



**SSUGT**  
SIBERIAN STATE  
UNIVERSITY OF GEOSYSTEMS  
AND TECHNOLOGIES

## Vestnik SSUGT

Scientific magazin  
Published since 1996  
Issued 4 times a year

**Issue 2 (34). 2016**

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Before 2015 г. Magazine  
was published under the name  
«Vestnik SSGA»

The journal is included  
in the List of refereed scientific  
journals, recommended  
by HAC for publishing the  
scientific results of dissertations  
in candidacy for a degree  
of Candidate or Doctor  
of Science degree

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**Registration certificate**

ПИ № ФС 77-62654  
от 10.08.2015

**Subscription indexes****in catalogues:**

«Russian press» – 43809  
Electronic catalogue  
«Russian periodicals»  
(www.ideg.ru) – 43809э

Magazine included in Russian  
Science Citation Index (RSCI)

**Layout editor of magazine**

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630108, Novosibirsk,  
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**English translation**

D. V. Romanov

**Editor**

E. K. Dehanova

**Desktop publishing**

K. V. Ionko  
N. Ju. Leonova

Signed to print 24.06.2016.  
Format 70 × 100 1/16.  
Conv. pr. sheets 17,90.  
Circulation 1 000 copies.  
Order 105.

Printing and publication  
department SSUGT  
630108, Novosibirsk,  
10 Plakhotnogo St.

Printed in map printing  
laboratory SSUGT  
630108, Novosibirsk,  
10 Plakhotnogo St.

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## **ALGORITHMS FOR DIRECT COMPUTATION GEODETIC LATITUDE AND GEODETIC HEIGHT IN RECTANGULAR COORDINATES**

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Currently active is a practical implementation of the state geodetic coordinate system, 2011 on the territory of the Russian Federation. In this regard, entify a need clarification the mathematical and methodological foundation for the comparison of the parameters of the earth ellipsoid under transformations of coordinate systems, coordinate transformations, and solution of problems arising from the coordinate transformation from the local coordinate systems in national. Addition should be taken into consideration account the outcomes of the program by the construction of modern satellite State Geodetic Network Russian of three levels (TAGS, GHS and GHS-1), as well as the accuracy of its connection with geodetic networks of triangulation and polygonometry 1-4-th class. When construction of global geodetic networks associated with processing of satellite observations, and the solution of geodetic problems to determine the position of points on the earth surface are applied the spatial rectangular coordinates and geodetic coordinates . In this context arise the problem of transforming these systems of coordinates. The article proved mathematically sound high-precision non-iterative method of procedure for the direct calculation of geodetic latitude and altitude from the initial data - three-dimensional rectangular coordinates.

**Key words:** mathematics, astronomy, cartography, geodesy, geodynamics.

## **PROCESSING OF SPECIAL-PURPOSE GEODETIC NETWORK IN THE PROJECTION ON THE CUTTING PLANE (FOR EXAMPLE KIROV RESERVOIR IN THE KYRGYZ REPUBLIC)**

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In Kyrgyzstan, as in other CIS republics (Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan) work in a new system of coordinates SK-95. In contrast to SK-42, SK-95 may be used for in mobile satellite technology and techniques of measurement systems GPS, GLONASS. Today we have an opportunity to represent Kyrgyzstan on the same sheet of scale 1:1000000. However, the projection of Gauss – Krüger gives a large distortion, especially at the edges 6° and 3° areas, about 0.20 mm to 1 km. Therefore, it is proposed to use the second projection neglected with low distortion for engineering-geodetic activities in the national economy, with precise mathematical relationship with the state projection Gauss – Krüger. The article discusses the question of the application of special geodetic projected geodetic engineering and survey work on the example of the Kirov reservoir in Kyrgyzstan. In a practical example illustrates the effectiveness of special geodetic projection, Gauss – Kruger, provided. designing a network is not more than 250 km in diameter.

