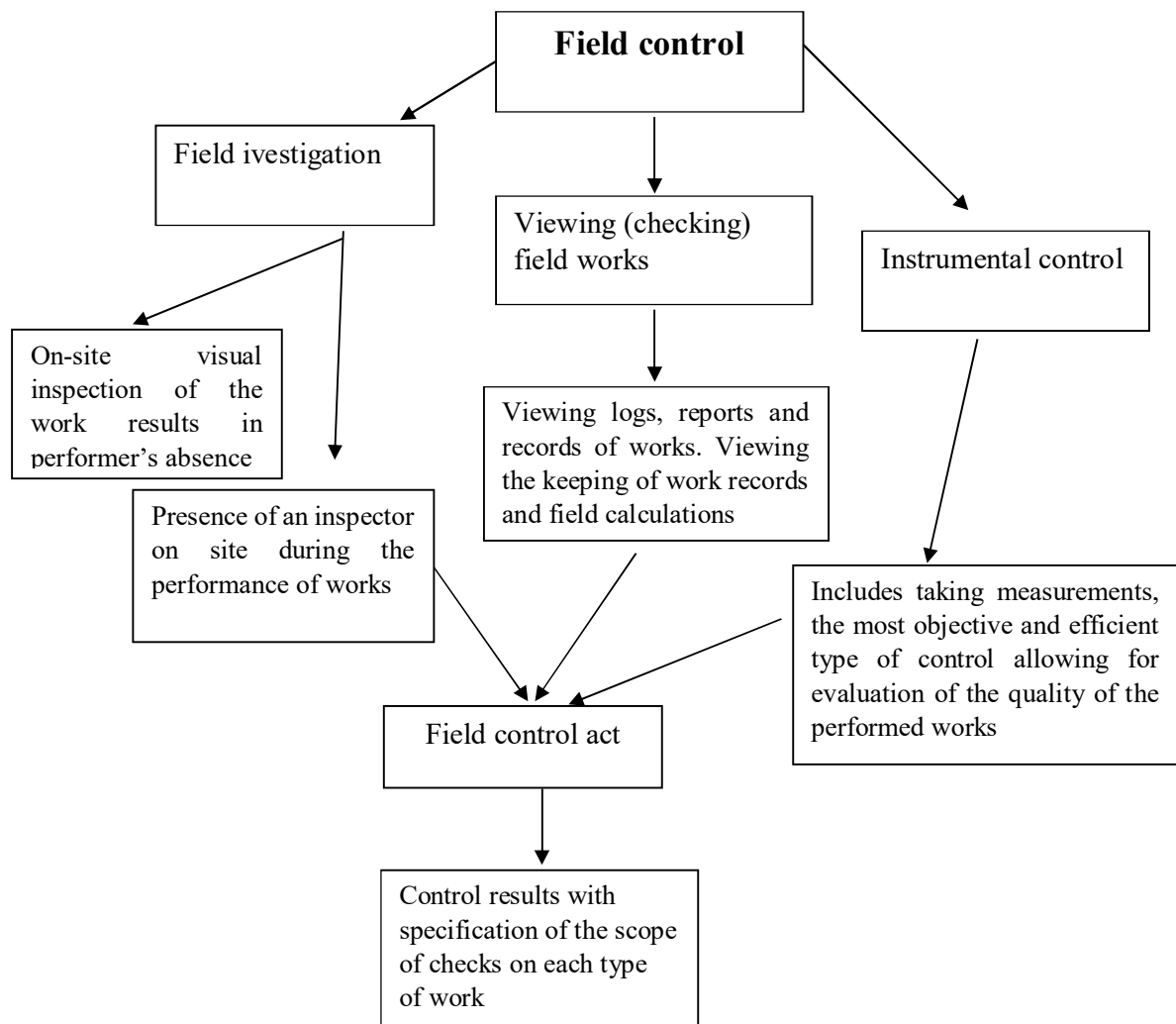
Figure 1 – Field control

Control and quality evaluation for surface, mobile and airborne laser scanning includes:

1. Evaluation of the coverage of the surveying area by scans and photoprints (within its borders).

2. Evaluation by the intrinsic convergence of the adjustment data. Program software for mobile and airborne scanning provides an opportunity to select the 'clean ground' separately by runs and to evaluate the variance (mean-square errors) of differences between the runs.

3. Quality evaluation of the orientation of airborne scanning and orthophotomaps. Orthophotomaps may contain 'cuts' (mismatch of photoprints' junctions), and their size is the quality index. There may be errors in the elements of interior orientation of the camera – these are so-called offset parameters – angles and linear parameters of relative orientation of the camera, the centre of a satellite receiver and the inertial

system. These parameters are determined by calibration procedures during each installation of aerophotographic equipment on the carrier. Laser scanning data processing is performed in the software product of *Terrasolid* company. In particular, software package TerraMatch – adjustment of scan paths by the scans laps – is used. It gives the opportunity to estimate the closure errors by the scans laps and to adjust them.
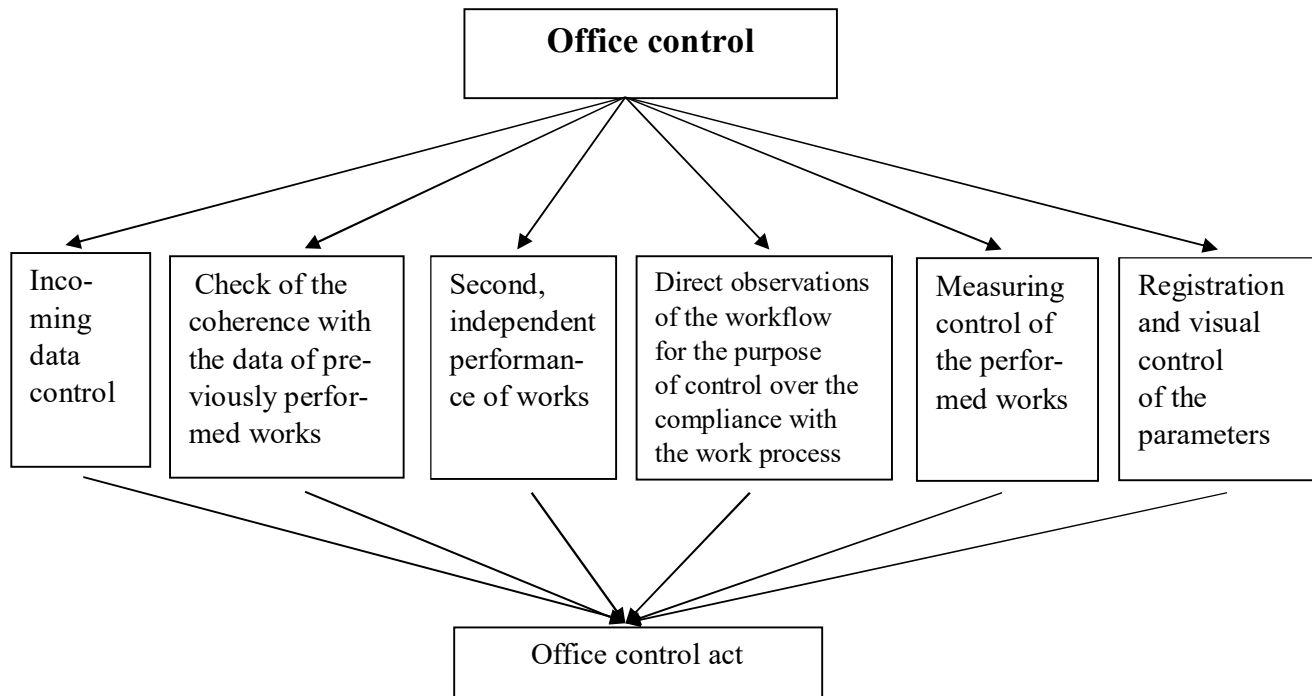
Figure 2 – Office control

Regulatory documentation has been analyzed, types of control (office and field) have been examined, methods of quality evaluation of laser scanning data have been presented. However, for the compete implementation of the methods a range of investigations should be still carried out. Moreover, the advantages and disadvantages of the application of airborne laser scanning in designing linear structures (roadways, in particular) have been presented.

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INVESTIGATION OF FACTORS AFFECTING THE HEAT-SHIELDING PROPERTIES OF CLOTHING FOR CHILDREN

Abstract. This article examines the study of the target functions of textile materials and investigation, allowing to find out the most significant factors that more affect the heat-shielding properties of clothing for children.

Keywords: thermal conductivity, ranking factors, textile materials, constructions packet, heat-shielding properties

The geographical position of Uzbekistan, located far from the oceans and seas, in the inner part of the Eurasian continent, determines the continentality of its climate. Climate continentality is expressed in cloudless weather most of the year, high temperatures in summer, a small amount of precipitation, high evaporation of moisture, a long and hot summer, and also a relatively cold winter for these latitudes, and large daily and annual amplitudes of air temperature.

Atmospheric circulation plays a major role in shaping the climate of Uzbekistan. In winter, from the north and northeast, arctic cold air masses penetrate the territory of Uzbekistan and reach the southern borders of the republic. As a result, it is clear and cold weather [1].

Basically, the hottest climate in the south of the country, and the coldest - in the north. In northern Uzbekistan, the average temperature in December is -8 ° C (18 ° F) and up to 0 ° C (32 ° F) in the southern part.

In recent years, the climate has noticeably changed due to global warming and the drying up of the Aral Sea, after which the cold and snowy winters became mild with less precipitation, allowing you to travel in winter [2].

Climate directly affects human health, and health in turn depends on a combination of several factors, one of which is clothing. The level of thermal protection of clothes is of great importance when creating a set of clothes for children, it is important to create warm, but at the same time light seasonal clothing for a temperate climate. Heat-shielding properties characterize the ability of materials for clothing to protect the children's body from both excess heat losses in cold weather and from overheating in hot weather [3].

In order to keep warm and protect the child from the cold, products are made that assume the active use of bags of different composition and layers, a necessary condition for such products is to provide a heat-insulating function [4].

To conduct a screening experiment and identify the most significant factors in determining the rational structure of a product package, we developed a questionnaire indicating 12 factors and calculated a sample, the number of expert experts of which was 50 people, which meets the requirements for small sample sizes [5, 6].

Usually, a priori ranking of the factors is carried out in the following sequence. Based on the literature data, a list of factors influencing the parameter being studied is made, and the scope of each factor is determined. Then it is suggested to specialists working in this field to arrange the factors in a row according to the degree of their influence (significance).In this case, each specialist can add to the list if he, in his opinion, is not complete or express an opinion on changing the intervals of variation. In the selection of specialists, it is necessary to strive to have representatives from as many scientific schools as possible among them. When collecting opinions, each of the specialists is invited to fill out a questionnaire in which the factors are listed, their dimensions and estimated intervals of variation.Filling out the questionnaire, the specialist determines the place of factors in the ranked series. Evaluation of factors is carried out by putting figures from the most significant to the less significant. With their equivalence, the factors are assessed equally.

Processing the results of the expert assessment proposedfactors, allowed to develop a rank chart that defines the main target parameters of the study (figure).
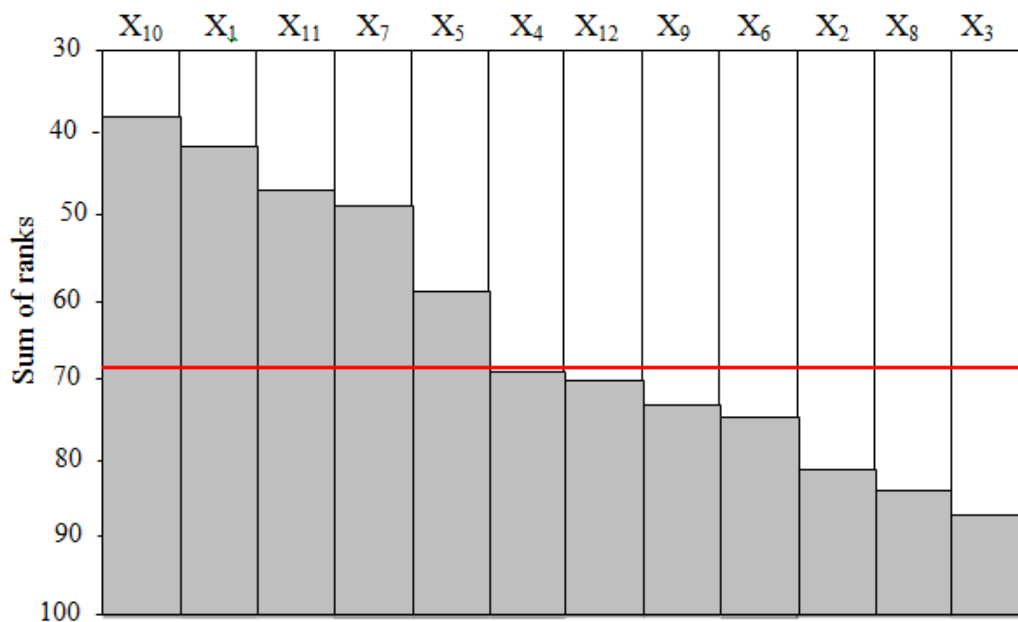
Figure. Results of a priori ranking of factors affecting the heat-shielding properties of package materials.

