Реферати

УДК 536.58; 681.536.5

Косяк И.В. Прецизионная система термостабилизации повышенной мощности. *Регистрация, хранение и обраб. данных.* 2018. Т. 20. № 1. С. 3–16. — укр.

Проведен анализ принципов построения систем температурной стабилизации и экспериментальные исследования по разработке системы термостабилизации. Рассмотрены особенности разработки и построения систем автоматического регулирования температуры. Предложена реализация высокоэффективного регулятора температуры. Ил.: 13. Библиогр.: 12 наим.

Ключевые слова: термостабилизация, пропорционально-интегрально-дифференциальный регулятор, высокоэффективный регулятор температуры, модуль Пельтье.

UDC

Kosyak I.V. A precision system for thermostabilization with increased power. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 3–16. — Ukr.

An analysis of principles construction of temperature stabilization and an experimental research on temperature stabilization system have been carried out. The features of design and construction of systems for automatic temperature control have been considered. A realization of highly efficient temperature controller is proposed.

The principles of construction of temperature stabilization systems using Peltier thermoelectric modules are investigated. A highly effective thermal stabilization system for Peltier modules with output power > 50 W without the use of expensive controllers has been developed. It is shown that the created thermostabilization system ensures stability of temperature maintenance <0,01 °C.

The highly effective system of thermal stabilization optimally combines the basic specifications: high temperature stability, high energy efficiency, low current ripple TEM and low cost.

The urgency of the development is due to the fact that the known temperature controllers, which provide high accuracy of the maintenance of the set temperature level in the established modes and good quality of transient processes, have a complicated technical implementation with the use of either programmable controllers or computer control. Their disadvantage is a high cost and low accuracy of temperature stabilization in the range of 0,01–0,1 °C. Regulators with a simple technical implementation and low price support the accuracy of stabilizing the temperature of >>0,1 °C in the established modes with significant error and do not provide stability of the stabilization system in conditions of change in wide limits of the temperature of the surrounding environment.

The highly stable temperature regulator proposed in the article with a relatively simple technical implementation solves this contradiction.

The controller uses a one-circuit automatic temperature control system. The control loop contains a proportional-integral-differential (PID) regulator, which, in conditions of disturbing effects on the stability of maintaining the desired temperature of the object, provides the necessary change in the control signal at the input of the control circuit. Fig.: 13. Refs: 12 titles.

Key words: thermostabilisation, proportional-integral-derivative control, highly efficient temperature controller, Peltier module.

УДК 004.942

Каліновський Я.О., Боярінова Ю.Є., Хіцко Я.В., Сукало А.С. Структура алгоритму швидкої двомірної згортки за допомогою ізоморфних гіперкомплексних числових систем. *Реєстрація, зберігання і оброб. даних.* 2018. Т. 20. № 1. С. 17–29. — рос.

Розглянуто питання побудови алгоритмів швидкої двомірної згортки масивів різної розмірності. Алгоритми будуються на основі подання масивів даних в ізоморфних гіперкомплексних числових системах, отриманих множенням розмірності систем подвійних чисел і ортогональних подвійних чисел, що дає можливість простого за структурою переходу від однієї системи до іншої. Це призводить до зменшення кількості операцій, що необхідні для виконання двомірних лінійних згорток масивів різної величини. Вивчено ефект зменшення кількості операцій. Дослідження виконано за допомогою системи аналітичних обчислень Maple. Бібліогр.: 12 найм.

Ключові слова: гіперкомплексна числова система, двомірна згортка, ізоморфізм гіперкомплексних числових систем, подвійні числа, ортогональні подвійні числа, оператор ізоморфізму, Maple.

UDC 004.942

Kalinovsky Ya.A., Boyarinova Yu.E., Khitsko Ya.V. and Sukalo A.S. Structure of an algoritsm for quick two-dimensional convolution by means of isomorphing hypercomplex numerical systems. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 17–29. — Rus.

In the mathematical modeling of linear systems, it is necessary to repeatedly perform a linear convolution of discrete signals.

The complexity of calculating the linear convolution rapidly increases with the length of the convoluted arrays and their dimension, thus the methods of «fast» convolution calculations are used. One of the most common methods is convolution using Fast Fourier Transform (FFT) algorithms, which are based on decomposition of the original large-dimensional problem into a large number of low-dimensional problems. Thus, it is very important to develop such methods for solving problems for small dimension, which use, possibly, a smaller number of real operations.