**Key words:** distortion, conformal projection, cutting plane, system of coordinates, special-purpose geodetic network.

## **INFLUENCE OF DIFFERENTIAL AMBIENT TEMPERATURE ON A COLLIMATION DIGITAL LEVEL IN CONTROL OF FOUNDATIONS OF BUILDINGS AND STRUCTURES**

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In the process of surveying works geodetic level can suffer temperature influence of environment: when taking the device from the case, working in hot shop, giving reference point from indoor to outdoor position and in other cases. The paper gives the results of angle  $i$  change of digital geodetic level Trimble DiNi0.3 in sharp temperature shift from 16°C to 28°C. The surveying was conducted in summer and winter period: the angle  $i$  was multiply measured at first in laboratory, then in field conditions. It is stated, that in 1°C temperature change the angle change does not exceed 0.5". The application of digital geodetic level lets enlarge acceptable difference of station shoulders from 0,2–0,4 to 2,0 m.

**Key words:** digital level, collimation, calibration, temperature influences, measurement height differences, geometric precision leveling.

## **TIDAL EFFECTS BY GRAVITY OBSERVATION, MODELS AND LIQUID CORE EFFECT**

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Results of tidal investigation used for Earth structure study and Liquid Core study. Tidal deformation modelling was use for numeral solution of differential equations system. Theoretical results compare with experimental data received by tidal program analyses. Dynamic effect of Liquid Core is important part of tidal investigation. Compression of Liquid Core, as the result of our experimental study is the object of our investigation. Tidal analyses were develop with two years series of gravity data. We used gPhone 111 gravimeter data from Shultz Cape station (south Primoria, Coast of Japan Sea, POI FEB RAS).

**Key words:** dynamic effect of liquid-core, tidal variations of gravity, gravimeters, compression of liquid-core.

**DETERMINATION OF INITIAL LEVEL FORM OF ROTATING AXE SYMMETRICAL EARTH MODEL IN MOTIONLESS SPATIO-TEMPORAL KERR METRIC**

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For derivation of formulae of relativistic effects it is necessary to know coefficients of spatial-temporal metrics (metric tensor), which can be driven from Einstein equations. In 1963 R. Kerr managed to find exact solution of Einstein equations in case of axe symmetrical rotating body. This spatial-temporal method can also be used in geodesy. Our work investigates the form of initial level form of axe symmetrical rotating Earth model in motionless spatial-temporal Kerr metrics. Relativistic geoid represents a 2 dimensional surface, in any point of which the clock running speed of the observer on this surface is the constant value. That is why for derivation of equation of initial level of axe symmetrical Earth model in reference system of motionless observer in the equation of interval Kerr metrics the coefficient of time coordinate was accepted as equal to a constant. This constant is tied to gravitational potential. The article gives the solution of the obtained equation and determination of deviation of initial level of investigated Earth model from the Earth's ellipsoid. As a result it is stated, that the initial level position of the rotating Earth model is higher than that of conforming ellipsoid, maximum deviation being up to nine meters.

**Key words:** initial level, spatial-temporal Kerr metrics, Earth ellipsoid, relativistic geoid, inertial reference system, gravitational radius of the Earth, relativistic geodesy, general relativity theory.

**DEVELOPMENT OF THE METHOD AND APPARATUS  
FOR AUTOMATED MONITORING OF THE PLANNED POSITION  
OF MARINE BERTHING FACILITIES**

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In current practice of construction projects Arctic offshore pier may be deviations from the planned situation building structures as during the construction phase and during operation. In winter period there is a powerful influence ice loads, measuring and control that with traditional method of surveying extremely difficult. The objective of this research is to automate monitoring procedure of building structures. Article suggests a new method and apparatus for automated health monitoring of construction elements of geotechnical engineering structures of maritime transport in the Arctic port piers. Maritime port located on the Arctic shelf is exposed to difficult

environmental impact, the study and the characteristics of which are not fully understood. High freight load, a limited period of use in the summer navigation, the lack of scientific support for the project, all this lead to the need to perform regular observations of engineering.

