

GEODESY AND MINE SURVEYING

**REGULAR APPROACH TO ORBITAL, GEODETIC
AND GEODYNAMIC PARAMETERS ESTIMATION
BY SATELLITE MEASUREMENTS RESULTS**

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The problem of choosing qualitative and quantitative components for estimating orbital, geodetic and geodynamic parameters by the results of space vehicle trajectory measurements using dynamic method of satellite geodesy. The problem is solved in regular formulation, with three basic conditions to be satisfied: mathematical model adequacy and observability and consistency of algorithm for model parameters estimation. Construction of ε -adequate mathematical model (ε – scalar, characterizing the initial information accuracy) of the dynamic system output to be measured is considered. The system is formed by spacecraft constellation and geodetic network points. Global and local non-observability of the dynamic system output model is stated. To overcome non-observability of the model it is suggested to mark out informative (stable) part of the problem solution stage-by-stage. First, the combined equations are reduced to the form close to cellular-diagonal structure by physical and algebraic decomposition of mathematical model. At the final stage, regularization of cellular-diagonal combined equations solution is performed both from «the left» (coefficients matrix) and «the right» (free terms vector). As a result of this decomposition and regularization, automatic (self-adaptive) algorithm is synthesized for choosing composition and stable estimation of informative parameters retaining physical meaning.

Key words: satellite geodesy, dynamic system, satellite measurements, parameters estimation, observability, decomposition, solution regularization.

**JOINT APPLICATION OF GRAVIMETRY AND GEODETIC METHODS
FOR MONITORING OF NATURAL AND ANTHROPOGENIC
GEODYNAMICS IN HYDROCARBON FIELDS**

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Capabilities of gravimetry are presented as regards control of vertical reference stations heights determination, degree of their stability, sorting and ordering of leveling and satellite measurements results (by the example of works on Novoportovskiy geodynamic testing area).

The possibility and inevitability of obtaining rough height values are substantiated. Real accuracy of reference point height determination is estimated. The example of calculating possible error of height difference determination by satellite coordination is given.

Key words: oil and gas fields, geodynamic testing area, geodetic and gravimetric technique for geodynamics monitoring.

OPTIMIZATION METHODS FOR ENGINEERING GEODESY PROBLEMS SOLUTION

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The problem of rectangular object geometry restoration (with optimal correction) by the results of its four angles coordination is considered. Two techniques for this problem solution are offered:

- the technique based on the solution of combined equations for referring the coordinates of four points to be corrected to the chosen parameters based on the least squares method;
- the technique based on the combined equations solution with direct minimization of the objective function by generalized reduced gradient using the procedure of «search for solution» in Excel.

Key words: least squares method, optimization, restoration of structure geometry, search for solutions in Excel.

MODELLING OF SPATIO-TEMPORAL VARIATIONS FOR ENGINEERING STRUCTURES AND NATURAL OBJECTS BY GEODETIC DATA

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One of the main objectives of modern science is investigation of natural and anthropogenic objects state (seismic areas of the Earth surfaces, engineering structures, precision facilities, environment pollution areas, etc.) in order to secure the safety of citizens and housing resources, accident prevention, etc. Natural and anthropogenic catastrophes taking place in the world necessitate development of new techniques for research and forecasting of such conditions. The authors put forward the idea of modeling spatio-temporal variations of engineering structures and natural objects for their state determination by geodetic data. The main purpose of these determinations is to describe the object spatio-temporal state which is characterized by its shape, size, orientation, and position in time and space. The examples presented here deal with this problem solution by mathematical simulation.

Key words: modeling, mathematical simulation, spatio-temporal state, engineering structures, natural objects, geodetic monitoring, size, shape, spatial position.