There are a number of methods for the rapid calculation of linear convolution: the methods of Cook-Toom, Vine, Fast Fourier Transform (FFT), Cooley-Tuke, Good-Thomas, and others.

The algorithms for performing convolution based on the transition to hypercomplex spaces are considered. The basis of this approach has been developed by the authors.

Convoluted numerical sequences are considered as components of hypercomplex numbers belonging to some HNS.

The product of these numbers will contain paired products of components of convolutional numerical sequences. Nevertheless, they will be combined in amounts not in the same composition as necessary for organizing convolution components.

In addition, the number of real multiplications with multiplication of hypercomplex numbers in the general case is the same as in the direct calculation of convolution, that's why there is no profit.

In this way there are two problems: the first one is a reduction in the number of real operations when multiplying hypercomplex numbers; the second one is the organization of the choice of paired products of convolution components.

The solution of these two problems allows synthesize such convolution algorithms, which by the number of operations are more efficient than direct calculation algorithms for convolution. Refs: 12 titles.

Key words: hypercomplex number system, two-dimensional convolution, isomorphism of hypercomplex number systems, double numbers, orthogonal double numbers, isomorphism operator, Maple.

УДК 004.942

Кузнецова Н.В. Финансовый риск-менеджмент с учетом информационных рисков. *Регистрация, хранение и обраб. данных.* 2018. Т. 20. № 1. С. 30–39. — укр.

Исследованы существующие методы менеджмента рисков и проиллюстрирована вся процедура анализа риска на базе системной методологии. Предложен критерий учета информационных рисков из-за возможных потерь при реализации информационной угрозы и квадратичный критерий для учета компенсационных затрат на борьбу с проявлениями рисков как информационных, так и финансовых. Приведена система финансового риск-менеджмента, которая учитывает как информационные, так и финансовые риски, и формирует управленческое решение. Процесс работы системы риск-менеджмента является адаптивным, то есть на основе предложенных критериев оценки качества принимаемых решений есть возможность принять, отклонить или повторно разработать управленческое решение. Ил.: 2. Библиогр.: 8 наим.

Ключевые слова: информационные риски, критерии качества решений, финансовые риски, менеджмент рисков.

UDC 004.942

Kuznietsova N.V. Financial risk management with taking account of information. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 30–39. — Ukr.

The existing risk management methods, such as risk aversion, localization, diversification and risk compensation are investigated and the whole process of risk analysis based on the system methodology through the main stages: detection, analysis and minimization of risk is illustrated. The criterion for taking into account information risks through possible losses in the implementation of information threat is proposed. The main criteria for analyzing information risks through the assessment of the quality of data, the decisions taken and the adequacy of the modeling are given, and the own quadratic criterion is proposed to take into account the compensatory costs for combating the risks of both information and finan-

cial nature. Also, the system for financial risk management, which takes into account both informational and financial risks and forms a managerial decision is shown. The process of work of the risk management system is adaptive, that is, on the basis of the proposed criteria for assessing the quality of the decisions made, it is possible to accept, reject or re-develop a management solution based on the set of input data and modeling results. The proposed methodology for analyzing and evaluating information risks within financial risks has been implemented in a unified information technology on the SAS platform. Fig.: 2. Refs: 8 titles.

Key words: information risks, decision quality criteria, financial risks, risk management.

Путятін В.Г., Корбан Д.В., Князь О.І. Вплив атмосферних умов на радіолокаційне спостереження навігаційних об'єктів. *Реєстрація, зберігання і оброб. даних.* 2018. Т. 20. № 1. С. 40–50. — рос.

Проведено теоретичне дослідження впливу однорідного, турбулентного середовища та середовища з метеоутвореннями на розповсюдження електромагнітних хвиль, що проходять через ці середовища при радіолокаційному спостереженні навігаційних об'єктів судновою радіолокаційною станцією (РЛС). Використання матриць прямого та зворотного поширення призводить до спрощення синтезу змінювання параметрів електромагнітної хвилі залежно від стану середовища при дистанційному отриманні інформації щодо навігаційного об'єкта. Бібліогр.: 12 найм.

Ключові слова: навігаційний об'єкт, суднова РЛС, матриця поширення, електромагнітна хвиля, середовище поширення, коефіцієнт послаблення, турбулентне середовище, градієнт діелектричної проникності, коефіцієнти матриці, статистична матриця, детермінована матриця, метеорологічні утворення.