**Key words:** Arctic port pier, quay walls, monitoring system, technical state, plane position.

## **GEOMONITORING OF ENGINEERING STRUCTURES AND FORECASTING THEIR DEFORMATIONS USING LASER SCANNING DATA**

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To ensure the safety of engineering structures, geomonitoring is widely used. The purpose of the monitoring is: the timely detection of deformations critical values; determination of their causes; predicting the way the deformations may develop; finding and taking measures for elimination, mitigation and prevention of harmful processes. Forecasting is the most complicated part of the geomonitoring because it requires collection, taking into consideration, registering, storing and processing the results of engineering structures deformation measurements. Prognosis is necessary for getting a scenario of deformation development and insight into the general condition of engineering structures. The aims of geomonitoring of engineering structures and analysis of their deformations are very actual and complicated. They need the maximal accuracy of measurements, observation process automatization, the utmost reliability of geodetic devices, as well as flexible software tools for processing and analyzing the data. At all stages of any engineering structure life cycle (surveying, tracing, staking etc) the results of geodetic measurements and observations are the initial basis for creating a comprehensive system letting us monitor and predict the general condition of the above mentioned structures. The complex approach to monitoring aims solution includes both the engineering structure condition assessment (processing the results of geodetic observations and getting the quantitative characteristics of condition changes in engineering structure in general, and any of its parts in particular), and the prognostic characteristics definition.

**Key words:** geomonitoring, terrestrial laser scanning, deformations, cross-section, engineering structures, forecasting.

## **MATHEMATICAL MODELLING FOR FORECAST OF HORIZONTAL SHIFTS OF SAYANO-SHUSHENSKAYA DAM WITHIN EXPLOITATION PERIOD 2007–2009**

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The paper considers the approach to creation of mathematical models for forecasting shifting process of controlled points on the dam crest of Sayano-shushenskaya HPP based of dynamic system theory.

It shows the solution of recurrent equation in view of the two first conventional moment functions of shifting surveyed dam points, representing the forecast model that allows to find shift forecast of particular points and pre-calculate forecast errors.

For the chosen forecast period were created mathematical models for different number of input influencing factors. Represented the sequence of estimation stage execution in creating forecast mathematical models depending on the character of forecast task for different time period of exploitation. In order to avoid intercorrelative dependence of influencing factors there was created an additional model on temperature influence, that allowed to correct to some extent the forecast shifts.

For the chosen time period of dam exploitation there were created mathematical models and represented forecast results.

**Key words:** mathematical model, geodetic data, forecast, horizontal dam shifts, concrete dam, deformation process, inertial delay, controlled points.

## **EVALUATION OF RAILWAYS HILL'S STABILITY**

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The use of information technology in the design of new railway lines to provide support for the process of decision-making at all stages of development of the draft operational information support. The implementation of such support requires the organization's management information sources, selecting the best characteristics of the information model and effective staff control over the design process. Modern technical capabilities allow to start the development of design systems in which the computer is used not only for design, graphic and design tasks, but also for the development of design solutions on the basis of complex mathematical models and mathematically correct algorithms for optimization. The method of definition of the critical modes of functioning of object of transport infrastructure by results of complex inspection allows to predict deformation process origin, further developments of deformations of a road bed and the recommendation about his operation.

**Key words:** computer modeling of an embankment, the intense deformed state, an assessment of stability of slopes of embankments, humidity of soil, the sliding surface, the strength characteristics, a comprehensive survey, roadbed, software package.



## **THE CARTOGRAPHIC REGISTRATION OF THE BASIC SPATIAL OBJECTS FOR MONITORING OF NATURE MANAGEMENT**

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The article highlights the urgent problem of the information society - the use of the basic spatial objects and the organization of spatial databases to solve territorial problems in the sphere of economy, agriculture, transport, environmental survey, etc. The paper describes the experience of an information registration of the basic spatial objects and the creation of respective basic spatial data for nature management monitoring. Their place and importance in the spatial data infrastructure is defined, the problems of data reliability are marked out.

The classification of the basic spatial objects is developed, which allows to combine basic topographic objects and the objects of different department identity into an information array. The clarification of some basic sets of spatial objects is offered. The paper presents a practical example of the creation of the basic spatial data using unmanned aircraft. A method of creating nature management monitoring maps through an automated information and mapping system is described, the classification of nature management monitoring maps is recommended.