STUDY OF REFLECTIONLESS TOTAL STATIONS DISTANCE MEASUREMENT ACCURACY

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Laboratory research results as regards accuracy of distance measurement by reflectionless total stations are presented. Mean square error of distance measurement ($S \leq 20$ m) is 1mm, max. It has been found that application of film reflectors improves accuracy of distance measurements. The growing number of observation sessions ($n > 3$), in process of distance measurement, does not result in noticeable improvement of accuracy. The technique for determining stadia constant without reference baseline and reflectors is offered. Recommendations on precise trigonometric first- and second-order leveling “from the middle” are given. It is proved that precise leveling by total station in some cases may be conducted with inclination angle exceeding 3° .

Key words: total station, film reflector, trigonometric leveling, accuracy.

DETERMINATION OF TOTAL STATION STADIA CONSTANT

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The existing techniques for stadia constant determination without baseline are considered. Measurement technique offered by the authors does not require setting the instrument at both ends of the control sight line. The technique allows for determining the stadia constant while measuring distance in reflectionless conditions. The results of laboratory measurements are presented. In the course of these measurements the stadia constant $K = -0,6$ mm for certain Leica total station TS-02 was found.

Key words: total station, laser distance meter, stadia constant.

CARTOGRAPHY AND GEOINFORMATICS

MOTION PATH MODELING FOR SYSTEMS CONSIDERED AS PERFECTLY RIGID BODY

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When determining spatio-temporal position of the system without deformations (or with those negligibly small) it may be considered as a perfectly rigid body. Spatial position of such system is determined by that of some of its points. The algorithms for determining spatio-temporal position of the perfectly rigid body based on the solution of combined linear algebraic equations are considered. Geometrical models for the motion path of the perfectly rigid body (with translational motion), which is rotating about stationary and non-stationary axis are presented.

Key words: spatio-temporal position of system, equation of line, equation of plane, rotation of absolutely rigid body about stationary and non-stationary axis.

LAND MANAGEMENT, CADASTRE AND MONITORING OF LANDS

CENTRE TO BE ESTABLISHED IN NOVOSIBIRSK REGION: ANALYSIS OF ECONOMIC COMPONENT AND OPTIMIZATION OF ROSREESTR TERRITORIAL BODIES STAFF SIZE

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Load – and staff size indices of four Rosreestr territorial bodies (in coverage zone of interregional registration centre of Novosibirsk region) are analyzed. This centre is a high-technology area dealing with registration procedures for four Siberian regions: Novosibirsk, Kemerovo, Omsk, and Tomsk. The required staff size for Novosibirsk registration centre to be founded and the number of public officers of Rosreestr territorial bodies subject to reduction have been calculated. The economic effect of specialists work load redistribution between territorial bodies of Rosreestr and the new registration centre is substantiated.

Key words: road map, Federal target program, interregional registration centre, uniform registration system.

JUDICIAL CADASTRAL REVALUATION OF LAND UNIT: PROBLEMS AND PROSPECTS

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By the example of Novosibirsk region settlements, the authors dwell on the problem of cadastral revaluation, market value for disputable land units and fixing the date for its determination. Relevant judicial practice and legal position are analyzed with regard to some changes therein.

Key words: state cadastral valuation of land units, cadastral value of land unit, date of land unit cadastral valuation, market value of land unit, cadastral revaluation, new-allotted land unit.

OPTICS, OPTICAL AND ELECTRONIC DEVICES AND COMPLEXES

TECHNIQUES FOR ANALYSING ACTIVE SHF-CIRCUITS STABILITY AND THEIR S-PARAMETERS MEASUREMENT

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Techniques for analyzing active microwave circuits stability and their S-parameters measurement at set operating characteristics of these circuits are offered. They provide adequate measurement of their S-parameters. The principle of constructing simulator-analyzer for self-oscillating SHF-amplifier is offered. It is to realize these techniques in CAD (computer-aided design) system.

Key words: stability, S-parameters measurement, simulator-analyzer for self-oscillating SHF-amplifier, CAD (computer-aided design) system.