Analysis of the consistency of expert opinions showed that the coefficient the concordance was 0.23, the significance of the coefficient was established using the Pearson criterion, which is 24.2. In accordance with the requirements of [5], it can be argued that the consistency of expert opinions is high and allows us to accept the results as reliable.

According to the results of the prior ranking, it was established that the greatest influence on the heat-shielding properties of clothes from the identified factors as a result of the analysis of the system are the following factors: the quality of the fabric, the thermal conductivity of the fabric, the density of materials, the layer of the product.

They determine the conditions for conducting a full-factor study of this system when organizing experimental studies and establishing functional dependencies of the influence of these factors on a selected indicator of thermal comfort for a child.

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EFFECTIVE STERILIZATION OF STAGNANT ZONES USING A SPECIAL STEAM-STERILIZED CONNECTOR

Keywords: sterilization, superheated steam, steam-sterilized connector

In the biotechnological processes carried out using bioreactors of various volumes, equipment and media sterilization is one of the most important procedures to the success of the experiment. Low quality of sterilization can lead not only to incorrect results, but also to contamination of the working surfaces. Sterilization of laboratory bioreactors (≤ 1 L) is carried out by autoclaving. It is advisable to use super heated steam for bioreactors of larger working volume. The solution of contamination for bioreactors without moving devices (column or tubular bioreactor) problem can often be chemical treatment and re-sterilization. However, the design complications (an agitator and reflective elements addition, measurement equipment, an increase of the total length of flexible tubes, etc.) can lead to the appearance of zones whose sterilization efficiency is significantly lower than in the working volume of the bioreactor. For effective heat treatment, a forced change of steam flow direction to into the stagnant zones is necessary. For this

purpose, an effective steam-sterilizable connector (SSC) was developed (Fig. 1a) [1].
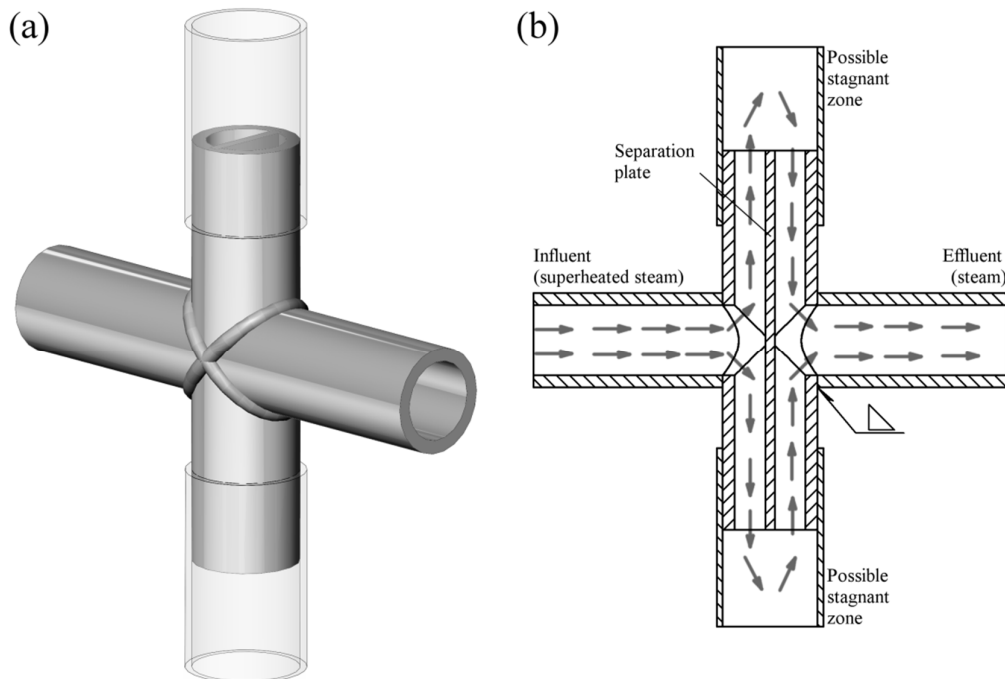
Figure 1 - 3D model and the principle of operation
of the steam-sterilizable connector

This fitting is a hollow cross-piece with a separation plate mounted inside, striking which jet of steam splits into two oppositely directed (Fig. 1b). Owning to this, part of the steam flow effectively sterilizes the volume of the stagnant zone. The steam-sterilizable connector can be used for the periodically-connected additional equipment (a sampling chamber, inoculators, etc.) [2]. Disadvantage of this fitting is the need for welding (Fig. 1a). This lead to impossibility of the changing of the working diameters, to occurrence of corrosion at the joints of the cross-piece elements, as well as to the difficulty of processing internal welds. In addition, the separation plate also can reflect a part of steam flow, reducing of the steam flow density. The separation is uneven and the sterilization efficiency of one of the paths also decreases. Taking into account the above, we have developed a new concept of a steam-sterilizable connector (Fig. 2).

(a)　　　　(b)

Possible stagnant zone

Separation plate

Wedge-shaped element

Influent (supeheated steam)

Effluent (steam)

Possible stagnant zone
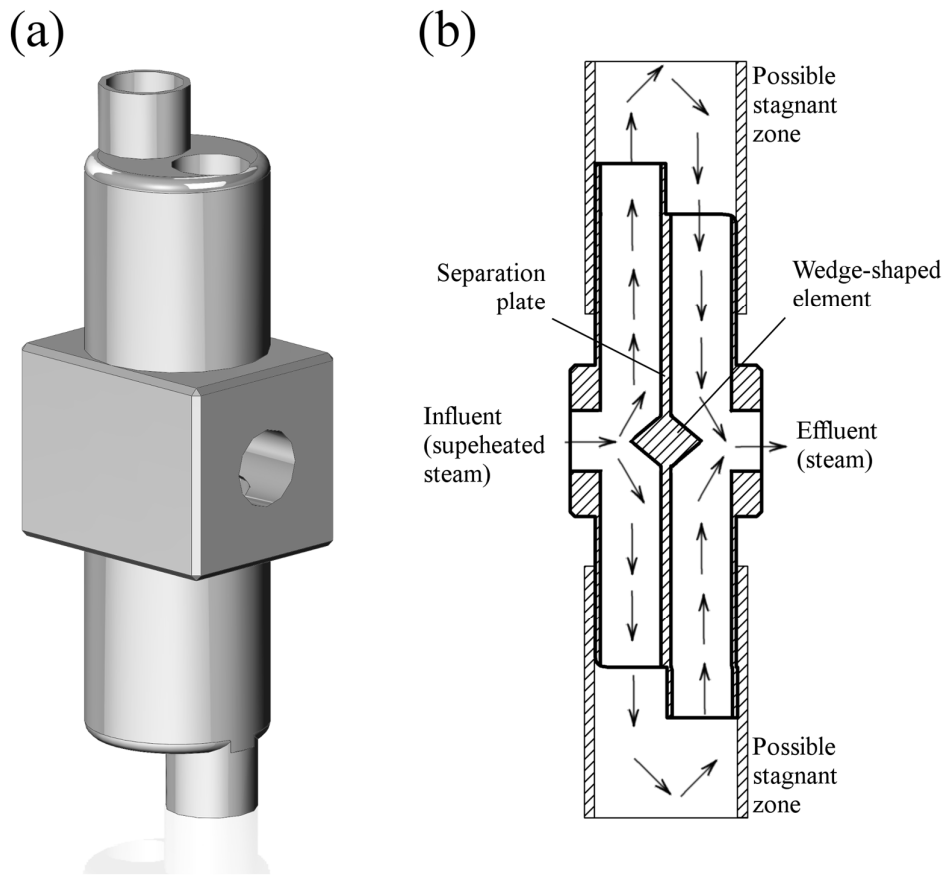
Figure 2 - 3D model and the principle of operation
of the modified steam-sterilizable connector

The modified SSC can be manufactured by machining and all holes have a circular cross section. In addition, the separation plate is not flat. It is possible to create a wedge-shaped element in the cross section of the SSC using a taper-boring. The wedge-shaped element separates the steam flow into equal jets. In this case, the steam flow reflection degree at the separation point can be significantly reduced. The shape of the sterilizing lines should be noted. Due to the different lengths, the depth of steam penetration into the stagnant zone increases, which in turn improve the sterilization efficiency.

The steam-sterilizable connector is an effective and simple fitting for extension the basic configuration of bioreactor. The ability of the quick substrate feeding, sterile sampling, pure culture addition or titration increases the mobility of biotechnological processes. Application of the SSC significantly expands the range of possible procedures without risk of contamination.

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SECTION V. Medical sciences

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CONDUCTING AND CONTRAINDICATIONS
FOR THROMBOLYTIC THERAPY IN ISCHEMIC STROKE

Cerebral stroke ranks second in the number of deaths from circulatory system diseases in the Russian Federation. Annual mortality from stroke in Russia is one of the highest in the world (175 cases per 100 thousand people in year). The early 30-day mortality after a stroke is 34.6%, and during the year about 50% of patients die, i.e. every second sick.

New approaches to the treatment of ischemic stroke include the use of modern highly effective methods of reperfusion of the substance of the brain in the first hours of disease aimed at restoring blood flow in the affected vessel that helps to prevent the development of irreversible damage to the substance of the brain or reduce its volume, i.e. minimize the severity of residual neurological deficit.

Safety and efficacy of systemic thrombolysis in ischemic stroke using rt-PA (alteplaza) have been proven in a number of large randomized placebo controlled clinical trials (NINDS, ECASS I, II, III, ATLANTIS), as well as registers SITS-MOST and SITS-ISTR. According to the recommendations of the European stroke organizations (ESO) (evidence class 1, level A) and the American Stroke associations (ASA) (evidence class 1, level B), systemic thrombolytic therapy (TLT) using rt-PA is the most effective treatment ischemic stroke in the first 4.5 hours of the onset of the disease.

The treatment of patients with stroke at the pre-hospital stage consists in carrying out monitoring and correction of vital body functions. Drugs that are not recommended for stroke prehospital: furosemide (causes hemoconcentration and deterioration hemorheological parameters), piracetam (nootropic depleting type of action, use in the acute period of stroke is not shown), aminophylline, vinpocetine, instenon (can cause robbing syndrome), dexamethasone, prednisone (do not reduce swelling brain with stroke), nifedipine (dramatically reduces the level of blood pressure).

Reducing time wasted on admission of patients with clinical picture of stroke requires compliance with the established procedure of personnel actions mandatory compliance with the standard diagnostic protocol, use formalized scales and algorithms. The order of clinical, laboratory and instrumental examination of patients with ONMK suggests:

- Mandatory examination by a physician with an assessment of the severity of the neurological deficit, including scale stroke NIH (Appendix 1; medical It is recommended to be certified under the RIC and JI. scale stroke NIH), the coma scale of Glasgow);

- laboratory diagnostics with obtaining results within 20 minutes from the time of blood collection, but no later than 40 minutes from the moment of admission of the patient;

- instrumental diagnostics - ECG, CT (high field MRI) of the brain - within 40 minutes of receipt. Consultations of specialists (therapist, cardiologist, neurosurgeon, endocrinologist, an ophthalmologist and others) are performed according to indications at the same time.

The basis of the instrumental diagnosis of cerebral stroke is CT (high field MRI) of the brain, which should be carried out with the participation of neurologist (anesthesiologist-resuscitator) in the conditions of the department (room) radiation diagnostics, with the formation of a conclusion on the results of the study within 40 minutes after admission of the patient to the hospital.

Objectives of neuroimaging before thrombolysis:

- eliminate the signs of intracranial hemorrhage (in intrathecal, intershell spaces, brain parenchyma and ventricular system brain);

- determine the volume, nature and severity of ischemic changes, identify contraindications for systemic thrombolysis (intracranial hemorrhage, signs of extensive cerebral infarction (hyposensitive focus (or hyperintensive on DVI) $\geq 1 / 3$ of the AGR basin).

Before TLT, there is no need for proven ischemia by the CT method, since identification of the lesion area may be difficult when performing a CT scan before 24-72 hours. Some clinical signs take

precedence over CT data. meningeal symptoms in the absence of data on SAH on CT results serve grounds for refusal to conduct TLT. When identifying signs of ischemic damage to assess the volume of the ischemic focus according to the results of CT in the routine practice is recommended to use the scale ASPECTS.