**Key words:** basic spatial objects, basic spatial data, nature management.

## **SPATIAL INTERPRETATION OF NATURAL RESOURCES DATA DUE TO DEVELOPMENT OF CARTOGRAPHIC PROVISION FOR NATURAL RESOURCES MANAGEMENT**

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The article deals with questions of choosing of mapping unit and spatial localization of heterogeneous natural resources data in developing of cartographic provision for natural resources management. The ambiguity of choosing of mapping unit for natural resources mapping is stated. The factors of choosing of mapping unit in developing of cartographic provision for natural resources management are considered. The use of administrative subjects as a mapping units is proposed. The scale series of natural resources maps for natural resources management are characterized which taking into account territorial organization of natural resources management in Russia and traditional map classification by scale. The method of localization of natural resources attributive and geospatial data in developing of cartographic provision for natural resources management is depicted.

**Key words:** natural resources, natural resources mapping, maps of natural resources, administrative subjects, political division, mapping units, natural resources management.

## **REMAINDER APPROACH METHOD IN MARKET COST ESTIMATION OF LAND PARCEL OBJECTS OF INDUSTRY AND TRANSPORT, INCLUDED IN DANGEROUS INDUSTRIAL OBJECT FOR CONTESTATION OF CADASTRAL COST RESULTS**

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The paper is devoted to a question of establishment of objective cadastral cost of lands of the industry and transport, and also to assessment of market cost of the land parcels for the contestation purposes of results of their cadastral cost. The paper considers the specificity of using financial flow as capitalized profit, based on net profit margin from enterprise activity, in case of application of remainder approach method in estimating market cost of industry and transport land parcels, on which are situated dangerous industrial object complexes, for the purpose of contestation of cadastral cost results, that allows to take into account the expenditures for 2 factors: labour and management as operational costs of company, and thus to determine the cost of 2 remaining material factors: land and capital.

**Key words:** remainder approach method, market cost, land parcel of industry and transport object, contestation of cadastral cost results.

## **LAND RELATION ASSESSMENT AS INSTRUMENT OF MODERN MUNICIPAL MANAGEMENT AND CITY BUILDUNG ACTIVITY**

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There discussed the role and content of land relations, playing the most important role in social economic, including spatial, development of municipal institutions (MI). The modern material and city building character of land relations substantially corrects traditional approaches to design and implementation of social economic plans and programs of local self government that are essential for encouraging investment, increasing activity of local entrepreneurship society, creating effective system of management decisions in the given sphere, forming substantial taxation base and so on. One of the new instruments here can become the mechanism and assessment results of land relation development, allowing to make more reasonable judgments about the development of MI territory and its particular subsystems, to make and realize more reasonable plans.

**Key words:** land relations, material and city building character, municipal institution, assessment, city management instrument.

## **ANALYSIS OF THE CONTENT OF THE PUBLIC CADASTRAL MAP ON THE REGIONS OF THE RUSSIAN FEDERATION**

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The article discusses the current possibilities of obtaining reliable and timely information about the real estate. State regulation of development of regions in the sphere of information support of the property market currently is in a phase of formation and introduction of new forms of interactive communication between the parties, which leads to the need to modernize existing services retrieve data about objects of real estate.

Investigated one of the tools of interaction of state bodies of cadastre and registration of rights with the users – the public cadastral map. In accordance with the applicable regulations on the public cadastral map should be playable set of publicly available cadastral information.

The analysis of the current situation in Russian regions, which showed that not all the information available for display on the public cadastral map, there are actually, and also that the content of this state of the Internet resource is non-uniform in different Federal districts, not all planned information, the OCG and the USRR are displayed in full and are largely not relevant.

The authors proposed to increase the credibility of a potentially useful resource users to provide regular updates of publicly available information. Namely: to use modern opportunities of remote sensing data and multi-specialized software for processing images, to optimize the possibility of obtaining information about objects of real estate to improve the information security market participants, which is one of the most important factors for creating an enabling environment for economic development of the region.

**Key words:** region, cadastre, real estate, market, automated interpretation, photogrammetric processing, public information, cadastral map, satellite images, investment climate.

