

ABSTRACTS

Geometric modelling of the meridional boundaries of the flow parts of the axial compressors / V. Borisenko, A. Ustenko, Y. Druz // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 5-10: Pic. 2. – Ref.: 9 title.

The article proposes a method of geometric modelling of the meridional boundaries of the flow parts of the axial type compressors using the curves given in the natural parameterization and the linear law of the distribution of the curvature from the arc length. The problem is solved, provided that the known coordinates of two output points located at the entrance and exit of the flow part of the compressor, as well as the angles of inclination to them are tangent. Unknown coefficients of the linear law of the distribution of the curvature and the length of the arc of the curve are determined by minimizing the deviation of the intermediate points obtained in the optimization process from the initial set points. A software code has been developed that allows to build meridional boundaries and to visualize them on a computer monitor.

Use of hybrid schemes when solving task in private derivatives / O. Bulanchuk, G. Bulanchuk, I. Yevarlak // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 11-15: Pic. 6. – Ref.: 11 title.

On a numerical solution of the equations of mathematical physics it is often used hybrid schemes. Such schemes are reasonable for the simulation of processes described by the functions with discontinuous singularities (or big gradients). The purpose of the article is the research of hybrid schemas for the solution of transfer equation. It was considered different boundary conditions and initial states. It was shown that the stability of the solution depends on the parameters of the numerical schema.

The initial conditions of the «step» type and the «rectangular momentum» type for the one-dimensional homogeneous transport equation were considered. The calculations were compared with the analytical solution at various parameters, which governs the area covered by the solution. It is clear from the calculations that when the parameter increases, pulsations begin to increase. That is, the hybrid scheme gives incorrect results in areas with smooth solutions. In the future it is planned to carry out similar investigations for the nonuniform transport equation, as well as for the two-dimensional equation.

In the region where the function is discontinuous the schema of the first order approximation has an advantage.

A software tool to support the process of researching dynamic systems / A. Veitsblit, N. Korotaev // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 16-23: Pic. 10. – Ref.: 9 title.

At the present stage of the development of society, the method of mathematical modeling is one of the key in the study of various aspects of human activity. The main traditional features of the models that are currently used by foreign and domestic scientists for the analysis and management of economic systems are their stability, stationary, specificity, that is, consideration of certain aspects of complex economic processes in statics. But because economic processes take place in time, the use of dynamic models is more appropriate and appropriate for their modeling. However, often the tools used to work with models are not suitable and not convenient in specific cases.

The purpose of this research is to offer a convenient service for supporting the process of studying dynamic systems, with the ability to quickly edit and display results in real time. Work on the software level passes with dynamic systems as with classes, thanks to which the user has the ability to work with the dynamic system as a text display of linear or differential equations. This approach to working with models of dynamic systems is distinguished by this module from popular systems of computer algebra (Maple, Mathematica, Matlab), which use procedural code to solve such problems.

As the result of this research were developed software tool which can be used by researchers to simplify the process of researching models of dynamic systems. Such models are very common in the modern world, they describe processes in the economy (securities markets, company management, etc.),

in ecology (population growth and development, distribution of epidemics), in chemistry (autowave processes in catalytically active environments) in physics (turbulence), and in other areas.

Computational grids as a result of geometric transformations / V. Danylenko, O. Shoman // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 24-29: Pic. 5. – Ref.: 9 title.

In order to ensure the interconnectivity of physical and computational mappings, an interactive grid generation process using graphical computer tools is required. For practice, the most interesting are the orthogonal and conformal grids, which are regular netting grids. The application of some types of settlement grids, which was obtained using geometric transformations, is considered. In the examples given, coordinate grids are the result of geometric transformations of object models in different coordinate systems. Such grids often help to solve positional-metric tasks in the implementation. The general disadvantages of constructing grids with conformal mappings using complex variables include restrictions on the dimension of the grids, since they are predominantly two-dimensional. However, the methods of consecutive conformal mappings ensure the interdependence of these mappings. The purpose of research is related to the compilation of algorithms and programs of visualization of regular grids for further interpretation of solutions. The characteristic input conditions of the geometric problem are the equations and boundary conditions, as well as the physical quantities (parameters) for which a grid of lines is obtained. As an example, such parameters can be the value of the potential and intensity of the electric field. From the positions of applied geometry, conformal meshes are considered as a graphical representation of generalized parallel sets. The results of grid simulation using conformal mappings are shown.