Contraindications for thrombolytic therapy

Cerebral

1 Neuroimaging (CT, MRI) signs of intracranial hemorrhages, brain tumors

2 Hemorrhagic stroke or stroke of unspecified history.

3 Rapid improvement or mild symptoms to the beginning of the CRT (non-disabling symptoms) in the absence of data for occlusion of the great vessels

4 Signs of severe stroke: clinical (NIH stroke score> 25), neuroimaging (according to CT scan of the brain and / or MRI of the brain in DVI mode, the center of ischemia extends to the territory of more than ⅓ of the basin SMA)

5 Cramps at the beginning of a stroke (if there is reason to assume that focal symptoms are represented by Todd paresis

6 Previous stroke or severe traumatic brain injury for 3 months

7 Suspected Subarachnoid Hemorrhage

8 history of surgery on the brain or spinal cord

Cerebral and somatic

9 Arterial aneurysms, defects in the development of arteries or veins

10 Tumors with a high risk of bleeding

SOMATIC

11 Hypersensitivity to any component of the drug.

12 Hemorrhagic diathesis

13 Arterial hypertension over 185/110 mm Hg. Art. or need Intensive decline less than these figures

14 Bacterial endocarditis, pericarditis

15 Gastrointestinal bleeding or bleeding from the urogenital systems in the last 3 weeks. Confirmed peptic ulcer exacerbations stomach and duodenum in the last 3 months.

16 Hepatic insufficiency (cirrhosis, active hepatitis, portal hypertension)

17 Acute pancreatitis

18 Real bleeding or extensive bleeding over the past six months.

19 Extensive surgery, trauma, childbirth, puncture. uncompressed vessels, cardiopulmonary resuscitation during the last 10 days

20 Recent myocardial infarction

21 Pregnancy

22 Data on bleeding or acute injury (fracture) at the time of inspection.

LABORATORY

23 Acceptance of indirect anticoagulants (warfarin), if the INR> 1.3

24 Heparin use within 48 hours with increased APTT.

25 Thrombocytopenia less than 100,000 / mm3

26 Glycemia less than 2.8 and more than 22.5 mmol / l

27 With previous intake of new oral anticoagulants (PLA - dabigatran, rivaroxaban, apixaban) APTT, INR, number platelet count, thrombin time or activity of the X factor must be in limits of normal values. In the absence of the ability to define data indicators last drug intake from the PLA group should be> 2 days before development of stroke (assuming normal kidney function).

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**SURGICAL TREATMENT OF EPILEPSY:
FUNCTIONAL HEMISPHERECTOMY**

Introduction

The onset of a single epilepsy-specific attack is possible due to the specific response of a living organism to the processes that occurred in it. According to modern concepts, epilepsy is a heterogeneous group of diseases, the clinic of chronic cases of which is characterized by convulsive repeated attacks. The basis of the pathogenesis of this disease are paroxysmal discharges in the neurons of the brain. Epilepsy is characterized mainly by typical repeated attacks of a different nature (there are also equivalents of epileptic attacks in the form of sudden onset mood disorders (dysphoria) or characteristic disorders of consciousness (twilight stupefaction, somnambulism, trance), and also the gradual development of personality changes characteristic of epilepsy and (or) characteristic epileptic dementia. In some cases, there is also epileptic psychosis, which is acute or chronic appear as affective disorders such as fear, melancholy, aggressiveness, or increased ecstatic mood, as well as delusions, hallucinations. If the occurrence of epileptic seizures has a

proven connection with somatic pathology, then we are talking about symptomatic epilepsy. called temporal lobe epilepsy, in which the convulsive focus is localized in the temporal lobe. This selection is determined by the characteristics of clinical manifestations characteristic of the localization of cramping Yeah in the temporal lobe of the brain. Neurologists and epileptologists are engaged in the diagnosis and treatment of epilepsy. In some cases, seizures complicate the course of a neurological or somatic disease or brain injury.

Surgical treatment of epilepsy is a fairly responsible and complex operation, requiring extensive knowledge and skill from the doctor, as well as experience. Properly carried out and planned, as well as successfully completed operation, it makes it possible to significantly reduce the severity and frequency of epileptic seizures, and is the main radical method of a complete cure for epilepsy. Attempts to perform hemispherectomy for various purposes began at the beginning of the last century. However, most of these attempts ended unsuccessfully not only due to flaws in the operation technique and lack of experience, but also because of imperfect knowledge about physiology and brain function, the absence of such diagnostic methods as electroencephalography - EEG monitoring, magnetic resonance imaging - MR diffusion, functional MRI, MR spectroscopy, positron emission tomography.

The purpose of the report is to study aspects of surgical operations on the brain, in particular, the removal of epileptogenic foci in particularly difficult cases of the disease, in which the patient suffers seizures, they are poorly controlled, and also in cases where drug therapy does not give the expected effect and epileptic seizures. diagnosed only in certain segments of the brain.

The described method of surgical treatment is most suitable for children under 13 years of age, since at this age the nervous system is more plastic and the healthy hemisphere can take over the functions of the lost. To achieve this in an adult with a developed nervous system is much more difficult.

Materials and methods

Under local anesthesia: the only drugs that can be used for anesthesia are drugs (usually fentanyl) and droperidol under general anesthesia: avoid benzodiazepines and barbiturates.

In modern neurosurgery, extensive basal approaches with resection of the skull base bones are increasingly used.

Results and discussion

During the observation of the children who underwent surgery, it turns out that about 80% of the children could walk on their own, 2/3 had

at least a slight impairment of speech, and only 18% of the children retained the normal ability to read. 85% required special training conditions. However, at the end of the observation, 61% of patients did not have epileptic seizures, and in 13% of cases, the frequency of seizures decreased by 90% or more.

It is noted that in the case of surgery in infancy, then as they grow up, there are no signs of lateralized deficit of brain functions.

It follows from this that infants do not have lateralization of functions, or it takes place, but the brain has tremendous restorative abilities capable of leveling the damage.

Findings

Surgical treatment showed the highest efficiency. Despite this, the parents of the sick child should make an informed decision, having discussed all the risks and possible consequences with the doctor.

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LACK OF LIGHTING OF WORKPLACES OF LECTURE HALLS AS A REASON REDUCTION OF VISION IN MEDICAL STUDENTS

Introduction

The most important task of any educational institution is not only to provide students with the knowledge and skills of good quality, but also to preserve their health. The process of studying in an institution of higher education is a difficult and crucial period in the life of students, associated with serious physical, mental and psycho-emotional stress. The specificity of higher education is the use of various forms of education, the basis of which are lectures. At during our survey of students, it was found that the most disturbing is the illumination of the lecture halls, directly related to perception and processing of visual information, as well as affecting the health and performance trainees.

Purpose.

Rate the actual lighting situation in lecture halls and the administration's attention to the existing problem with a view to its eliminate.

Tasks:

The main objective of our study was to conduct a hygienic assessment of the main parameters of the illumination of the lecture halls of the medical academy as a factor of the working environment, its compliance with regulatory requirements and to find out whether adverse changes in visual function students.

Materials and methods.

The adequacy of the illumination was estimated by measuring the illumination at various points in the lecture hall using a luxmeter, as well as by calculation of the specific power of lamps , illuminating the premises.

Results.

In the surveyed premises, ceiling lamps were installed equipped with LB fluorescent lamps. 1-6 audience capacity lamps - 18 W, 4 pieces in each lamp. At 7 and 8 classrooms - 2 LB lamps with a power of 36 watts. AT the result of the calculations in the lecture halls №1 - №6 calculated specific electric power lamps amounted to 17.1-17.24 W / m2

When the standard is not less than 20 W / m2. Calculated the real WEL taking into account the number of not working lamps and fixtures. She is ranged from 14.8 to 16, 9 W / m2 What is more different from the normative. The situation is different in audience number 7 and number 8. The calculated UEL was 28.3 and 24.1 W / m2 that corresponds to hygienic requirements. However, the real value of UEL for these

The audience is 19.8 W / m2. Though not significant, but less than the normative.

Conducted measurements of illumination at workplaces revealed the following: the illumination of the lecturer's workplace in all classrooms practically corresponds to the normative (at least 300 lux), the exception is the light in lecture number 5 and number 7 (uch. k. 1) (290 and 260 lx, respectively), which is associated with the presence of non-working fixtures in this area. With The study of the illumination of students' workplaces has established that the best illumination is noted in audience number 7 and number 8 - from 30 to 420 lux, despite a large number of broken lights and lamps. In addition, the lighting in these classrooms evenly in space. That meets hygienic requirements. Completely different situation it is celebrated in all lecture halls of lecture building No. 7. Illumination of workplaces of students in the center the hall is 2-3 times less than normal (100–200 lux, at a norm of not less than 300 lux). Moreover, the illumination in these halls decreases from the center to the periphery, i.e. uneven in space. The smallest illumination is observed on the extreme side areas of each rows and the last rows (from

80 to 132 lx). The foregoing leads to the conclusion of extremely serious violation of hygiene requirements for lighting student jobs in 1-6 lecture halls.

In our opinion it is connected:

1) Insufficient electric power of the lamps used in these audiences.

2) Lack of regular replacement of not working lamps and repair fixtures.

3) The use of diffusing elements in luminaires with poor transmittance and the absence of their regular cleaning.

There is evidence in the literature that in the process of studying in a university, up to 20% of students acquire various visual impairments. Therefore, we have been interviewed more than 100 third year students to study the incidence of organs of vision. Revealed that about 23% of respondents had pathology of vision before start training at the Medical Academy. 16.5%

Respondents noted visual impairment already in the first year of study at the university. A year later, visual impairment is noted in another 8.7% of respondents. To the third year, another 7.8% of students decreased visual acuity. Thus, 34 students (33% respondents) noted a decrease in visual acuity only in the first 3 years of study at the university.

Findings.

The results of the study revealed the presence of a serious problem with artificial lighting in lecture halls, especially 7 lecture corps, as well as a decrease in visual acuity medical students only for the first 3 years of study more pronounced (33%) than the average for universities (20%). Of course, not only insufficient lighting can cause dysfunction of the visual analyzer, but Illumination of workplaces is the main factor that directly affects all parameters of the visual analyzer. The study allows us to recommend the administration of CFUV:

1. Repair broken lights and replaceburned out lamps in luminaires in all lecture halls.

2. Increase artificial lighting in all lecture halls of lecture building No. 7 by replacing available lighting fixtures for more modern ones capable of generating more luminous flux if it is impossible to at least replace the lamp for more powerful.

3. To oblige electricians serving lectures. audience, regularly monitor the technical condition of lighting equipment, and the commandants enclosures instruct to regularly monitor work technical staff.

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**CORONARY ARTERY BYPASS SURGERY
ON THE WORKING HEART**

Introduction

Coronary bypass surgery, aortic bypass surgery (CABG) is an operation that allows to restore blood flow in the arteries of the heart by circumventing the narrowing of the coronary vessel with shunts (vascular prostheses). Shunting should be distinguished from stenting, i.e. the installation of the stent - a special frame, placed in the lumen of the coronary vessels of the heart and ensuring the expansion of the area, narrowed by the pathological process.

Coronary artery disease is caused by a narrowing of the lumen of the coronary vessels, which leads to insufficient oxygen supply to the heart muscle. In such a situation, there are often complaints of pain behind the sternum or in the left half of the breast, the so-called. angina pectoris, or angina pectoris. In such cases, diagnostic procedures are indicated, the main one being coronary angiography. In some cases, it is possible to expand the narrowed area with balloon angioplasty and stent insertion, but in most cases, aorto-coronary bypass surgery (CABG) is necessary. Timely surgery for coronary artery bypass surgery prevents irreversible changes in the heart muscle, in many cases improves myocardial contractility and improves quality and longevity. [1]

The main indications for myocardial revascularization are:

1) severe angina resistant to drug therapy,

2) prognostically unfavorable lesion of the coronary bed - proximal hemodynamically significant lesions of the left main coronary artery and the main coronary arteries with narrowing of 75% or more and passable distal channel,

3) intact contractile function of the myocardium with the left ventricular EF of 40% and above. [2]

The necessity of the operation of coronary artery bypass surgery (CABG) for stenosis of the left coronary artery has been precisely established. It is also known that conducting only conservative therapy gives a low increase in the patient's life time, in comparison with the surgical treatment of this pathology. Recently, options for CABG without the use of a cardiopulmonary bypass apparatus are being considered, since this method has several drawbacks. There is statistical information indicating that the rejection of this tactic of conducting an operation opens

up a number of clinical, angiographic, and economic advantages. Clinical advantages are operations on patients with high operational risk, as well as elderly patients. [3]

Purpose.

Study of the safety and relevance of minimally invasive CABG surgery performed using the ORCAV technique (pump-free shunto-coronary surgery) in patients with extensive artery coronaria sinistra stenosis.

Materials and methods.

The basis of this study is the work of specialists from the Moscow Scientific Center for Cardiovascular Surgery.

Research results.