Putyatin V.G., Korban D.V. and Knyaz A.I. Influence of atmospheric conditions on the radiolocation supervision of navigation objects. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 40–50. — Rus.

A theoretical study on the influence of homogeneous, turbulent environment and the environment with meteorological formations on the propagation of electromagnetic waves passing through these media during radar surveillance of navigational objects of the ship radar has been performed. The use of matrices of direct and reverse propagation leads to simplification of the synthesis of changes in the parameters of the electromagnetic wave, depending on the state of the environment in the remote receipt of information about the navigation object.

It is shown that Muller's dispersion matrix is complete description of dispersive properties of homogeneous atmosphere (having absent dramatic changes of inductivity), turbulent atmosphere (with the not looked after by sight dielectric heterogeneities appearing from the dramatic changes of inductivity) and atmosphere with a presence in her of different meteorological inclusions. The matrix of distribution of meteorological inclusions is presented by two constituents: determined and statistical ones. The determined constituent characterizes direct distribution of hertz wave through homogeneous meteorological inclusions, and a statistical constituent characterizes dispersive properties of particles of different meteorological inclusions.

Both the matrix of direct distribution and matrix of reverse distribution of meteorological inclusions consist of two constituents: determined and statistical ones characterizing the process of distribution of hertz wave from aerial ship radar to the navigation object and from a navigation object to aerial.

At presence of atmosphere of the dielectric heterogeneities, caused by turbulent processes as a result of dramatic change of temperature or humidity of air in the direction of distribution of the hertz waves radiated by aerial ship radar, the inductivity of turbulent atmosphere consists of sum of two constituents. One of constituents characterizes the mean value of inductivity in the radio-location volume of turbulent atmosphere, and other constituent characterizes her deviation from a mean value. These two constituents are the coefficients of matrix of distribution of turbulent atmosphere and determine the polarization state of hertz wave getting through a turbulent atmosphere. Refs: 12 titles.

Key words: navigation object, ship radar, matrix of distribution, electromagnetic wave, environment of distribution, coefficient of weakening, turbulent environment, gradient of inductivity, coefficients of matrix, statistical matrix, deterministic matrix, meteorological inclusions.

УДК 004.93

Каврін Д.А., Субботін С.О. Метод редукції мажоритарного класу в незбалансованих вибірках. *Реєстрація, зберігання і оброб. даних.* 2018. Т. 20. № 1. С. 51–59. — рос.

Розглянуто проблему формування навчальних вибірок для побудови діагностичних і розпізнавальних моделей за прецедентами в умовах незбалансованості класів. Запропоновано метод автоматизації формування навчальних вибірок з вихідних незбалансованих вибірок великого розміру. Метод дозволяє значно скоротити розмір вихідної вибірки зі збереженням важливих топологічних властивостей шляхом редукції мажоритарного класу та відновити кількісний баланс класів. Розроблено програмне забезпечення, що реалізує запропонований метод, яке було використано при виконанні обчислювальних експериментів на синтетичних і реальних даних. Проведені експерименти підтвердили працездатність та ефективність запропонованого методу та програмного забезпечення, що його реалізує. Іл.: 4. Бібліогр.: 13 найм.

Ключові слова: вибірка, екземпляр, класифікація, метрика якості, мажоритарний клас, міноритарний клас, семплінг.

UDC 004.93

Kavrin D.A., Subbotin S.A. The majority classes' reducing method of imbalanced datasets. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 51–59. — Rus.

To speed up the process of diagnostic and recognition model constructing, it is necessary to extract a subsample of a smaller volume from the original sample, which will preserve the basic properties of the dataset. The problem of the sample selection from the imbalanced large-sized datasets has been addressed for constructing of the diagnostic and pattern recognition models.

The goal of the work is the creation of the sampling's automatization method from the imbalanced large-sized dataset, based on the principles of undersampling.

The method of automatization of sample selection from the original imbalanced large-sized dataset has been proposed. The method consists of two phases. The first phase is reducing the size of the original imbalanced large-sized dataset while maintaining important topological properties by reducing the majority class. The second phase is restoring the quantitative balance of the classes by generating synthetic examples of a smaller class. Thus, in the conditions of the class imbalance, the method has allowed restoring the balance and reducing the training sample while maintaining important topological properties of the original imbalanced large-sized dataset, creating high accuracy model within acceptable operating time.

The software implementing proposed method has been developed and used in the computational experiments on synthetic and real imbalanced datasets. The conducted experiments confirmed the efficiency and working capacity of the proposed method and its implemented software.

