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RESEARCH METHOD OF CONTROL PHASE GNSS MEASUREMENTS BASED ON SIMULATION DATA

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The article describes the research methods of control phase GNSS measurements on satellite ephemeris and coordinates observation point based on the analysis of simulation data. The developed method is based on a comparison of the first differences of the measured GNSS pseudo ranges with the simulated first difference calculated on the coordinates of the satellite and the receiver, taking into account changes in tropospheric and ionospheric delays, provided that the measurements are made with the receiver that is connected to the small-sized atomic frequency standard. By comparing the difference calculated residual between measured and simulated data which are then analyzed for the presence of anomalous errors and loss account cycles. There provided examples of detection of explicit and implicit loss account cycles in phase GNSS measurements which are simulated randomly, using the developed technique. For the detection and further correction of explicit and implicit loss account cycles we propose to apply adaptive Kalman recursive procedure type.

Key words: loss account cycles, adaptive Kalman recursive procedure type, simulation modelling, method of phase control of GNSS measurements, small-sized atomic frequency standard.

WORKING OUT OF A TECHNIQUE OF RECEPTION OF NORMAL HEIGHTS IN TERRITORY OF THE NOVOSIBIRSK REGION WITH USE OF EARTH GRAVITATIONAL MODEL EGM2008

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Results of researches on working out of a technique of reception of normal heights in territory of the Novosibirsk region with use of global Earth Gravitational Model EGM2008 and the software for processing of GNSS-measurements are resulted. Regular shift between the normal heights calculated on global model EGM2008 and the heights defined from GNSS-measurements and geometrical levelling on territory of the Novosibirsk region is defined. The technique of localisation of global model EGM2008 for territory of the Novosibirsk region is offered, such model of geoids in the form of file EGM2008_NSO.GEM, in a standard mode

loaded in Leica Geo Office software is almost generated. Test tests of the developed technique and the localised model of geoids EGM2008_NSO.GEM, its applications showing possibility for reception in territory of the Novosibirsk region of normal heights from GNSS-measurements with accuracy of levelling of IV class are conducted. Ways of the further continuation of researches and perfection of the developed technique are specified. The main reserve of increase of accuracy of reception of normal heights from GNSS-measurements according to the offered technique defines accuracy, detail and uniformity given (satellite measurements and geometrical levelling) on the control points located in territory of the Novosibirsk region.

Key words: Global Earth Gravitational Model EGM2008, definition of normal heights from GNSS-measurements, local model of geoids for territory of the Novosibirsk region.

GEODYNAMIC SYSTEMS (THEORETICAL FOUNDATIONS OF QUALITATIVE RESEARCH HORIZONTAL MOVEMENTS)

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It is widely recognized the important role of the geodetic observing techniques in solving complex problems of research of geodynamic objects of different scales. Geodetic data and their subsequent statistical analysis in combination with geophysical observations allows to perform mathematical modeling and identification of the stress-deformed state of geodynamic systems in the aspect of prediction of natural and man-made disasters. Data on changes of coordinates of ground points are the experimental basis for the understanding of the strain fields and the causes of their variation. Natural processes are mostly nonlinear, Nonlinear processes are present when movements of tectonic blocks. And, in particular, with differently directed movement of the adjacent blocks, when there is a risk of seismic events – earthquakes. For studies of nonlinear processes should be selected appropriate mathematical basis. Here are some of the theoretical foundations of qualitative research horizontal movements of the earth's surface as one of the applications of the qualitative theory of differential equations. Examples of integral curves which can be qualitative characteristics of geodynamic systems. In many cases, these trajectories correspond to the horizontal movements of the earth's surface.

Key words: geodynamic systems, horizontal movements, qualitative research, differential equations.