100 patients suffering from coronary artery disease due to stenosis of the left coronary artery were studied. 47 patients underwent CABG using the ORCAV method, while 53 patients received conventional surgical treatment using a cardiopulmonary bypass. Most patients underwent revascularization of three or more coronary arteries. The revascularization index in the group of patients with CABG without IC was about 3.0, and in the group of patients with CABG and IC it was 2.6. Observation time was 56 ± 3 months. Postoperative mortality was considered any patient death within 30 days after surgical treatment. Also such diagnostic criteria as an electrocardiogram, echocardiogram, biochemical analysis of blood were taken into account. Mortality in the first 30 days was as follows: 2.1% (1 person) in the group using the minimally invasive procedure of the operation and 9.4% (6 people) in the group using the traditional method of CABG. [4] Perioperative MI was transferred by 4.2% (2 patients) from the 1st group (using minimally invasive techniques) and 14.2% (6 patients) from the 2nd group undergoing coronary artery bypass surgery using an IR device. An increase in the level of the ischemic ST wave over 1 mV was more often observed in subjects from the second group.

Findings.

The above results of studies suggest that when performing bypass surgery using the IC device, the risk of ischemic changes and myocardial infarction is higher than during an operation on a working heart. It confirms less long stay of patients from the first group in the hospital, in comparison with patients of the second group. It follows from this that minimally invasive myocardial revascularization using the ORCAV technique has a low lethality and a good clinical potential. However, the data show that there is no significant difference in the long-term perspective between MIRM and the traditional method.

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SECTION VI. Economics

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**INTERNET TECHNOLOGIES AS A TOOL
OF PRODUCT PROMOTION**

Annotation. The use of Internet technologies in order to optimize the marketing activities of food trade enterprises is becoming one of the innovative development important directions. This article describes the features of product promotion using modern marketing tools.

Keywords: electronic commerce, product promotion, Internet technology, online store

In the vast world economy, the Internet technologies introduction in the sphere of trade, social and consumer services is a fundamental phenomenon of the formation, development and the information society functioning.

The food trade industry is characterized by high competition among a large number of retail outlets that offer similar products, which necessitates the need to solve the problems of enterprises adaptation to the constant changes in the competitive environment. Therefore, under such conditions, the use of Internet technologies in order to optimize the

marketing activities of food trade enterprises becomes one of the innovative development important directions.

The term "promotion" entered the science and practice of management simultaneously with the approval of the conceptual marketing and logistics foundations. According to this, the web-site of enterprises should solve a dual nature parallel problems.

Must be also highlighted two goals of using the web-site – marketing (the site serves as a channel of marketing communications) and logistics (channel of product distribution).

According to the author [1], electronic Commerce is defined as a form of trade in which all activities related to the sale of goods are conducted through the Internet. At the same time, internal processes related to the organization of trade activities can be implemented by various electronic methods.

In General, electronic Commerce can be defined as the conduct of transactions, such as the goods and services purchase and sale, or the negotiation of purchase and sale through electronic money or electronic networks.

The use of the network for the first purpose provides for the entire complex implementation of the enterprise marketing communications and consists of such elements as advertising, sales promotion, direct marketing and public relations (public relations).

Effective use of the Internet as a channel of marketing communications allows the company to reduce its own costs by reducing the number of printed advertising materials, saving time for marketing staff, and is an additional public information source about the company's activities that affect consumers to create a positive corporate image [2].

One of the communication environment features of the Internet, namely, interactivity allows enterprises to realize the multilateral communication possibility in real time.

Means of Internet technologies as innovative methods of trade provide trading enterprises with the opportunity to expand the boundaries of markets for products, to provide consumers with complete information about the product and to create new tools for competition.

The process of electronic commerce covers the following operations of the trading company:

market monitoring, which provides information about the needs of consumers;

product portfolio;

competitors ' price offers;

ordering of customers, after-sales service and provision of additional services [3].

Through the Internet, the buyer using a browser comes to the Web-site of the online store. The Web-site has an electronic showcase, which presents a catalog of products (searchable) and the necessary interface elements for entering information, order form, making payments via the Internet, delivery, obtaining information about the company-seller and on-line assistance.

To quickly find an online store for potential customers, the site requires search engine optimization – a set of measures to improve the site position in the results of search engines for certain user requests. Unlike services for banner advertising, website optimization is lower in cost.

The structure of the online store requires a complex management system. The main elements of the system include: catalog, shopping cart, ordering procedure, customer section, order processing, delivery management, integration with various payment systems, as well as with product management systems (for example, 1C). The presence of information on new products and top positions, discounts and promotions on various types of goods on the website positively affects the visitors of the store.

The availability of information on the Internet market makes data on different prices open to consumers and competitors. Individual offer of products and services according to the specific customers needs allows for individual pricing.

Before trading companies there is a need to create a unique offer, so as not to reduce prices. In the case where the number of e-shops that sell the same goods is constantly growing, there is a need to differentiate and create additional services to give the goods more value.

According to the author [4], for commercial enterprises in the process of managing the system of goods sales that use online trading, the most acceptable are such pricing methods: setting the price of goods below cost; pricing depending on demand; setting the price of the transaction.

The introduction of Internet projects by commercial enterprises into their own mechanisms of food promotion makes it necessary to improve the processes of food sales.

The mechanisms of goods promotion are influenced by a set of factors in the form of the trading enterprise functional systems involved in the food implementation, which include communication policy that provides information interaction of trading enterprises with end users.

The food promotion mechanism with the help of Internet technologies provides additional opportunities to adapt to changes in the external environment, cooperation between the participants of the trade process, as well as the development of enterprises communication policy.

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**MARKETING TOOLS IN THE MANAGEMENT
OF RECREATIONAL AREAS**

Annotation. The article deals with the role of territorial marketing as a tool of management and development of recreational areas.

Keywords: marketing, territory marketing, marketing tools, marketing of recreational areas, brand of the territory

According to the author's teachings [1] marketing is a social and managerial process that allows individuals or groups to meet their needs through the exchange of goods and consumer values created by them.

The first methodological approach to the study of the territory marketing essence is that the marketing of territories is based on the theory and experience of traditional marketing, which necessitates the

definition with an understanding of modern marketing and trends in its development.

Marketing of territories is a relatively young direction and mainly uses methods and tools typical for traditional marketing, as for the research stage.

The analysis of literary sources allowed to reveal that marketing in the process of its development has transformed from a simple sales activity to a complex system of education within the enterprise management system and is now defined as an independent type of business, management function, business philosophy, science, social process.

Undoubtedly, we can agree with the author [2, 3] that the marketing of territories allows us to look at the territory from a new point of view, namely as an object of promotion, that is, as a kind of product with consumer value.

The effectiveness of the marketing policy will be evidenced by a high assessment of the competitive advantages of the territory. Among the main indicators may be the development level of market, municipal, financial infrastructure, the degree of support by local authorities for projects implemented in the territory, the volume and quality of services provided by the territorial entity, the demand for products and services.

It can also be summarized that the marketing of territories makes it possible to create, maintain or change the thoughts, intentions or behavior of regional products and services consumers, contributes to the formation of the region special image.

Marketing research of the territories allows to obtain the data necessary for the selection of the investment object from the investor's point of view and the data necessary to attract funds to the territorial objects from the point of view of the regions representatives.

Marketing of recreational areas is understood as a systematic theoretical and methodological approach to the activities planning aimed at meeting the needs of institutions and organizations in special and general natural recreational resources, recreational areas of recreational services [4]. The purpose of this approach is to study the optimal impact on the consumer and meet the demand for these services, including the expanded reproduction of natural and recreational resources in order to maintain the necessary environmental and resource balance, which would provide normal living conditions of society as a whole and its individual members for the long term.

According to the authors involved in the marketing of territories, the brand of the territory should be considered as a set of enduring values that reflect the unique original consumer characteristics of the territory and the community, widely known, received public recognition and are in stable demand of consumers.

The brand of the territory is formed on the basis of a pronounced positive territory image, which is based on the unique opportunities to meet certain demands of its consumers, is the emotional consumer preferences highest manifestation.

It also often becomes the result of the activities of many, independent of each other, connected by common interests in business, and sometimes directly competing with each other market entities

The marketing system of recreational areas is designed to provide justification for decisions on the effective use of the potential of recreational areas by the relevant enterprises of the recreational sphere in order to meet the population needs in recreational services.

The regional management system, a component mechanism of which we consider the recreational areas marketing, having the necessary management structures, powers, levers of influence, is able to provide an integral coordination of the market participants interests, non-profit institutions and institutions, consumers, which makes it possible to develop and implement an effective policy for the development of the region.

By the main objectives of the recreational areas marketing can be: increase employment, increase income and quality of life; formation of a favorable demographic structure, social and cultural progress; expansion of the recreational services market; preservation of the natural environment and the environmental situation improvement.

The marketing concept in management is beneficial for the region in terms of the resource recreational potential implementation; enterprises and investors from other regions and countries; creating a favorable environment for the development of small and medium-sized businesses.

Marketing of recreational areas is aimed at creating the culture of the region, the system of values and the territory self-identification, its inhabitants and economic entities, the development of the region socio-economic capital.

Marketing tools in the recreational areas management is designed to balance the interests of many regional market subjects and implement the overall orientation of the region socio-economic system in the direction of sustainable development.

Thus, the conducted research makes it possible to define the marketing of recreational areas as a complex system of education, a subsystem of territorial administration, an important innovative modern tool of territorial management, a management concept aimed at the development of the recreational sphere in order to meet the needs of the population in recreational services, ensure the competitiveness of the territory, as well as neutralize the consequences of economic activity, solving environmental problems, conservation of natural resources.

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TAXATION OF THE OIL AND GAS INDUSTRY
(ON THE EXAMPLE OF PJSC GAZPROM»)

Annotation. The article discusses some features of taxation of oil and gas companies, their social responsibility and role in the economy on the example of the company PJSC Gazprom. The statistical data on the mineral reserves of oil and gas companies, the formulas for calculating the tax base and the amount of tax in natural gas production are presented, the analysis of the activities of PJSC Gazprom, its tax policy and development prospects is carried out.
Keywords: Oil industry, taxes, tax base, «Gazprom» company

Discovered gas reserves in Russia amount to about 48-49 billion tons, according to the Central Dispatching Office of the Fuel and Energy Complex (CDU TEK). Large hydrocarbon reserves are concentrated on the Russian Arctic shelf [7].

Gazprom is one of the largest oil and gas companies in the world in terms of size of proven reserves, which amounted to 35,355.4 billion cubic meters of natural gas, 1,595.6 million tons of gas condensate and 2,045.3 million tons of oil (Chart 1).

It should be noted that, in addition to Gazprom, only Novatek, Rosneft and Lukoil can be called significant in terms of gas production (Table 1).

Prospects for the development of Gazprom as one of the leaders of the global energy industry are closely related to the improvement of hydrocarbon processing. The company aims to increase the depth of processing and output growth with increased value added [5].

Chart 1

Rating of gas companies in the Russian Federation in 2017[1]

RATING OF GAS PRODUCING COMPANIES OF THE RUSSIAN FEDERATION (WITHOUT GAZPROM) IN 2017, GAS PRODUCTION, BILLION CUBIC METERS
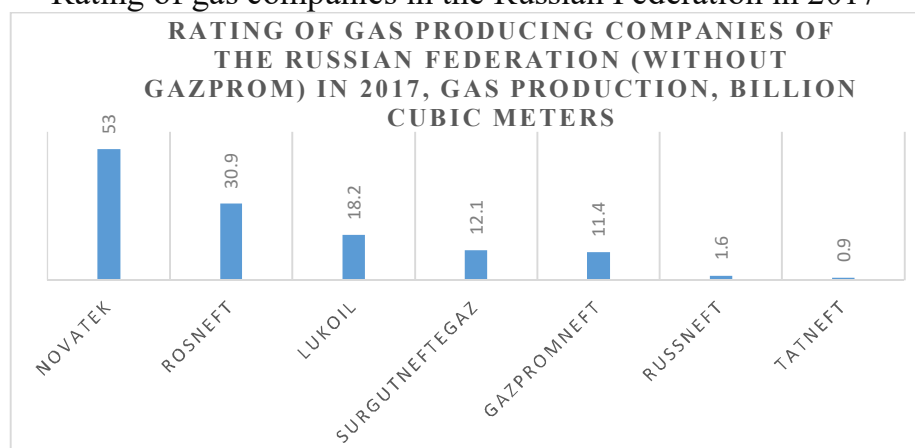
Table 1[2]

Taxes other than income tax consist of:

	For the year ended December 31	
	2017	**2016**
Mineral Extraction Tax	915 228	613 662
Excise	162 140	144 648
Property tax	154 639	127 053
Other taxes	14 052	15 034
Total taxes, except income tax	**1 246 059**	**900 397**

Taxes paid by PJSC Gazprom in 2017-2016

From July 1, 2014, a new taxation scheme for gas producing companies was introduced in terms of the mineral extraction tax. The previous taxation system for gas and gas condensate production did not take into account neither the stages of the life cycle of the development of mineral resources, nor changes in the price situation of the market, nor development conditions, or other factors, therefore the gas industry enterprises carried an excessive tax burden. The new method of calculation takes into account, in particular, the composition of gas, macroeconomic indicators, the level of prices in the blue fuel sales markets and the cost of transporting combustible natural gas. All this is necessary to stimulate the development of new hydrocarbon deposits [6].

