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## SENSITIVITY FUNCTIONALS IN BOLZA PROBLEM FOR THE MULTIVARIATE DYNAMIC SYSTEMS DESCRIBED BY INTEGRO-DIFFERENTIAL EQUATIONS WITH DELAY. . . . 2

**A.I. Rouban**

The sensitivity functional (the first variation of a quality functional in relation to variable and constant parameters) for the multivariate non-linear dynamic systems described by the integro-differential Volterra equations of the second kind with delay, and also with variables and constant parameters is constructed by the variation method. The generalized functional of system operation quality has Bolza form with integral and finite components. Values of delay, initial and finite time points depend on the constant parameters, and phase coordinates in starting point can have a rupture. The given examples show deriving sensitivity functionals from the general result for simpler integro-differential models with delay.

**Keywords:** sensitivity functional, variation method, the conjugate equation, integer-differential equation, delay time.

## TWO WAYS TO COMPUTE PROBABILITIES OF RECOGNITION OF SHIFT DIRECTION OF POINT ON A PLANE ON A BACKGROUND OF RANDOM ROTATIONS. . . . . 9

**A.A. Zharkikh, S.M. Bychkova**

The complex motion of a point on a plane is considered. The observed point and center of the point rotation carry out a parallel shift with probability  $p$  in one of  $m$  equidistant on an angle of directions at each discrete time moment and, simultaneously, the observed point rotates relatively to this center on a random angle. The decision rule for determining the direction of shift is justified. Expressions for conditional probability densities distribution of sample means of coordinates of the observed point are derived. Formulas for the probabilities of correct recognition of the shift direction are derived in two ways. One way uses the resulting conditional probability density functions. The second way is realized by averaging over random parameters of motion.

**Keywords:** probability theory and mathematical statistics, random motion on a plane, the statistical pattern recognition theory, testing of statistical hypothesis, the probability of correct recognition.

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**S.S. Sulakshin, A.N. Avinova, I.V. Bogdan**

The paper presents a methodology for the aggregated quantitative assessment of the state of the country as a complex social system. The analysis of the stability evaluation is given, the perspectives for further development of methods for predicting the crisis of complex social systems are shown. The interpretation of the dynamics of socio-economic indices and the prospects for their use is discussed.

**Keywords:** methodology, quantitative evaluation, complex social system, forecasting, trend.

## DYNAMIC MANAGING OF INVESTMENT PORTFOLIOS BASED ON VECTOR AUTOREGRESSION MODELS AND MULTIVARIATE VOLATILITY MODELS . . . . .20

**V.V. Habrov**

Theoretical part of the paper covers the problem of dynamic management of investment portfolios in a term of mean-variance analysis in cases when information about pricing models of asset returns and volatility of their errors is known. This problem is one of a type of models of multi-step optimization of discrete systems for given constraints functions in the terminal step and on the control variables. The practical part examines the characteristics of optimal portfolios which asset returns are predicted by the VAR models and the covariance matrixes of the assets using multivariate models of volatility.

**Keywords:** discrete optimization, portfolio theory, vector autoregression model, multivariate volatility models.

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**V.A. Vedeshenkov**

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two adjacent startings are used. DS have a diagnostic monitor that initiates the diagnosing processes and processes the control results. The example of diagnosing of fault components in the DS including seven processors and seven memories is considered.

**Keywords:** digital systems, symmetric bipartite graph, component, two fold starting, diagnosis, tested subsystems.

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**L.A. Pankova, V.A. Pronina**

Text retrieval concepts are interpreted in terms of the fuzzy set theory. The text retrieval models based on the fuzzy set theory are proposed. It is shown that the three models (including two proposed ones) give the same formulas for calculating the relevance of document to query.

**Keywords:** text retrieval, semantic relatedness, fuzzy set, fuzzy relevance relation, generalization principle.

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**R.E. Asratian, V.N. Lebedev**

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**Keywords:** distributed systems, Internet technologies, proxy-servers, information security.

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**Ye.I. Somov, S.A. Butyrin**

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**Keywords:** large-scale satellite, in-flight structure identification, gyromoment stabilization.

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**A.K. Volkovitskiy, E.V. Karshakov, B.V. Pavlov**

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**Keywords:** relative positioning, electromagnetic system, moving object.

## TIGHT-COUPLED INERTIAL-SATELLITE SYSTEMS ON THE BASIS OF INVARIANT MODEL OF MOBILE OBJECT CONDITION . . . . . 65

**D.S. Konev**

The paper describes the constructed dynamic model of coordinates change of any object, allowing to carry out the a posteriori estimation of navigation parameters by known methods of stochastic filtration theory on the basis of code and Doppler satellite measurements.

**Keywords:** vehicle, loosely coupled integrated inertial and satellite navigation system, tightly coupled system.

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