TIDAL EFFECTS BY GRAVITY AND SEA LEVEL OBSERVATION, OCEAN TIDAL MODELS

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Tidal corrections for gravity and geodesy observation are important for monitoring study. South Siberia and Far East observation is part of world tidal network. There tidal result agrees with static theory and it had weak ocean dynamical influence. Results change near coast, where observation at Khabarovsk and Sakhalin stations, are complete long-term observation at Poisiet level station and Shultz gravity station (Poisiet bay, Japan Sea coast, South part of Primoria, Far East of Russia). Tidal analyses were develop with two years series. Altimetric models was choose by observed results.

Key words: tidal models of Earth, altimetric tidal ocean model, gravity study, sea level observation variations.

DEVELOPMENT AND NATURAL TESTS OF AUTOMATED SYSTEMS OF DEFORMATION MONITORING

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The paper describes problems of the development and practical use of an automated deformation monitoring subsystem ASGDM for waterworks GTS and the main results of ASGDM field studies on lock chambers of the Volgograd waterworks facilities. The effectiveness of the integration of robotic total stations and digital inclinometers with the geodetic data collection and processing in the unified control software GeoMos is demonstrated.

Key words: automated total station, digital inclinometers, deformation, monitoring, control program, automated system of geodetic deformation monitoring, waterworks.

THE INFLUENCE OF ATMOSPHERIC PRESSURE AND AIR TEMPERATURE ON VALUE OF GRAVITY

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An atmosphere pressure and temperature variation acts on gravity measurements not only like Earth's crust deformation, but like attractive mass intermediate layer. On statistical treatment of computed results of gravity correction for stationary atmosphere with variable dense was derived unified algorithm of its value computing. Mathematical models for correction computing in dependence of atmosphere pressure and temperature variations are derived here. In modern level of gravity measurements this effect is significant and recommended to account in practice.

Key words: gravimetry, stationary Earth's atmosphere, the mathematical model, the acceleration of gravity.

INTERFEROMETRIC HYPER AND ULTRASPECTRAL IMAGING SPECTROMETERS OF REMOTE SENSING

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Considered general basis and peculiarities of building interferometric imaging spectrometers (on the basis of dynamic and static Fourier spectrometers) with matrix photodetectors, designed for solving different tasks of remote sensing. Stated the interrelations of geometric-optical and spectral characteristics of devices. Formulated the advantages of interferometric hyper- and ultraspectral devices in comparison with dispersive ones. Given the descriptions and technical parameters of particular samples of domestic and foreign devices. Drawn the conclusion that the development of hyper- and ultraspectral devices goes in the direction of increasing the energetic sensitivity, working band broadening and improving spectral resolution, improving calibration precision on wave length scale (wave numbers), perfecting methods and ways of avoiding blurred image, being caused by moving carrier, up-speeding data processing and transmitting, improving mass and size parameters and unification of system-forming units and modules.

Key words: remote sensing, hyper- and ultraspectral systems, airborne and satellite imaging spectrometers, imaging Fourier transform spectrometer, matrix radiation receiver, Earth observing system, space, specifications.

SUBSTANTIATION OF DIRECTIONS OF DATA USE DIGITAL SURVEY IN TERRESTRIAL LASER SCANNING

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The article presents the methodological substantiation of directions of data sharing terrestrial laser scanning and digital photography. The analysis of production materials on the basis of which found that the problem of improving the accuracy of scanner data occurs only when the decision of the expert (precision) and high-precision applications. The results of the calculation of digital photography options to cover the entire area of the field of ground-based laser scanners according to. Made a theoretical basis on inexpediency of increasing the accuracy of scanner data techniques using digital cameras as the way to improve the accuracy of laser scanning data is clearly visible, and the quality of manufacturing lenses almost reached the

limits. Therefore, it is more expedient to use digital images when interpreting an array of points and creating orthoimages for performance vectoring objects.

Key words: terrestrial laser scanner, digital image, comparative analysis.