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[1] https://www.neftegaz-expo.ru/ru/ui/17158/
[2] http://ir.gazprom-neft.ru/novosti-i-otchety/godovye-otchety/

Based on the company's financial statements for 2017 and 2016, it can be noted that expenses on taxes (except for corporate income tax) in the fourth quarter of 2017 increased by 345 billion rubles, or 38%, this was caused by an increase in the tax on extraction of mineral resources in connection with the ongoing crisis of the Russian economy. The increase in the base rate of the mineral extraction tax could affect the increase in expenses in 2016.

The mineral extraction tax relating to the extraction of hydrocarbons, including combustible natural gas, gas condensate and oil, is charged in proportion to the amount of mineral resources mined. In the Russian Federation, starting from July 1, 2014, a calculation formula is used to determine the rate of mineral extraction tax for gas of combustible natural and gas condensate instead of the fixed rate of mineral extraction tax.

Since January 1, 2015, the MET (Mineral Extraction Tax) rate for natural gas is defined as a set of indicators:

1) the base rate - 35 rubles per thousand cubic meters of natural gas;

2) the base value of the unit of reference fuel calculated taking into account various macroeconomic indicators, including the price of oil and gas;

3) a coefficient characterizing the degree of difficulty in extracting natural gas and (or) gas condensate from hydrocarbon deposits;

4) an indicator characterizing the costs of transportation of natural gas.

For gas condensate, the MET rate is defined as a combination of the following indicators:

1) the base rate - 42 rubles per 1 ton of gas condensate produced;

2) the base value of the unit of reference fuel calculated taking into account various macroeconomic indicators, including the price of oil and gas;

3) a coefficient characterizing the degree of difficulty in extracting natural gas and (or) gas condensate from hydrocarbon deposits;

4) correcting coefficient.

Gazprom is one of the key taxpayers in Russia. In 2017, taxes accrued by the Gazprom Group (except for corporate income tax) amounted to 1,246.1 billion rubles, having increased by 345.7 billion rubles compared to 2016.

The increase in the tax burden for Gazprom Group in 2017 was mainly due to an increase in the mineral extraction tax.

Since 2016, the increasing coefficient has been applied at calculating the MET rate for gas for owners of UGSS (Unified gas supply system) facilities or organizations in which owners of UGSS facilities directly and (or) indirectly participate and the total share of such participation is more than 50%. In 2017, the value of the multiplying factor used to calculate the mineral extraction tax on gas was: 1.969 from January 1 to September 30.

As part of the planned changes in the level of tax burden on the oil production sector, the mineral extraction tax rate was increased compared to 2016. Also, the increase in oil prices significantly affected the increase in the tax burden due to mineral extraction tax in 2017 (Table 2).

Table 2.
Customs duties and excise taxes paid to the federal budget
in 2016-2017[1] (in thousand rubles)

	2017	2016
Customs duties	581 109	537 059
Excise duty	51 873	39 258

From the data of Table 3, it follows that customs duties and excise taxes increased in 2017 compared to 2016.

From January 1, 2015, natural gas is subject to excise tax, if it is provided for by international agreements of the Russian Federation. The tax rate is 30%. It should be noted that currently excisable oil products include gasoline, motor oils, diesel fuel and natural gas, while oil and gas condensate are not excisable goods.

The export of hydrocarbon raw materials, including natural gas and oil, outside the borders of the countries of the Customs Union is subject to export customs duty. According to the Decree of the Government of the Russian Federation N 754 August 30, 2013, when natural gas is sold outside the Customs Union, export duties are charged at a fixed rate of 30% of the customs value of the exported natural gas [10]. Sales revenue is recognized net of customs duties. In 2017, the cost of export duties increased by 44 billion rubles, excise taxes - by 12, 615 billion rubles.

The amount of corporate income tax, determined on the basis of the accounting profit (loss) and the established corporate income tax rates (20%, 13%, 0%), amounted to minus 28,005,657 thousand rubles. (the sum of the conditional income on the tax on profit of organizations) and 99 355 755 thousand rubles (the amount of the conditional expense on corporate income tax) in 2017 and 2016. The current income tax

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[1] https://www.minfin.ru/ru/fed_budget/

according to the Company amounted to 133,067,081 thousand rubles and 142,454,223 thousand rubles for 2017 and 2016. The reason is a gradual rise in the Russian economy and a way out of the 2014 crisis.

Tax control of PJSC Gazprom

Gazprom will join the tax monitoring on January 1, 2019. Tax monitoring is a form of tax control that allows the tax authority to verify the correctness of calculation, the completeness and timeliness of paying (transferring) taxes, fees, insurance premiums, the obligation to pay (transfer) of which in accordance with the Tax Code of the Russian Federation is assigned to the taxpayer in real time. The period for which the tax monitoring is carried out is the calendar year. It is assumed that with the gradual transition to open information interaction of the Gazprom Group, the volume of necessary documents will be reduced tenfold, and the duration of tax audits will be reduced fourfold.

The social significance of the company "Gazprom"

Social responsibility of the company of the oil and gas sector of the Russian Federation is a very important aspect of the activity. Such companies should monitor the environmental safety of their activities. As an example, PJSC Gazprom, which organizes projects for the protection of natural objects, preserving clean air, projects for preserving clean water resources, etc. Each employee of PJSC Gazprom must be instructed on labor protection, which also means high social responsibility of the company. Exceeding the norms of indicators on the environmental safety of mining can lead to enormous consequences in the environment. PJSC Gazprom, adopted its own environmental policy in 1995 and became the first company in the Russian Federation to declare voluntary responsibility for the environment protection.

Approved by the Department in 2015, the updated edition of the environmental policy of the company, reflects current trends in environmental protection and energy efficiency, as well as reducing climate impact. The environmental policy defines the obligations and mechanisms of the company's activities in relation to environmental protection: ensuring environmental safety, including the development of hydrocarbon deposits on the continental shelf and in the Arctic zone of the Russian Federation and minimizing the risks of negative impact on the environment, including natural objects with increased vulnerability.

In 2017, significant environmental aspects for PJSC Gazprom were recognized: emissions of methane into the atmospheric air during the repair of gas pipelines and nitrogen oxides during operation of compressor stations, wastewater discharge and waste disposal.

In 2017, five of the six targets set for 2017-2019 have been met. The growth of the target to reduce the fee for excess environmental impact is mainly due to the late receipt of permitting environmental documentation (permits for emissions, discharges of pollutants, limits on waste disposal).

Thus, it should be noted that oil and gas companies pay three types of tax payments, while they receive certain benefits. In addition, the oil and gas sector has an important social function.

Social responsibility of business on a serious scale is a relatively new matter in the world, especially in Russia. Oil and gas companies in developed countries do business mainly in the territories of third countries, and their natural social tasks — protecting the environment and the health of their employees. Social responsibility was not an invention of the companies themselves, but gradually imposed on them by society and the state. Now the social factor has begun to influence positively on stock prices, and its importance has grown so much that this type of activity does not decrease even in the context of a decline in oil prices. In the Russian conditions, the oil and gas business leads in the field of corporate responsibility for several reasons. Firstly, it is the richest branch of the country. Secondly, local authorities and social movements closely monitor these companies. But to a large extent this is due to the release of our companies to Western exchanges, the presence of Western (or "enlightened home") minority shareholders and managers [1].

The main task for improving the tax system is the introduction of modern and effective methods of collecting and calculating taxes in the oil and gas sector. It is necessary to ensure a steady flow of tax revenues to the budget.

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SECTION VII. Educational Sciences

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**LANGUAGE SKILLS DEVELOPMENT
AND INTEGRATIVE TEACHING MODEL**

Annotation. The article describes the view on the problem concerning the speaking skills improvement. The authors provide an integrative approach which help to join outdoor, non-verbal communication and informative games activities during one lesson. The integrative model based on three types of games facilitates the process of language skills development.

Keywords: Speaking skills development, stages of speaking skills development, outdoor, non-verbal communication and informative games activities, integrative approach

English is the language of international communication. Thus that is the indispensable means of the teaching languages process. The strategy of the Life-long education 2025 describes the importance of equal development of physical, communicative and informative competences of a primary school student. That says that the modern school should provide for the holistic world view development.

The authors of this work find that this is important to speak about the communicative competence improvement which the scientific literature describes as the ability and readiness to organize interpersonal, intercultural competence. The reseraches (N. Galskova, N. Gez, E. Passov, etc.) shows this view. Moreover they consider speaking as the component of the communicative competence.

The analysis of the teaching material («Spotlight» by N. Bykova, J. Dooley, M. Pospelova, V. Evans) shows the teachers have the lack of the efficient means to improve the process of speaking skills development. Thus the teacher has to find the tools which orient these skills development within his physical (indoor and outdoor games), informative (web-quests excercises) and nonverbal communicative activities. Below we will give the view concerning the integrative approach on speaking skills development. Thus we consider three goals of our research. *The first goal is to show the stages of speaking skills development and the second goal is to show the games which help to improve speaking skills within physical, non-verbal communication and informative teaching environment.*

The reseraches analyzes three efficient stages which help to organize speaking skills development (I. Bim, E. Passov, S. Shatilov etc). They consider preparative- oriented stage, stereotyped- oriented stage and situation-oriented stage.

Preparative-oriented stage has the aim to learn the new linguistic specificities and its first training. We believe that this is important to use excercises which orient the student for identification, differentiation, substitution, transformation of the linguistic specificities. The excercises which help students to improve translation skills are important on this stage.

Stereotyped-oriented stage orients the students for better reproduction of the linguistic specificities in different non-variant typical speaking situations. The imitative and transformation excercises are necessary on this stage.

Situation-oriented stage helps to improve speaking skills in real communication. Communicative excercises and games have an efficient role on this stage.

The reseraches believe that game is the necessary language teaching tool. It strikes the high level of motivation and to interfere to communication environment. The second goal of our paper is to provide the integrative view on the problem concerning the speaking skills development within the life-long educational conception 2025. Thus, we believe that a teacher can suggest the excercises which can motivate students of a primary school efficiently. As physical activity is the efficient part of these age children development we believe that in-door and out-door games will help to increase the desire to learn and to speak more. Moreover these games orient children to be more disciplined, to organize and to do their actions, develop their physical abilities. F. Frebel gives further stages to organize the out-door game: to increase motivation and desire to play communication game, to understand the rules of the game, to control the game and to analyze the results of the game. That helps the child to identify, differentiate, substitute, and transform his activities as well as to improve his translation and speaking skills.

Ex 1. The game «Animals»

Look at the picture («Cat»). What is he doing? What can he do? – It is jumping. It is crawling, etc. Answer and show please.

The next (stereotypes-oriented) stage aim is to facilitate students' motivation during the lesson which help to improve more language skills development. We find that is it interesting to use mimics, poses, gestures which are the part of the speaking skills and the culture of people with different social background. Thus we provide the next games: expressive games, takesic games and proxemics games (V. Mizherikov, T. Yuzefavichus etc.). These games facilitate to organize interesting and non-standard classes, enlarge students' knowledge about different cultures and the social and cultural background of different peoples, and teach expressing the self-activity and self-expression which influence language skills development. Visual aids, speech patterns, pictures, audio and visual materials orient to more flexible communication.

Ex.2 Analyze the «crossing arms» position gestures in different countries and prepare the dialogue where you could show the role of this gesture.

Situation-oriented stage is the final stage to improve the language skills at school. We provide web-quests for this period. The reseraches (M. Andreeva, Ya. Byhovskiy, T. Kuznetsova, I. Sokol, etc.) consider web-quest as the web-site in Internet which has the problem-oriented game task. The specificity of the web-quest task is to find the necessary information in Internet to introduce it to each other, to organize the process to do the task, to evaluate and to find the right conclusion.

Moreover they learn to change the information, to motivate speak the foreign language more, to create more communicative situations which influence their speaking skills development. Hyperlink is the efficient means to reach the goal of the web-quest task.