## **LOCATING UNDERGROUND MINES AS THE OBJECT OF CADASTRAL REGISTRATION**

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Implementation of state cadastral registration involves entering into the state cadastre of real estate individual - specific characteristics of the property. These objects are according to legislation, including the construction and, in particular, underground structures. Among the mining complex underground structures assumed underground mining. Unique information about the plants, taking place in the state cadastre of real estate, is its location in space, among other - the depth of the object or directly to underground mine workings, laying depth. When determining the characteristics of the practice contractor can meet a number of challenges, chief among them - is the transfer of plane coordinates and mark (height) for the relevant horizon of the location of underground mine workings. This article describes how to determine the coordinates of underground mine workings of the system created in the underground workings of the underground support horizontal and vertical surveying network. Given that in the graphic part of the technical plan outlines structures depicted projections onto the horizontal plane, suggested as characteristic points of the boundaries of the horizontal underground workings to determine the extreme points of the vertical sections of underground excavation, vertical - extreme points of the horizontal sections of workings, and have inclined mine workings to take into account their beginning and end of their borders consider their horizontal distance on the plane. In the case of co-design on the horizontal plane of several underground mines different horizons necessary to allocate a color, or a numerical value horizon.

**Key words:** agriculture, underground mining, the coordinate system, the state cadastre of real estate, the state cadastral registration of objects, cadastral works, technical plan construction, laying depth.

## **COORDINATION CONTROL OF STATE LAND SURVEILLANCE**

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The work states the basic approaches to organization of State Land Surveillance (SLS) in the Russian Federation. Definitely, the efficiency of SLS is specified first of all by instrumental control of land parcels (LP) boundaries, which on the territory are denoted by reference points and location of capital construction objects (CCO), situated on these LPs. The paper provides scientifically grounded norms, which are reasonably to be used when performing SLS, and the algorithm of mathematical processing of geodetic control measurement results, allowing to estimate the accuracy of boundaries of LPs, registered in State Cadastre, and the presence of a cadastral error in them.

Realization of the suggested algorithm allow to significantly increase the accuracy of State Land Surveillance and in case of necessity to perform correction of unique informational space of terrestrial formation.

**Key words:** cadastral activity, State Real Estate cadastre, State Land Surveillance, average square error, land parcel, capital construction objects, coordination control of SLS, boundary reconstruction.

## **PERSPECTIVE INFORMATION MODEL OF THE STATE LAND SUPERVISION**

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In article authors considers the problems arising in the sphere of protection of lands in the Russian Federation. As a result of the information state-of-the-art review legislation base, perspective information model in which interdepartmental interactions between the structural state divisions realizing this major function of the State real estate Cadastre is suggested. Essential shortcomings on the organization of the state land supervision are shown in article and ways for their elimination are offered. These shortcomings are complex interdepartmental information interaction and eliminated as a result of implementing the proposed model, which provides transfer the state land supervision functions to Federal Service for State Registration, Cadastre and Cartography.

**Key words:** land law, land protection, state land supervision, the municipal land control, public land control, supervisors, information model of the state land supervision.

## **OPPORTUNITY OF CREATING GEOINFORMATIONAL RESOURCE FOR THE PURPOSES OF LAND MONITORING ON THE TERRITORY OF SOUTH TYUMEN REGION**

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The article considers the perspectives of creating integrated geoinformational resource by means of integration of web-technologies and geographical information systems (GIS) for the purpose of integration and inventory control of information about agricultural areas in Tumenskij region of Tumenskaja oblast'. Performed the analysis of statistic data of agricultural lands by means of GIS technologies. Provided the characteristics of geoportals, operating on the Russian Federation's territory, based on spatial data infrastructure of the Russia Federation (SDI RF) and

publicly accessible in Internet. Described the scheme of geoinformational provision of digital modeling of territories with help of geoportals. On the basis of performed analysis there justified the conclusion about the necessity of continuous monitoring agricultural lands' quality and quantity, which are perspective and profitable territories.

**Key words:** GIS, web technologies, spatial data infrastructure, Internet, land fund, natural resources, agricultural lands, geoportal.