CALCULATION OF THE LENGTH OF A LINE PLACED ON THE EARTH SURFACE IN APPLIED GEOINFORMATICS PROBLEMS

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This article presents the solution for the line length calculation problems. Results of calculations of a circular helix length, length of a line located on a sphere surface and a line placed on the Earth surface are provided in this article. In all the cases from 10 to 12 iterations have been run. The results showed that convergence is achieved with a limited number of iterations. Already with 6-8 iterations the limited relative error does not exceed 0,03 for the straight lines and 0,06 for the lines on the Earth surface. With 10th iterations the error doesn't exceed 0,001 and with a higher number of iteration it can be further reduced. This accuracy is enough for the majority of practical problems. This iteration method can be applied for the length calculations of lines with the data received from aerospace photography or laser scanning.

Key words: curve arc length, arc length calculation «from above», arc length calculation «from below», limited relative error, properly parameterized oscillation.

NATURAL RESOURCES' GEOINFORMATION MODEL OF THE REGION AS A MEANS TO IMPROVE THE EFFICIENCY OF NATURAL RESOURCES PLANNING AND MANAGEMENT

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The role of geoinformation modeling as the foundation for the effective management of sustainable development is examined in the article. The timeliness of geoinformation modeling for the planning of regional natural resources management is stated. Brief description of analysis of the modern regulatory language of geoinformation mapping is given. Based on the achieved results a new term is proposed: a natural resources' geoinformation model (NRGM). It's purposes and main structural elements are described. The criteria of up-to-dateness and veracity of NRGM data base are given. The significance of natural resources' geoinformation model as an instrument for integration of heterogeneous data (e. g. Earth remote sensing data, state cadastral data, government statistics) is emphasized. The main tasks to optimize natural resources management by use of NRGM are listed.

Key words: geoinformation modeling, natural resources, natural resources management, geoinformation model, natural resources' geoinformation model.

LASER SCANNING IN THE STATE REAL ESTATE CADASTRE: TECHNOLOGICAL AND LEGAL ASPECTS

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Laser scanning described as tool for state real estate cadastre information obtaining, preparing cadastre documents and for the state land supervision and the municipal land control. The authors analyzed contemporary legal point of view to setting the height of the capital construction object. The object dimension is the factor which affect to market price of real estate object. And this factor is important for cadastral estimation and object taxation. The text of the article considers the problems of the introduction of three-dimensional model of the object in the state real estate cadastre, produced using laser scanning technology, in the legal aspect. There are distinguish two stages of legitimating. The first one is preparatory stage, when the information obtains and analyses. The second one is realization stage, when Z coordinated are implemented in state realty cadastre.

Key words: laser scanning, 3D modeling, state realty cadastre, information accuracy, state land supervision, the municipal land control, current object accounting, laser scanning legitimating, cadastre estimation.

OPTICAL ELECTRONIC COMPLEX FOR CONTROL OF CHECKING LINES' POSITION OF SIGHTING UNIT DURING STAND TESTS

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The article gives the description of computerized and non-computerized control of checking line position during sighting units stand tests with help of high-precision optical electronic complex. Represented one of the original schemes of optical electronic complex and the mathematical model related to it. The mathematic model research results let state that optical electronic complex, the indicating system of which is based on position-sensitive photodetector, laser and computer, is able to provide the meeting of basic metrological requirements for this kind of controlling-measuring devices. The peculiarity of the represented in the article method of checking line position determination with help of optical electronic complex is the opportunity of

computerized determination of sighting mark coordinates, using the image segmentation of field rod of collimating measuring unit, and that eliminates operator-related error and increase measurement precision up to twice as much.

Key words: optical electronic complex, checking line, stand tests, shock machine, sighting device, laser, position-sensitive photo detector, segmentation method.

ACOUSTICAL ANALOGUE OF PHOTONIC JET PHENOMENON

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The formation of the diffraction field of acoustic waves on permeable objects with characteristic dimensions of the order of the wavelength is investigated. It was shown that in the acoustics the analogue of the phenomenon of photonic jet which providing subwavelength localization of acoustic field in the shadow region of the particle is possible. The key simulation results based on Helmholtz equations are described. It has been shown that the resolution of acoustic jet (at FWHM) may be as small as one third of wavelength.