Ex.3 Do the web-quest on «Animals protection»

Below we give the integrative model to improve the speaking skills development. We believe that this model enlarge the possibility of both teachers and students communicative environment development (on the example of outdoor games, non-verbal communication activities and web-quests).

```
┌──────────────────────────────────────┐
│ non-verbal communicative activities  │
└──────────────────────────────────────┘
                    │
              ╭───────────╮
             (  language skills )
              ╰───────────╯
          ↙                    ↘
┌──────────────────┐      ┌──────────────┐
│  outdoor games   │      │  web-quests  │
└──────────────────┘      └──────────────┘
```
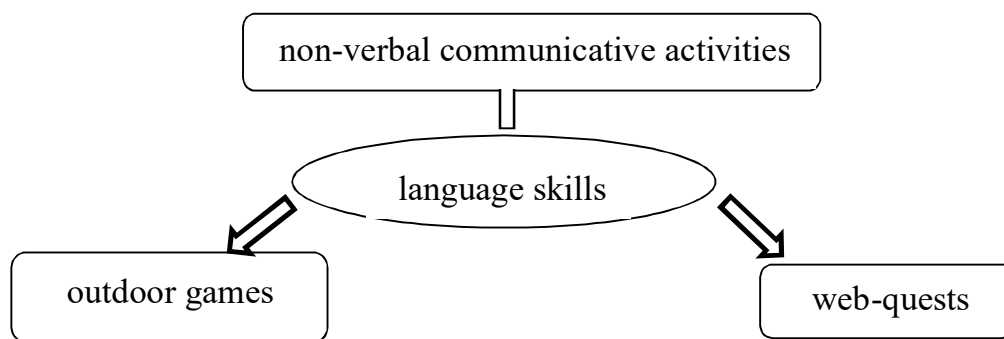
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TEACHING WORD FORMATION AND WORD COMBINATION

We looked at some of the principles of word formation in English. We noted that words can be formed by the addition of prefixes and suffixes – a process called affixation. (The word affixation is itself an example of the result of adding affixes to the root fix.) We also saw how, by compounding, two or more words can join up to make one. Thus: black + board = blackboard. Or, new words can be created by a process called conversion, when a word that in one context is one part of speech (such as a noun), in another context can be enlisted to serve a different function (such as a verb). Hence, you may have heard the relatively recent term to board as in The teacher boarded the new words and the students wrote them down.

Then again words can cluster (but not join up) to form multi-word units – loosely called chunks – that behave as if they were single words. For example, alongside black, the Longman Dictionary of Contemporary English lists: black and white, black and blue, black sheep, in the black and to black out. (This last is an example of a phrasal verb.) Many chunks have an idiomatic meaning – that is to say the meaning of the chunk as a whole is not directly inferrable from the individual words: He's the black sheep of the family; you've introduced a red herring, etc.

There are uncountless ways to bring happiness to my life thanks to the internet.

After finishing the paragraph and reading it again, I felt unsatisfy. I think that my real and only knowledgements are in the vocabulary.

A rule-based approach starts by isolating and highlighting any relevant patterns or regularities. Take word formation, for example. In a rule-based approach, words can be grouped and presented according to the manner of formation (affixation, compounding, conversion, etc). Within these categories finer distinctions can be made. So, of the words formed by affixation we can select those formed by the addition of

prefixes, and this group can be narrowed down further to those that have a negative meaning. The way these words are formed can then be described in general terms in the form of a rule – or 'rule of thumb'. Here is an example of such an explicit rule statement (from Gude K and Duckworth M, Proficiency Masterclass, OUP):

> B Negative prefixes. The prefixes mis-, dis-, ig-, and un- can all be used to give a word a rather negative meaning. The prefix may help you to guess the meaning of the word.
> mis- = 'wrongly, badly' or 'not done' (mismanage)
> dis- = 'away from, the opposite of, lack of' (distaste)
> ig- = 'not, lacking in' (ignorant)
> un- = 'not, lack of, the opposite, reversal or removal of' (undo)
> Here is some advice to help you choose the correct prefix.
> dis- can be used to form verbs, eg dissatisfy, adjectives, eg dishonest; and nouns, eg disability.
> The prefix ig- appears only before the letter n.

Here, on the other hand, is a table which suggests – but doesn't explicitly state – a rule about noun and verb endings:

1 Now you can strengthen the thin green line. Strengthen is a verb which is formed from the adjective strong. Work in pairs and complete this table.	ADJECTIVE	NOUN	VERB
	wide		
	strong		
	deep		
	weak		
	short		
	high		

from Naunton J, Think First Certificate, Longman

A similar approach is used with word collocations, wherever a general tendency can be identified. Here, for example, is a coursebook extract that focuses on the difference between make and do combinations:

VOCABULARY

Make or do?

1 Read the following sentences carefully.

Last night I tried to do my homework. However, I kept making mistakes because the man upstairs was doing his exercises and making a noise.

Make usually means to create, bring into existence, or produce a result.

Do usually means to perform an action. However, there are exceptions to this 'rule', as you will see in Exercise 3.

(from Bell J and Gower R, Intermediate Matters, Longman)

One problem with a rule-based approach is that the scope of the rule is not always clear. How many, and which, adjectives can be turned into verbs by the addition of -en, for example? Sweet and fresh — yes, but wet and dry? There is the added problem of the lack of one-to-one match between forms and categories. For example, in- and un- both express negation (uncertain, inactive), but in- can also be used with the meaning of in, or within (as in inclusive). And when do we use in-, as opposed to un- or non- or dis-, to convey negation? How, for example, does the learner know whether to use unsatisfied, dissatisfied, insatisfied or nonsatisfied ?

Other pattern-highlighting techniques involve the use of texts and include the following:

– learners are given a text and asked to search for and underline all compound nouns, negative prefixes, multi-word units, etc.

– learners find words in a text that are derivations. For example, 'Find three words in the text that are derived from sense ...'

– learners classify these derivations according to which part of speech they are

– learners categorise underlined words in a text according to a common affix, or according to the word formation principle they exemplify (compounding, conversion, etc.)

The more of these kinds of operations the learner does the better, since (as we saw in the last chapter) the more decisions the learner makes about a word the greater the depth of processing.

A great advantage of working from texts is that the words that are to be focused on are already in context, hence their meanings may be clearer than if presented as isolated words in a list. Also, and perhaps more importantly, the shared context will bring words together that are commonly associated. In the following text, for example, there are a number of words associated with time, crime and the law.

An approach to focusing on these features might be:

- Ask students to read the text and to answer comprehension questions to gauge level of understanding. For example:

1. The maximum time you can be detained without charge is:

a) 24 hours; b) 36 hours; c) 60 hours

2. You can be detained for 36 hours only if:

a) a serious arrestable offence has been committed,

b) a magistrate gives permission,

c) further questioning is necessary.

- Ask learners (working together and using dictionaries) to underline all words relating to legal processes, and to categorise these according to a) people, b) processes.

- Ask them to use dictionaries to make verbs for these nouns: limit, detention, charge, offence, questioning, suspect, and to make nouns of these verbs: arrest, detain, commit, extend, secure, preserve. Which of the verb forms can take -able to form an adjective?

- Ask them to circle all time expressions with numbers and note the prepositions used in each case.

- Ask learners to identify the verbs that fill these slots: _____ a person

without charge; _____ an offence; _____ a suspect in custody;

_____ a suspect before a magistrate; _____ a time limit.

- Ask learners to rewrite the passage in 'plain English', e.g. as if they were explaining it to a friend. Alternatively, ask them to translate it into their own language.

- Learners then use the rewritten (or translated) passage as a basis for reconstructing the original text. They then compare the reconstruction with the original.

- A follow-up activity might be to ask learners to research and summarise this aspect of the legal system in their own country (respecting, of course, their cultural sensitivities).

Note that this text, although short, is difficult and the tasks would be achievable only by quite advanced learners. Nevertheless, the same tasks could be adapted to much easier texts, and used at lower levels.

To summarize, then: the teaching of the grammar of word formation and word combination can be approached from two directions: early instruction in the rules, or the learning of a quantity of vocabulary items from which these rules are slowly distilled. We have looked at the case for a midway position that recognizes the need for early exposure but at the same time accepts that consciousness-raising through focused attention can speed up the process of 'getting a feel for it'. Plentiful exposure plus consciousness-raising is a key principle underlying what has come to be known as a lexical approach.

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ACTIVATION OF STUDENTS AT THE LECTURES

Lectures are the main way to quickly and effectively pass the most up-to-date information to the students. Lecturing potential, knowledge of a subject, commitment to some idea, emotionality, the voice, diction, clear and correct speech, appearance, proper conduct in front of the audience, having an eye for the audience, knowing how to feel and contact the audience – there are the basic requirements for lectures.

Activation of learning activity provides for obtaining by a student the knowledge and skills based on which he or she gets the ability to obtain new knowledge without any assistance. This refers to all methods of education activities but especially to lectures as the principal method of teaching.

A lecturer should attract, hold and catch the interest of the audience with a discussed idea, should spark imagination.

Lectures allow to most effectively conduct the worldview training of future specialists, they give the direction of formation of their scientific knowledge, convictions and professional interests.

Lectures can offer relatively primary cognitive activity to students. Moreover, some researchers maintain that the scope of education material that keeps in the students' memory right after the lecture amounts to only

30 – 65 % of the whole lecture being read. And in a few days it drops even below [7]. This may create the impression that lectures play a restrictive role in the education process. Meanwhile, this is wrong.

Lecturing lays a foundation for scientific knowledge, gives good theoretical grounds for the studied science, introduces students to the methods of research, serves as the starting point and sets the direction of the student's work regarding other methods of education activities.

A good lecture evokes the student's mind, makes the student put thoughts into the subject of the science and search for answers to outstanding questions, it also opens up new horizons to the audience. Generally, lectures are read by the most qualified teachers. It is them who can have the most emotional influence on the students and make them feel involved which is so useful for the education process.

Lectures are the main way of quick and efficient transferring of the most up-to-date information to the students. Laboratory activities, for instance, are always a bit behind the scientific and technical development rates due to time consumption for getting difficult-to-obtain equipment and the preparation of new teaching techniques. No textbook or study guide can keep up-to-date with the newest information brought by science and technologies. The new education material told at the lecture is well absorbed by the students if it **activates the cognitive activities.** That is why the key point of a lecture is to evoke the active attention of the audience, to move their thoughts towards the thoughts of the lecturer.

Good understanding and well-organized work of the students at lectures may be reached, first of all, by the content of the lectures, their well-defined structure, by applying the attention keeping techniques and following all the basic lecture requirements. If this work is done correctly, it significantly strengthens the pedagogical role of lectures. They provide for the activation of cognition and performance capability of the students, develop and foster a love for work and develop the interest to the subject [6]

The educational function of the pedagogic process includes:
– forming in the students the system of scientific, technical, technological and production knowledge – facts, laws, patterns, theories, phenomena, and processes;
– forming in them the general scientific, polytechnic and special professional skills;
– forming the application of knowledge skills and the skills of educational and production task solving;
– solidifying, developing, increasing and deepening the obtained knowledge, and skills.

The development of **activity and cognitive capacity** of students takes place in the process of finding answers to the outstanding questions they have or during the attempts of solving the tasks brought up by the pedagogical process.

Now, let us move on to examination of basic techniques of improving creative activity of students at lectures which are described in the literature [1, 2, 3, 4, 5]. The activation techniques are given in Table 1.

Table 1 – Students activation techniques at the lectures

1. **A striking fact arousing the interest of the audience**
2. **Highlighting the history of development of the science being studied**
3. **Appealing to the direct interests of the audience**
4. **Using the scientific research work of the students**
5. **Rhetorical questions**
6. **Demonstration of life and work of the leading figures of science and technologies**
7. **"Paradox situation" technique**
8. **Key element of the lecture**

Equally important is **the external form of expression** of a lecture: it should be interesting, inspiring and emotional.

Emotionality, affecting the cognition, memory and attention, activates the cognitive activity of students.

The emotional and exciting ending of the lecture is the key to the students' interest at the beginning of the next lecture.

A vigorous and exciting way of giving a lecture, undoubtedly, attracts the audience. Students listen to such lectures with acute fascination.

The main task of a university lecturer is to efficiently organize the work of the students at the lecture, which is based on **the active process** including listening, understanding and comprehending the material and transformation of the obtained information into the form of brief notes helping to quickly recollect the basic content of the attended lecture [7].

Improvement of lectures as the principal organizational form of education should be carried out along with development of all other types of educational activities and with the problems of activation of seminar and laboratory activities which deepen the knowledge and help to exercise creativity of the future professionals.

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THE EFFECT OF PSYCHOLOGICAL PERSONALITY TRAITS ON THE DYNAMICS OF PERFORMANCE IN A CYCLING RACE

Abstract. This issue is important nowadays, and in this article we analyze how psychological personality traits help to show strong motivation towards reaching high performance by an athlete

Key words: psychological personality traits, emotional and volitional traits, motivation, decision, tolerance

Soviet psychology recognized S.L. Rubenstein's concept stating that the effect of external factors on a person is mediated by the internal environment. Therefore, same external effects may cause different reaction. Regarding athletic training it indicates a necessity of individualization of training with consideration of the athlete's psychological personality traits.

In order to substantiate the ways of individualization of training of highly-qualified cyclists the research of psychological personality traits effect on the competition performance dynamics has been carried out.