ECOLOGY AND ENVIRONMENTAL MANAGEMENT

ANALYSIS OF NOVOSIBIRSK REGION RESOURCE POTENTIAL FOR TOURIST INDUSTRY DEVELOPMENT

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The problems of methodological and practical character involving regional potential assessment for tourism industry development are considered. The resource potential of the

region is the basis for its social and economic development including industrial development of the territory. On the basis of common approaches analysis concerning assessment of regional tourism industry resource potential, special technique was developed. It allows for estimating the region potential (for municipalities) and revealing urban and region districts most attractive for tourists. The results of integrated assessment of Novosibirsk region territories resource potential for tourism industry development are presented. Tourism types specialization has been determined, and regional resources map for tourism industry has been made.

Key words: resources, region, resource potential, tourism, tourism industry development.

ECOLOGICAL DISASTER AND EMERGENCY PLANNING ZONES IN TERRITORY MANAGEMENT

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Ecological awareness, though dominating, cannot embrace all spheres of nature management and protection. There are some contradictions between unlimited environment and criteria for ecological disaster zoning and emergency situations of natural and anthropogenic character. Activities in each land use category are regulated by social and economic interests, but environment protection requires inadequacy criteria for natural potential self-recovery. General principles for establishing ecological criteria are considered as the circumstances when adopted normative and methodological regulations for assigned areas do contribute to nature protection and resource saving. However, land-use zoning is conventional and does not prevent negative factors. The extent of negative factors and processes is going to result in insuperable obstacles for territorial planning schemes. The unpredictable ecological condition may be avoided. In territorial planning, alongside with economically significant zoning and resources-climate specialization, it is necessary to reveal the areas of ecological disaster and emergency of natural and anthropogenic character which are to become the state burden and item of expenditure at all budget levels.

Key words: health standard, the air, the maximum one-time maximum allowable concentration, the average daily maximum permissible concentration, the territorial zone of sanitary protection zone, the maximum permitted emissions.

ELECTROMAGNETIC FIELDS IN DWELLING HOUSE ECOLOGICAL SAFETY SYSTEM

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In dwelling house ecological safety system, integral effect of electromagnetic fields and radiation of natural and anthropogenic character should be taken into account. These effects result in local anomalies of different intensity or “shape fields”, respectfully. «Shape fields» are supposed to exert individual impact on human organism depending on the personal dissymmetry of cells, organs and whole organism structure.

Key words: electromagnetism, local anomalies, «shape fields», intensity, individual effect, dissymmetry, background radiation.

ECONOMICS AND MANAGEMENT OF NATIONAL ECONOMY

PROCEDURE FOR ESTIMATING ECONOMIC SYSTEMS MODELS PARAMETERS

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A new approach to the procedure for estimating econometric models parameters is offered. It is based on Sherman – Morrison – Woodbury matrix lemma. The offered technique for estimating econometric models parameters has an advantage over others because both additional economic entities and additional factors-signs may be sequentially joined to the previously selected model. The demonstration example presented here shows the technique for building econometric models parameters estimates (for offered technique). The estimation algorithm is to be used as a basis for choosing optimal factors-signs, with additional computational procedures being unnecessary.

Key words: ridge regression, explanatory variable, ill-conditioned matrix, signs-factors, recurrent algorithm, ridge-regression, econometric model, least square method.

SOCIO-HUMANITARIAN RESEARCHES

RUSSIAN CHAOS VERSUS GERMAN ORDER AS A DEVELOPMENT OF RUSSIAN LITERATURE TRADITIONS IN SASHA CHORNY'S STORIES

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The article deals with a conflict between Russian and German worlds in Sacha Chorny's stories «Courageous Woman», «Letter From Berlin» and «How a Student Had Eaten a Key and What Happened Then». Russian characters are in these texts lone persons who appear in a foreign German locus. They are marked with chaos features and get trickster characteristics. Russian characters could act opposite a pet character – a young lady and cat in the story «Courageous Woman» as well as a Russian emigrant and squirrel. Germans are represented with typical philistines who maintain order within their chronotope. Confronting with them Russian characters usually suffer a defeat. The German locus encloses and represses Russian characters. As a result they are lost or banished from the German space.

Key words: Russian literature of the XX century, Sasha Chorny, chronotope, Russianness, Germanness, philistines, trickster.