Key words: subwavelength focusing, diffraction, near field, photonic jet, acoustic wave.

ALL-ROUND LOOKING OPTOELECTRONIC SURVEILLANCE SYSTEMS

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The article shows the results of the research defining the possibilities of creating panoramic optical – electronic systems (POES) of all-round and sector look, possessing high-speed operation and homogeneous angular resolution on the field of space under surveillance. Spatial resolution of POES is determined by a number of television or thermo vision cameras and photosensitive element array of photodetector in each channel. Processing means of POES provides the detailed vision of the most interesting fragments and detailed target environment. Multichannel construction of optic part of POES allows both high homogeneous angular resolution on all the field of view and high sensitivity and speed (frequency) of updating images. At this, electronic part should process data at the speed high enough to observe all the objects

and items getting into the field of view of POES. There represented the variants and samples of prototype modules of all-round looking POES.

Key words: panoramic optical-electronic system, optical panoramic unit, microprocessor means for processing of signals, digital signal processing, panoramic lenses, programmable logic integrated circuits, photodetector, microbolometric matrix.

POSSIBILITIES OF THE DUAL-BEAM INTERFERENTIAL LCDV TECHNOLOGY WITH THE NANOSECOND DURATION OF RADIATION IMPULSES

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There investigated the possibilities of increase in resolution of the laser induced vapor-phase chemical formation of topological micro and nanostructures on substrates due to carrying out processes in the monomolecular adsorbed layer and at interferential formation of drawing in the field of exhibiting; in single-stage nanosecond laser process we got the structures like diffraction gratings with the resolution up to a wavelength emission share. It is shown that ultimate resolution of laser-chemical technology of making structures on transparent dielectric substrates is defined by nonlinear nature of pyrolytic process, heat conductivity of the put metal layer and autocatalytic character of dissociation of molecules at pyrolysis. Presented the detailed description of test stand for investigation of formation processes of topological characteristics of submicron image with method of interferential LCDV. There described the results of experiments on topological formation of submicron structures.

Key words: dual beam interference, adsorbed layer, single-stage technology, nanostructures, laser-induced process, thin films, metal carbonyls.

THEORETICAL BASIS OF BUILDING SIMULATOR-ANALYZER OF ACTIVE MICROWAVE CIRCUITS

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The need to transmit steadily growing flow of information, the creation of modern devices in the range of ultrahigh frequency (UHF) and radio equipment for different purposes (radar, radio navigation, control, life), the development of new frequency bands sharply marked to ensure problem at the state level, the uniformity of measurements radio circuits parameters in coaxial paths in the range of microwave and re-transmission of measurement results in a micro-stripline tract.

Currently, one of the important tasks in the field of metrological assurance of measurement is the development and research of methods and precision measuring instruments S-parameters of active microwave – circuits intended for the design of Wuxi-inflammatory and Autogenerating microwave devices, which is carried out in the space of sured S -parameters active component of these devices, such as transistors. The disadvantage of this approach is that S-parameters of the active component are measured in a consistent measuring tract where the operation mode of the active component is far from its real mode of operation of the amplifying or generating device. This leads to not adequate to measure S-parameters and, consequently, low economic efficiency design amplifier and generator devices because of the need for multiple technological correction of the test sample.

In the article the principle of construction of the simulator-analyzer of active microwave circuits, providing a simulation of amplifying and generating microwave devices, followed by measuring complex reflection coefficients of the loads by their active component in its real operation, when the simulated amplification or generator unit technical characteristics strictly meets the technical specification. The measurement of complex reflection coefficients of the loads of the active component further provides the efficient design of amplifier and generator devices and eliminates the need to measure S-parameters. Furthermore, the prescribed mathematical model of simulator-analyzer mathematical model and its calibration, and the method of analysis of stability of the loaded active microwave circuits in the space of complex reflection coefficients with their loads, facilitate the choice of loads in a simulation amplifier and generator devices.