The research tasks were:

1.   To reveal the significance of certain psychological traits effect on the performance in a competition;

2.   To analyze the psychological traits effect at different stages – at the beginning and in the end.

Methods. The research investigates the correlation between the cyclists' performance in a competition and the records of psychological personality traits of an athlete, including the typological properties of a nervous system, personal temperament characteristics, the records of psychic tolerance and the motivation towards sports activities.

The first stage of a race, first of all, includes the strength of sport motivation and the need for achievements. They characterize the level of actualization of personal motivation sphere.

Another group of indicators involves the mechanism of assessment of the level of uncertainty of the competition situation and assessment of the possibility of achieving success in this regard. It is mostly the emotional and volitional traits: intolerance of internal uncertainty stressors (lack of self-confidence) and the following Cattell's test factors: A – schizothymia – cyclothymia, C – affective tolerance, E – dominance, H – courage, M – imagination as well as tension, anxiety, extraversion and independence.

For the sake of brevity let us limit our analysis to examination of psychological personality traits connected with the maximum percent of high or low performance. The possibility of high performance increases with low indexes of anxiety, tension, achievement need and high indexes of independence, extraversion, courage and dominance. The last-mentioned traits make an athlete more optimistic in predicting the result of performance, contribute to formation of an adequately high self-confidence and create good background for the optimistic mood during the performance. Furthermore, the traits determining the increase of self-organisation, awareness and tension also make certain contribution to achievement of good results. These traits include intolerance of internal uncertainty stressors. Apparently, high performance is achieved by athletes in the state of optimal excitement (the average between totally relaxed state and tension). Therefore, best results in the first race are most likely to be shown by athletes with a medium level of sport motivation, a medium level of affective tolerance and a medium level of susceptibility to imagination. Comparing personality traits connected with a maximum percent of low or high performance we may realize that the law level of anxiety and total tension as well as the medium level of affective tolerance are relevant to the maximum percent of high performance, while low affective tolerance, high anxiety and total tension are relevant to the maximum percent of low performance.

The medium level of imagination signifies the maximum percent of high performance, while the maximum percent of low performance can be attributed to the high level of susceptibility to improvisation of results. The attention should be paid to the psychological personality traits the significant effect of which appears to be connected with the highest percent of both, high and low performance. Among these are such traits as courage, independence, extraversion and dominance.

They have an impact on the self-assessment of the athlete's potential thus increasing the level of ambitions and motivating the athlete towards not only dynamic actions but also to unreasonable risky moves. The results of the activity may be inconsistently effective, i.e. unreliable.

Hence, it follows that when working with athletes possessing the mentioned personality traits it is necessary to provide for control actions reducing the likelihood of low performance. Such actions may involve setting a certain task for the race considering the particular conditions of the competition and reducing the likelihood of a bad start, as well as estimating an individual dose of motivation.

Pretty high intelligence level allows them in the extreme conditions of a competition to keep the ability of being realistic about the situation and making correct tactical decisions. During the race an athlete remains in the situation requiring making decisions on their own. The athlete may rely neither on the coach's advice nor on the support from his or her mates. In this case it is the personal ability to keep the chosen course of action that affects the success of performance in a competition.

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PROBLEMS OF TRANSFORMATION OF POLITICAL SYSTEMS IN THE ARAB WORLD

Abstract. Socio-political processes in the Arab world, the nature and prospects of their development are largely determined by the political system that has developed in these states, the peculiarities of its functioning and the main trends of evolution. The problem of transformation of the political system remains relevant for many countries of the modern world. The topic is of great interest to a wide range of public and experts in the field of international relations, as the object of the study will be the current global conflicts, in this case, the problems of the Middle East.

Key words: transformation of political systems, Middle East, political processes, factors of Arab revolutions

Modern Middle East and North Africa are involved in the processes of revolutionary transformation of political systems, conventionally called the "Arab spring". Despite the obvious prerequisites for the destabilization of the old regimes, the violent change of the political regime and the numerous victims came as a surprise to analysts. The systemic crisis led to violent regime changes in Tunisia, Egypt, Libya, Yemen, and the civil war in Syria. To a lesser extent, the turmoil manifested itself in all the countries of the Arab East. Each of the countries had its own specifics, political and socio-economic prerequisites and conditions were manifested, but radical political transformations occur at the same time, develop in a similar way and have similar features. The researchers agree that at the beginning of the XXI century a wave of revolutions swept through the Arab countries, the consequences of which did not appear until the end, but already quite clearly traced patterns that require scientific explanation.

After the Second World War, the colonial empires of the West began to disintegrate, new independent States were formed. In particular, in 1951 Libya gained independence and state unity, formerly the Anglo-French trust territory. In 1952, the organization "Free officers" headed by G. A. Nasser made a Patriotic military coup against the Pro-Western monarchy, proclaiming the ideas of Arab unity, Islamic socialism and

modernization along the "non-Western" path. Similar revolutionary processes unfolded in 1954-1962 in Algeria, in 1957-1957. in Syria and Iraq, in 1962 – in Northern Yemen, since 1967 – in southern Yemen [1].

The decolonization of Asia and Africa has led to a dramatic increase in the number of independent authoritarian governments. In some countries of the Arab world (Tunisia, Morocco) there was a cautious liberalization of political systems according to the Western scenario. But in all countries modernization was of a wave, cyclical nature and did not lead to a radical breakdown of traditional political institutions and practices. On the contrary, the adaptation of the original Westernizing, liberal norms and institutions, forms of subjectivity of politics to the Islamic traditional society was growing. This applied to constitutionalism, to the choice of forms of political regime and government, to pseudo-multiparty systems, and to the degree of autonomy of the media and public opinion from the government.

The problems of transformation of power and political governance in the transition to a modern type of society are relevant in the Arab world. During the period of political modernization, the relationship between traditional and basic values, national and religious identities, and democracy is established. In Muslim countries for a long time there was a way of traditional society in an unchanged form, which was preserved through the appeal to Islam not only in the private sphere, but also in public relations. Islam influences political behavior, determines mentality, traditions and way of life. In this regard, modernization, including in the political sphere, is proceeding very painfully and slowly, and in many societies (Libya, Yemen, Iraq, Syria) there was a "failure" of modernization and the systemic archaization of the political system is developing.

Today, Islam is growing in popularity in the Arab world. Its values and norms of behaviour are handed down from generation to generation, defining the civilizational tradition and creating sustainable forms of political worldview. With the increasing importance of Islam, we see how, on the one hand, the traditional institutions of society are being revived and strengthened; on the other hand, the contradiction between the religious and political order is intensifying, the trends of archaism are developing, covered by radical religious slogans. Thus, Islam appears as a powerful political force that cannot be ignored. The change of political regimes in the Arab world is always, one way or another, connected with the Islamic religious justification.

Despite the variety of political modernization in the Arab world, the beginning of the twenty-first century reform developed mainly borrowed in the West pattern. Arab societies have a large share of the public sector in the economy, and private enterprise is in close symbiosis with the state bureaucracy. Representatives of the latter are headed by public sector enterprises, which work closely with private firms. This leads to the merging of the interests of the state body of managers and large private capital. This is how the statist system develops, which prevents the development of competitive private production, small and medium-sized businesses, does not allow the market economy to develop fully, suppressing civil initiatives. However, the massive privatization that took place in the Arab countries in the 1990s and 2000s does not ease the political situation. Large entrepreneurs behave selfishly, neglect national interests, and the state has reduced its ability to control economic and social development. Denationalization of budget-forming sectors of the economy restores the heavy dependence of Arab countries on transnational corporations.

Among the main factors of the revolutions in the Arab countries should be called the delegitimization of the ruling elites and the political regime, especially manifested in the environment of the educated class of capitals and large cities, while the ruling class was not going to give up power in any way, political practice remained unchanged [2]. Thus, the prospects of legal rotation of power as a result of the elections and the gradual evolution of the political system, mainly associated with the democratization of the political regime, were reduced. Accordingly, social tension grew and the probability of revolution as a radical means of transforming the existing situation increased.

At the same time, it is necessary to take into account the demographic factor, especially evident in the protests of young people against the old regimes [3]. The conflict between the rich and the poor, the low level of social guarantees and the inability of the state to regulate and prevent the split of the ruling elites are relevant and obvious factors of revolutionary changes. Less obvious, but significant is the factor of split of elites. Conflict within the elite, first, reduces the effectiveness of government, dispersing the actions of the bureaucracy; secondly, as a result of the split formed several political centers that claim to power. Thus, the realization of selfish interests and the struggle for political domination come to the fore, leaving aside the improvement of life.

One of the main factors of the "Arab spring" is the liberal transformation of the socio-cultural sphere. The level of education was improving, and women were entering prestigious Arab universities on an

equal basis with men. Despite this, a large percentage of the illiterate population remains. In Middle East and North Africa, one third of young people cannot read and write. The level of education is unevenly distributed across countries: in Libya, the number of educated people is higher than in Tunisia, and in Algeria, higher than in Egypt and Morocco [4]. But the existing number of educated young people was enough to become a powerful revolutionary force, demanding to bring in line with the status obtained as a result of education, the level of material well-being. Thanks to the education system, which has become the bearer of the ideals of freedom of thought, equality of rights and respect for human dignity, there have been important changes in the public consciousness, young people do not reject, moreover, shows an interest in liberal values, perceives democracy as a standard of successful development, drawing an analogy with advanced capitalist countries. Attention should also be paid to changes in the socio-demographic indicators of the Arab States of North Africa and the Middle East. Half of the population is young people under the age of 20. The average age of the population in the Arab world is 25 years, and in European countries – 38 years [5].

The enlightenment and liberalization of consciousness of the most active, susceptible part of the population - urban intellectuals and officials did not crowd out traditional values. Islamic traditions remain strong. Islam in the countries of the Middle East is the basis not only of private life, but also largely determines the public sphere. Where democratic traditions and cycles of democracy and authoritarianism are systematically ordered, there are no sharp leaps in development associated with a change in political course. In our opinion, it is precisely these factors that determine the cyclical trajectory of the Arab revolutions. Islam imposes restrictions on the behavior of the protesters, and the lack of democratic traditions leads to constant fluctuations in the ideological vector.

The main revolutionary factors in the countries of North Africa were: the incompleteness and cyclical nature of modernization; increase of social and economic problems; the inefficiency of political governance, above all - patron-client relations and corruption; delegitimizing not only the ruling elite, but also the political order as a whole; socio-demographic indicators: excessive population growth, increasing levels of urbanization and education; folding social "segments" of supporters of liberalization - metropolitan intellectuals, some entrepreneurs and officials.

Technologies for revolutions include non-violent methods of destabilizing overthrown regimes through the activity of non-governmental organizations. Information and communication technologies make it possible to use social networks and the Internet to quickly and effectively program public opinion, manipulate the possibilities of overthrowing unwanted regimes [6]. In social media (Twitter, Facebook, etc.) search and rallying of supporters, their ideological processing, articulation of requirements are carried out. The use of Internet technologies makes it possible to make the creation of opposition networks fast and cost-free, gives "loopholes" for violations of laws.

The destabilization of political systems in the 2010s is due to long-term geopolitical and socio-cultural, demographic factors, the impossibility of success of social and political modernization in copying Western liberal models. The structural conditions of the revolutionary crisis of 2011-2013 included a high level of economic growth, demographic "overheating" of society due to the decline in mortality and increase in the level of education, and, consequently, the status expectations of young people. In Egypt and Libya, Internet-based social media technologies, supported by Western funding and technical support, have played an increased role in destabilizing and deposing patrimonial regimes.

To sum up, the modern Arab revolutions were based on the ideas of democracy. But the main real result of the "Arab spring" was not the establishment of democracy, but the overthrow of the old regime, the achievement and preservation of power by political elites in their own interests. In societies that have not undergone a full cycle of modernization, democracy is used in the revolutionary struggle as a declared goal, but after the revolution, the establishment of genuine democratic institutions does not occur. Initially inflated demands for revolution, associated with cardinal and rapid changes, lead to emasculation and imitation democracy, so as unrealistic demands fulfill cannot be. As a result, the country may experience economic and social collapse, and the democratic regime will fall, becoming unpopular.

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SECTION IX. Ecology

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APPROACHES TO WASTE MANAGEMENT IN RUSSIA

For several years in Russia there has been a significant increase in the amount of waste, which is caused primarily by an increase in the population, and consequently, by an increase in the volume of consumed products, as well as by the emergence of a large number of disposable packaging. However, at the moment we are not ready to properly solve the problem of waste disposal. In Russia, the share of waste processing is only 4-6 % while in the European Union countries up to 60% of solid municipal waste (MSW) is processed [1]. Thus, in Russia, most of the garbage is sent to landfills and unauthorized dumps. The amount of accumulated waste is growing, the territory of the country is being cluttered up. All this entails the need to develop other methods of waste processing, which, firstly, will not be environmentally hazardous, and secondly, will meet the sanitary and epidemiological safety requirements of the entire system of collection and disposal of MSW, and, thirdly, will be effective from a technological point of view.