The method and software for sample selection have been developed. They allow automating the process of training sample selection in conditions of class imbalance for the synthesis of diagnostic and recognition models by precedents. Prospects for the further research lay in developing the implementation of the proposed method for multiprocessor systems operating in parallel modes, as well as its experimental study on the larger datasets of practical problems of different nature and dimension. Fig.: 4. Refs: 13 titles.

Key words: example, classification, majority class, minority class, quality metric, sample, sampling.

УДК 621.43.056:632.15

Трикуш Н.П., Сегеда И.В. Автоматизированная система расчета корректирующих масс и прогнозирования остаточной вибрации при динамической балансировке турбоагрегатов. *Регистрация, хранение и обраб. данных.* 2018. Т. 20. № 1. С. 60–69. — укр.

Проанализирована технология динамической балансировки турбоагрегатов. Создана автоматизированная система, выполняющая анализ уровня вибрации и подбор груза для ее устранения. Усовершенствована технология расчетов корректирующего груза для каждого подшипника с целью получения более точных и быстрых результатов. Ил.: 6. Библиогр.: 8 наим.

Ключевые слова: механическая вибрация, динамическая балансировка, дисбаланс, уравновешивание роторов, автоматизация расчетов балансировочных масс.

UDC 621.43.056:632.15

Trykush N.P. and Segeda I.V. Automated system for calgulating corrective loads and predicting vibration during dynamic balancing of turbines. *Data Rec., Storage & Processing.* 2018. Vol. 20. N 1. P. 60–69. — Ukr.

In Ukraine, 47,7 % of electricity production falls on nuclear power plants. An important and time-consuming process in the NPP is the monitoring of the level of vibration and dynamic balancing of turbines. Nowadays in our country we have only a partial automation of it. Therefore, solving of technical problems in power engineering based on modern information technologies is actual and in demand. Analysis of existing solutions shows that there is practically no single algorithm for dynamic balancing and the method of selecting one optimal load for a set of bearings to eliminate the calculated vibration. The goal of the work is to create unified software that could not only compute the corrective loads, but also immediately offer an engineer the most optimal solution how to eliminate the vibration. Actually, to create such functionality, it is necessary to combine the numerical and vector methods of determining the vibration and to improve them for the possibility of choosing the best value. Our main tasks: to find the optimal mass of test load and optimal place to put it; find the optimum mass and the optimal location of the correcting load during repair and under load in order to get the minimum values of vibration at all monitored points, without exceeding their normal values; to analyze and predict how the direction of the vibration vector would change; to visualize the results on the selected direction; to improve a technology of calculation corrective load for each bearing to obtain more accurate and quick results. Sometimes the calculated values of the expected vibration do not coincide with real values when a turbine unit is operating at high power. Therefore, one of the solutions to the problem is to create a knowledge base for the system and an algorithm to select corrective loads based on conclusions and attempts that system made earlier. Fig.: 6. Refs: 8 titles.

Key words: mechanical vibration, dynamic balancing, imbalance, balancing of rotors, automation of balancing corrective loads calculations.

Проведены экспериментальные исследования проблем обнаружения закладных устройств нелинейным локатором. Лабораторные исследования проводились при использовании различных полупроводниковых элементов с различной длиной ножек. Полученные результаты показали, что длина ножек полупроводниковых элементов влияет на их детектирование. Ил.: 6. Библиогр.: 5 наим.

Ключевые слова: защита информации, нелинейный локатор, закладное устройство, полупроводниковый элемент.

It is common knowledge that today information is the most important resource of the modern world. Active development of information technologies and their integration, determine the extremely important roles that they play in many spheres of human life. Important information of national importance should be protected from unauthorized interception and the special importance in the issue of information security is the problem of information leakage through the mortgage devices. The problem lies in the fact that such devices for data capture can use most of the existing leakage channels. However, bookmarks are often used to intercept acoustic (linguistic) and specific information. Therefore, knowledge of the structural and technical features of the construction and functioning of hardware bookmarks is necessary to identify their strengths and weaknesses and to choose the optimal method of counteraction. The experimental researches of problems of detection of the mortgaged devices by a nonlinear locator are carried out. Laboratory studies were carried out using different semiconductor elements with different lengths of legs. The obtained results have shown that the length of the legs of semiconductor elements affects their detection. Fig.: 6. Refs: 5 titles.

Key words: information protection, nonlinear locator, bug, semiconductor element.