## **GENERAL QUESTIONS OF SAFEGUARD AND PROTECTION OF SOIL COVER FOR THE PURPOSE OF RATIONAL LAND USE ON THE TERRITORY OF SETTLEMENTS**

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The paper discusses the problems of safeguard and protection of soil cover for the purpose of rational land use on the territory of settlements. It gives the classification of technogenic soil pollution denoting the main ways of getting polluting substances into soil. Considered the interrelation of notions «land protection», «rational land use», and also main directions of environment protection of settlements. Introduced the notion «ecological comfort of population», which allows to characterize ecological condition of the territory and range it for the purpose of development of soil safeguard and protection measures. As a monitoring instrument of soil cover condition it is suggested to use remote sensing data of the Earth and geobotanical investigations. A separate element of soil cover condition monitoring must become a forecast model of negative anthropogenic factors' influence for the entire time period of economic use of territory.

**Key words:** soil pollution, land protection, soil pollution prevention, rational land use, ecological comfort for population.

## **DEVELOPMENT OF TECHNOLOGICAL SOLUTIONS IN PROTECTION AND SAFEGUARD OF OIL AND GAS COMPLEX LANDS IN MULTIANNUAL CONGELATION**

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The paper considers special ecological conditions of natural technical complexes of oil and gas deposits in the Far North. Given the description and peculiar features of soil cover represented by long-time-frozen peat-like and tundra gley soil types. Soil is the first natural element that undergoes significant transformation in industrial economic reclamation. The most negative changes of soil cover properties on the territory of the Far North occur during the

construction and exploitation oil and gas deposits. The paper gives the list of basic ecological risks appearing in territory reclamation process, coming first of all from technogenic pollution and non-rational use of land resources. To reduce the loss of land resources from oil extracting product pollution and decrease the area of technogenic lands, to organize effective system of land protection the number of technological solutions is developed. They include: the use of multibranch well for exploitation of out-watering hydrocarbon deposits, the construction of tiered multibranch well, decommission of wells with a lot of non-hermetic intervals of housing pipe, the application of wellhead pad for declamation of oil and gas well. The developed and implemented new technologies allow to significantly increase production of hydrocarbons without expanding the area of industrial lands.

**Key words:** land safeguard, land protection, land pollution, ecology-oriented technologies of oil and gas extraction, oil and gas complex, ecological risks, rational land use.

## **GOETHEAN IMAGES IN SASHA CHORNY'S WORKS**

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The article deals with an influence of Goethean images on the Sasha Chorny's works. Upon that the author stresses the interrelationship of elements in such binary oppositions as "genius – ordinary people", "man – demon". Russian culture of the XIX century adopted Goethean images (including Faust and Mephistopheles) and reconceptualized them. It concerns for example the motive of boredom which Russian literature included into the Faust's image under the influence of the Byronic tradition. The representation of the Faust's and Mephistopheles' images is also ambivalent in Sasha Chorny's works and differs in some cases from the Goethe's concepts. On the one hand the modern Faust of the early XX century is deheroized and turned into a philistine. On the other hand the Mephistopheles' image as a jester-trickster can influence the satiric poet's image.

**Key words:** dialog of cultures, Russian literature of the XX century, Silver Age of Russian poetry, Sasha Chorny, Goethe's influence, Johann Wolfgang von Goethe, Mephistopheles, Alexander Pushkin, George Gordon Byron, genius, philistines.

## **GRAPHICS OF MULTICOMPONENT NEOLOGISMS IN MODERN RUSSIAN LANGUAGE**

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Compounding is a productive way of forming new words in the language of internet communication. The article examines the graphical representation of the new compound word, as well as their role in visual perception and understanding neological formations of online discourse. The author analyses the compliance neological composites with the rules of Russian language. The author notes that the high use of complex words with uncodified writing in texts has several functions, actualizing the components of compound words and intentions of the

creator of the text itself and characterize the linguistic identity, and at the same time affect the overall linguistic space through the Internet.

**Key words:** compounding, neologism, composite, graphical composition, internet language, internet communication, modern Russian language.