Key words: simulator-analyzer of active microwave circuits, mathematical model, calibration, method of analysis of stability of the loaded active microwave circuits, complex reflection coefficients of their loads.

ELECTROMAGNETIC INFORMATION APPROACH AS THE BASIS OF DEVELOPMENT OF PARADIGM OF NON-LINEAR MANAGEMENT OF AGRICULTURAL SYSTEMS IN DIFFERENT CONDITIONS

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Expressed the necessity of development of concept notions about electromagnetic basis of noosphere, as development ways of non-linear thinking in management processes of such complex spheres, as, for example, agricultural production in extreme conditions. It is proposed to use for management weak and superweak electromagnetic actions on the basis of special computer program complex (author S. M. Prikhod'ko). The designed programs realize effectively the genetic growth and development potential of plants in particular GPS coordinates and their adaptability by means of low-intensity electromagnetic influence outside the technical informational field. To provide control to soil fertility potential when growing plants and crops, it is necessary to use more widely informational approaches and remote sensing of soil fertility and many other parameters.

Key words: noosphere, concept, non-linearity, management, agrotechnologies, computer programs, adaptability.

ASSESSMENT OF VALUE ECOSYSTEM SERVICES FOR THE DEVELOPMENT TOURISM AND RECREATION

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Evaluation of the resource potential of Russian regions for strategic and tactical organizational and management tasks involves the use of different approaches, including the ecosystem, which is using the integrated indicators allows to determine the benefits of the various options for the economic use of the territory, which is particularly valuable at the stage of justification of long-term programs and projects. The application of the ecosystem approach to the assessment of the recreational potential of the territories makes it possible to determine the value of natural capital for the development of different types of tourism and recreation. Such information is important for regional and local authorities during the development of strategic plans for development of territories and the drawing up of spatial planning schemes. The article deals with methodological aspects and practical experience in assessing the economic value of ecosystem services for the development of recreation and tourism.

Key words: ecosystems, ecosystem services, the value of ecosystem services assessment, resource potential, recreation and tourism.

ECOLOGICAL SUBSTANTIATION OF WATER-PROTECTION ZONES FOR WATER-FLOODED QUARRIES IN URBAN AREAS

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On the territory of Novosibirsk are 15 of flooded quarries, the coastal zone is characterized by medium and high degree of pollution. Currently, these water objects practically are not protected in legal status from the sources of anthropogenic impact. To limit the impact of economic activities and regulation of anthropogenic load, it is proposed to establish water protection zones for water-flooded quarries in urban areas, the size of which should be sufficient to preserve the self-cleaning ability of water in the organization of recreational zones for the population of the city. Given the possibility of environmentally adverse situations in certain flooded quarries because of their eutrophication and accumulation of pollutants selected water bodies by the values of maximum depth and water surface, for which the establishment of water protection zones is not required.

Key words: economic activity, water protection areas, recreation potential, the intensity of anthropogenic impact.

THE CONSTRUCTION OF THE NATURAL FOUNDATIONS OF LAW IN THE ECONOMY

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Economics, as a theory, free to choose the political and mathematical models, and how the practice follows the law. Therefore is important to construct a natural law based on mathematical and economic models, generalized economic practice. For structuring politico-economic models and the selection of the main economic categories adopted by the numeric sequence: real numbers, natural, rational and whole. Based on the analytic properties of these numbers and their inherent forms of evidence, classification 94 main laws and codes of the Russian Federation. In every numeric system, the analysis of the tendency towards self-contradiction in Kant, and in them – to the thesis or the antithesis of the antinomy. The findings for each group (numbers of families) are the Foundation of natural law according to economic categories.

Key words: regulatory impact assessment, evaluation of the actual impact, category, number, antinomies, thesis and antithesis, income, goods, services, price, cost.