The algorithm of verification the answer in testing systems, submitted in a text form / K. Kuzma // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 30-33. – Ref.: 9 title.

Existing testing-knowledge systems in their functionality significantly limit the possibility of non-formalized construction of test tasks. Modern software tools used for testing allow you to build questions only on certain types

The submitting of answer to a question in an arbitrary text form is not formalized enough.

Therefore, in order to automate the verification of a response filed in a text format in the natural language, it is necessary to develop an effective method for comparing such a response with the model (s) of the correct answer.

Considering algorithms for comparing lines of text, their classification is divided into two main types: «strict» comparison with the sample (pattern), «approximate» comparison with the «pattern». In this case, the template (search pattern) can be single or multiple.

The algorithm for comparison of short strings, which can have spelling mistakes in words, was proposed (test questions in the testing systems that relate to the type: «question-short answer»).

One of the modifications of the dynamic programming method, proposed by Hirschberg, was chosen to calculate the length of the longest common subsequence of two strings in order to compare the answer with the right sample. The choice of this method was due to sufficient efficiency and relative ease of implementation.

It was determined that further researching requires the algorithms of «approximate» comparison with multiple patterns by calculating the longest common subsequence of two strings. By using the dynamic programming methods, the comparison of short answers is carried out, that allowed to solve the problem of checking the answers, presented in textual form, as a problem of «fuzzy» search.

Microprocessor system for covering sound signal / V. Melnik // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 34-38: Pic. 1. – Ref.: 4 title.

The article deals with methods of hardware and software encryption of a sound signal, programs (sketches) of discretization of signals and discrete transformations for the Arduino platform processor.

The software of the system consists of signal sampling modules, its accumulation in the memory buffer, and skeletons that implement scrambling – descrambling the signal and sketches that implement the microcontroller's communication with external devices.

The article chooses the hardware and software of the digital device for encoding a signal based on efficient algorithms for obtaining the spectrum of the signal, and the corresponding software for signal processing is created. The software is run in C++ in the Arduino IDE environment.

As a result of the study, a method for scrambling audio signals and an algorithm for implementing it on the basis of Fibonacci numbers was developed to protect audio data from unauthorized eavesdropping. The properties and criteria of estimation of the information concealment system are analyzed, the principle of the algorithm of scrambling is described.

Development of a system for obtaining data from mems sensors and researching methods for their processing / S. Nadtochii, A. Guda // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 39-46: Pic. 9. – Ref.: 7 title.

Intro. MEMS – micro-electro mechanical system – device which combines micro mechanical system and electronic measurement system. As mechanical component it can contains, inertial sensor, like accelerometer, gyroscope, barometer or magnetometer, which are used for position determination in space.

Problems. One of the main problems during usage MEMS sensors it is getting clear, not noisy, measured values. Since all MEMS sensors has mechanical part, they're by default produce kind of noise, because mechanical part is an inertial system which cannot react immediately on external influences. Also a lot of MEMS sensors use ADC converters for measuring analog part of the system, which also adds its self-noise.

Available solutions. Manufacturers also understand that problems and tries solve them by adding self-calibration systems, which needs from sensor some time do not any moving. But it is can be uncomfortable for using in some cases. Also sometimes manufacturers add to their sensors DSP (Digital Signal Processor), which designed specifically for doing filtration calculations which can unload main processor of whole device from that tasks. DSP is part of high-end devices, which sometimes cost's a lot.

Results. So for that research we decided to use MPU-6050 combined accelerometer and gyroscope sensor which can be configured for getting data in different ranges. Also for getting this data we chose ESP8266 microcontroller, which have main feature built-in WiFi, which allow us to get data from MPU6050 and without conversion send it via UDP broadcast socket. In further, that allow us to receive data on any device from local network and process it as we want. Yes, we definitely decided to do not use ESP8266 for signal processing, because it more comfortably to filter data dynamically on PC by using high level languages like C++.

In that research we decided to look at Kalman and Complementary filters. As we can see, default, not filtered accelerometer signal has kind of noise, when system isn't moving and very big spikes when system moves. Gyroscope signal more clearly then accelerometer in both cases, but it has another problem, over time his signal unstoppable shifting from zero values, when system isn't moving, which is terrible and not usable.

Kalman filtering – gives us better and cleaner signal on accelerometer values, but it isn't solving problems with gyroscope shifting signal.

Complementary filter – consolidate only better parts of accelerometer and gyroscope signal. It gives us smooth signal like form gyroscope and compensate signal shift by adding accelerometer part.