At the moment, about 94 % of all waste in Russia is sent to dump sites, where they lie for many years. This is already a serious environmental problem affecting both the state of nature in general and the health of people living near such landfills.

About 60 million tons of MSW are produced annually in Russian settlements. At the same time, an average of 0.4 million hectares per year is allocated for garbage storage, which is comparable to the total area of the largest cities of Russia – Moscow and St. Petersburg [1]. The existing system of control over the generation and disposal of waste, due to its decentralization, does not allow obtaining reliable information on the actual volume of waste generation both in Russia as a whole and in individual regions. This has led to the formation of numerous spontaneous, unauthorized dumps. The area of authorized places for garbage storage is more than 4 million hectares [2].

In connection with the growth of the urban population there is a need for urban areas. Every five years, the size of residential land increases by an average of 20 %, which leads to an increase in the distance to MSW landfills and, consequently, transport costs. The average distance of MSW disposal in Russia is 20 km, and in large cities with the population of more than 500 thousand people it increases to 50 km or more. As the statistics show, the range of MSW disposal annually increases by an average of 1.5 km, and the cost of its transportation, respectively, increases by 15-20 %. Due to emissions of harmful substances from vehicles carrying garbage, the level of air pollution is also increasing. However, the approach of landfills to urban areas is impossible, because it increases the degree of environmental risk [3].

Do not forget that when placed on landfills, tons of valuable raw materials such as paper, glass, metals, plastic, etc. are irretrievably lost. According to some experts, these components account for more than 40 % of MSW, i.e. about 15 million tons annually [1].

And most importantly, landfills pollute the soil, groundwater and surface water, as well as the atmosphere, emitting carbon dioxide, methane, hydrogen sulfide, mercaptans, etc. Of the total number of landfills only 8 % meet sanitary requirements, the majority are significant epidemiological danger, and they disrupt the natural landscape [4]. If the problem of landfills will not be solved in the coming years, it can lead to a global environmental disaster, the beginnings of which are already visible now.

Another method of MSW disposal accounts for 2 % of the country's garbage. Waste incineration has its pros and cons. On the one hand, waste

incineration plants can help solve the problem of the endless landfills. Also in this process, the output energy is formed, which can be used to generate electricity and heating. However, atmospheric emissions and the problem of ash disposal from waste incineration prevent the widespread use of this method of waste management.

When choosing the way of disposal of MSW by incineration, the determining factor should be the use of multistage system of purification of exhaust gases and continuous automatic control of air emissions. This implies the main drawback of the waste incineration plants in Russia – the difficulty of neutralizing the gases released into the atmosphere from harmful impurities, especially from dioxins and nitrogen oxides. Waste incineration plants use a single-stage gas purification scheme, which does not allow their complete destruction and can cause air pollution [4]. However, it is worth noting that at present, technologies for deeper gas purification have already been developed.

During the combustion process in MSW incinerators along with the flue gases two types of waste are formed: slag and ash. An important task in the operation of the waste incineration plants is the disposal or dumping of toxic ash and slag, the mass of which is up to 30 % of the dry mass of MSW.

Thus, the most common current methods of disposing MSW in Russia not only do not lead to significant results, but also adversely affect the state of the environment. However, there is another method of recycling, which, however, is currently underdeveloped in our country.

Calculations show that selective waste collection with their subsequent processing is the most economically justified of all known strategies of reduction the volume of MSW deposition at landfills [5]. This method is the most environmentally friendly. However, the current waste collection system in Russian cities does not provide for the separation of MSW flows into different fractions, the separation of hazardous waste from the total volume, or the collection of secondary raw materials.

The main purpose of separate collection is the distribution of the total volume of MSW into three main flows with their further processing:

• "Dry" waste, which is further sent to material recovery facilities (MRF) for professional sorting of secondary raw materials by types, categories and grades;

• "Wet" waste may undergo aerobic (composting) or anaerobic fermentation. In this case, about 140 m^3 of biogas or 410 kg of compost, a valuable organic fertilizer, can be obtained from 1 ton of waste [6];

• "Tailings", other non-recyclable waste, may also undergo sorting and subsequent fermentation. However, the costs in this case are very high, the quality of secondary raw materials and compost is low and sale is problematic. Such measures solve the problem of neutralization and reduction of the flow before burial rather than obtaining marketable products [7].

The waste management system, based on the selective collection of MSW, involves the active participation of the population, to which our society is not yet ready. Therefore, it is necessary to change the current level of environmental awareness. You should also generate the corresponding economy and organization mechanism, which includes a set of interrelated activities needed to implement the selective collection of MSW.

The amount of annual losses in the country's economy due to the lack of a separate waste collection can be estimated at 232.8 billion rubles [1]. This once again should encourage the government to make a difficult but incredibly important decision: to invest in recycling now for the sake of salvation from garbage slavery in the future.

Thus, the difficult environmental situation in the country is largely a consequence of the constant increase in the amount of industrial and domestic waste and their unsatisfactory processing. Russia is overgrown with garbage, and this is the fault of each of us, because each person generates an average of 400 kg of garbage per year.

Obviously, to make production wasteless is impossible, in fact, it is impossible to make consumption wasteless as well. The popular modern principle of Zero Waste has an important goal: to reduce significantly the size of waste going to landfills and waste incineration plants. This policy should be followed by the "smart cities" of Russia. To do this, it is important to implement a number of global changes: to minimize the amount of garbage produced by the city, then invest in its distribution and, ultimately, properly recycle waste to obtain secondary products. At the moment, no region of Russia can "boast" compliance with all of the above.

If we start processing waste now, according to experts, by 2030 the number of buried garbage in Russia will be reduced by 75-80 %, and that means that the number of dump sites will also decrease. The new sphere will give new jobs, will save energy and the state budget. Tempting, isn't it?

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**ECOLOGICAL ANIMATION
IN SMALL TOURIST COMPLEXES**

An animation program is a plan for tourist, physical culture, mass cultural, educational and amateur activities united by a common goal or plan. Animation programs at the same time with purely recreational activities include a variety of sports games, exercises and competitions. Such a combination makes these programs richer, more interesting and useful for strengthening, restoring health, therefore, in the relationship between tourist animation and sports, the greatest recovery and health effect is most often achieved. Real animation programs are often complex in nature, and the listed types of animation are the constituent elements of these programs.

Ecotourism (ecotourism, green tourism) is a form of sustainable tourism that focuses on visiting the areas that are relatively unaffected by the anthropogenic impact of natural areas. The distinction of ecological tourism is in the priorities of tourists who aspire first of all to communicate with nature, to know its objects and phenomena, to actively relax outside. The most popular activities of ecotourists are hiking, bird watching, film and photography, eco-safaris, living in tent cities, visiting the mountains and mountaineering, fishing and water tourism, botanical excursions, archaeological and paleontological tourism.

Animation activities at a tourist enterprise should be carefully planned, regulated and organized both financially and methodically. Tourist animation is a tourist service, in which a tourist is involved in active action. In the preparation of animation programs such features of tourists as gender, age, nationality, as well as the active participation of tourists are taken into account.

The aim of our study was to create an environmental animation program based on a small tourist complex near the village of Pyaozersky (Karelia). Guest houses are located on the picturesque shores of Lake Tukhka, in the village of Pyaozersky, Loukhsky district of the Republic of Karelia, where three people (families with children and middle-aged people) come during spring and summer periods. Houses can accommodate 4-10 people. Next to each house there is a bath. The houses have stoves, gas, bedding and necessary utensils, all the houses and baths are equipped with lighting (from the gas generator). For summer period, sheds with a table, a bonfire site, a grill and a smokehouse are arranged next to the houses.

Drawing up the program we took into account the fact that tourists come to Karelia, mainly for 3-5 days to hunt and fish, so fishing is planned for them in the morning. At lunchtime there is a program and excursions. Most of the second half of the day is free so that the vacationers do not experience strong loads from the environmental program and can be alone with themselves. In the evening we have developed various activities for all age groups of tourist. Ee picked up and adapted ecological games to this area for children in accordance with age (younger, middle and senior school age). Also, according to our data, the main focus of ecotourism in the village of Pyaozersky falls on ecological trails and hiking routes to various natural sites, so we formed a three-hour walking route in the environs of the village Pyaozrsky "Beauty of Karelia" including a visit to the waterfall "Tuhka-Padun."

Animation program "Karelian Patterns"

1st day.

5pm – Acquaintance, relaxing together. Crafts workshop "Gifts of the Forest." For all age groups. Venue - the veranda of one of the houses.

19:00 - Kebabs. Bard song. Focused on adults of middle and older age. Location: Lake Tuhka.

Ecological game «Let's be friends with nature». For children of middle and senior school age. Location: Lake Tuhka.

2nd day.

8:00 - Fishing (for those who wish). All age groups holidaymakers. 11:00 - A three-hour walking tour of the "Beauty of Karelia" neighborhood. Visiting the Tukhka-Padun waterfall. All age groups of tourists take part in the excursion.

19:00 - Intellectual game «Connoisseurs of Nature». For children of middle and senior school age. Boating for all age groups. Venue: Lake Tuhka.

3rd day.

8:00 - Fishing (for those who wish). All age groups.

11.00 - Three-hour excursion to the nature museum of Paanajärvi National Park. All age groups of tourists take part in the excursion.

19.00 - Sports and environmental relay "Clean City". The program is aimed at all age groups of holidaymakers, with the exception of the elderly. Location: Lake Tuhka.

4th day.

8.00 - Fishing (for those who wish). All age groups.

11.00 - Summing up the competition "Gifts of the Forest." Rewarding families. Venue - the shore of Lake Tukhka.

Thus, on the basis of the research we have developed a draft environmental animation program for a mini-tour complex, which should not only increase the attractiveness of the hotel, but also meet the needs of the family for communication, entertainment, activities and active rest. In this case, the animation program includes the forms of leisure activities that are popular in all age categories.

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PROBLEMS OF THE ECOLOGICAL CONDITION
OF THE SMALL RIVERS

Abstract. Article is devoted to problems of an ecological condition of the small rivers. Aspects of anthropogenic influence on small waterways are considered. Also is need of carrying out timely monitoring of river waters and actions for their preservation is established.

Keywords: pollution, ecological state, small rivers, disappearance, monitoring

There is a big environmental problem – pollution and destruction of the small rivers. They often become soiled the local enterprises. Till today some of them, first of all that are in small districts, are not equipped with any treatment facilities. Very often they practically do not carry out the functions, do not work.

Unfortunately, exists and other dangerous phenomenon is a contamination of a coastal zone of the rivers, the population simply turns them into garbage holes. A condition of such rivers deplorable, they really are on the verge of disappearance. It concerns the small rivers near the large cities.

At present many ecologists work over problems on reorganization of the rivers, returns of water to them. It is recommended to equip ecological posts in many regions. Together with the population on them problem sites in the polluted territories of the rivers have to get out and there works on territory cleaning have to be carried out. It is offered to cooperate in this question to local authorities and the population: it is necessary to give information to the population. To organize seminars, to exchange experience with other areas. It is necessary to develop a practical grant on methods of an assessment of a state and pollution of the small rivers. To acquaint the population with the textbook of methodic.

It is necessary to conduct monitoring of a condition of waters in the rivers which, unfortunately, is at the initial stage and if it is carried out, only it is selective. For example, it is established that where the agriculture is conducted, there "the problem of pollution of waters starts being shown by ammonium nitrogen and phosphorus". It allows to conclude that the problem of pollution of the rivers drains is really actual.

Unfortunately, not all consider so, many officials in it do not see any problem and think that in some cases ecologists exaggerate a problem of pollution of the rivers. For example, in their opinion, it is not necessary to conduct works on cleaning of the rivers from vegetation on coast and in water. "It is impossible to clear the river of each leaf and the broken bush. It only will break natural processes".

Nevertheless, the huge blow, in certain cases, the irreparable is struck to an ecological condition of the rivers. Especially it actively became in Soviet period. For example, there was a tendency of drainage of bogs and the small rivers that led to negative consequences for all environment. Removal of marsh water from meliorative territories led to fall of level of ground waters that changed water, atmospheric and thermal modes of the district where these events were held. Territories from which take away waters, strongly change: the fauna, vegetation change, harm to local population is sometimes done, the rivers, as well as wells in which locals can extract water become shallow and dry up. On peat bogs the vegetation vanishes, processes of thermal and microbiological disintegration of peat can develop that in turn leads to increase in risk of forest fires.

Thus, one of very important environmental problems - a problem of pollution and disappearance of the small rivers is designated. It is possible to emphasize importance of preservation of natural heritage for future generations, in particular preservations of water resources. Joint forces of ecologists, nature protection bodies and the population it is necessary to organize actions for monitoring and cleaning of small water currents.