Findings. 1. In that research we analyzed use cases of MEMS sensors. 2. Developed system which allows us get data from the sensor and process it in real time. 3. Researched available solutions, tested and chosed better of them.

Development of an automated system for tuning parameters of the memory Oracle server to improve performance / D. Pavlenko, E. Ostrovskaya // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 47-51: Pic. 5. – Ref.: 6 title.

The result of the work is the creation of a functioning application that will help the DBA to tune the memory allocation of the Oracle server in order to improve performance.

This project was implemented using powerful tools for working with databases, namely C# and PL / SQL, because the applications developed in this language work very reliably and are universal, allowing the end user to use the program from any computer.

The use of powerful tools for creating applications running in the Windows 10 operating system and better, and in particular, database applications, has made it possible to create a software product that is maximally oriented towards database administrators.

The developed software covers a range of tasks related to tuning database performance using memory allocation. The decision to configure the server is made by the administrator considering the prompts of the program.

All functions performed by the software complex were thoroughly tested and tested during the development process and their operation is guaranteed.

This software product can undoubtedly compete with the currently existing systems for tuning database performance.

The method of computer designing football boots in the Crispin Shoemaker system / A. Perperi, O. Savielieva, I. Artemieva, P. Zaitsev // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 52-59: Pic. 8. – Ref.: 11 title.

In a context of growing competition in the labor market, a system of higher education should train highly skilled personnel. In order for the designer to be in demand in the modern production of shoes, it is necessary to teach him specialized CAD, which allows a new approach to the process of creating models and technology for their production.

The British company Delcam plc (in 2015 united with Autodesk) is a world leader in the development and sales of CAD / CAM systems designed for 3D design, production and quality control of products and technology of complex shape.

The article considers the technique of designing sports shoes based on the example of the development of a football boot model, which will have a new design to facilitate the playing of a football player and to popularize football and sports in general among modern youth. The materials of this study can be used for teaching students of high schools the design of shoes in specialized CAD systems.

Design stages in CAD for shoes Delcam Crispin Shoemaker 2015:

1) Select a sports pad. 2) The next step, based on the geometry of the 3D model of the pad in the Shoe Design module, is the three-dimensional design of the top of the shoe: stylus lines, textures, stitches, shoelaces, logos, etc. are applied on the block: creating an emblem for the Adidas sports boot and top sketch sports boots and a tongue on the boot. 3) Design of the sole. 4) Creating a lacing system. 5) Create a visualization of football boots.

Depending on the brand, football shoes are produced on average every half year, so the design of football shoes has become very important today and always relevant.

Mathematical modeling of the measuring tract for determination of pulse pressure in liquid / V. Pozdeev, A. Melnik // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 60-64. – Ref.: 4 title.

The analysis of the features of pulsed hydrodynamic measurements and loads acting on the surface of technological barriers from pulsed sources of disturbances in a liquid is carried out. A mathematical model of the measuring path with a spherical sensor has been developed to determine the undistorted pulse pressure profile in the free field of a liquid medium. The application of the developed model will ensure the stability and reliability of the readings of the recording equipment as part of information and measurement systems for monitoring high-speed processes in pulsed technologies. The determination of the undistorted pulse pressure profile provides important information for the improvement of existing pulse technologies. One of the main problems of modern experimental technology is to improve the accuracy of pulse pressure measurements. The relevance of the work is due to the widespread use of pulsed sources in modern technology.

Mathematical analysis and computer simulation of reinforced femur bone stressed states / O. Savielieva, T. Starushkevych // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 65-71: Pic. 11, table 2. – Ref.: 6 title.

The article deals with the solution of mathematical and computer modeling of the femoral bone stressed states, reinforced with original implants. Models of new original constructions are carried out by the method of computer modeling. The problem was to prove the usefulness of their use by conducting stressed states mathematical modeling. The calculation of the strength of the implants under stress

influence of human weight was carried out, using the program Ansys Workbench. The constructions of the models give a clear idea of how the implant will look like, including different parameters.

Modeling objects of reinforcement will allow the surgeon to calculate all the nuances of the physical condition of each patient individually and thereby increase the probability of success of the operation.

The relevance of the topic lies in the application of mathematical and computer modeling in bioengineering calculations to verify and enhance the utility of new original reinforcing structures.

The method of prophylactic reinforcement of the femoral neck under conditions of limb prosthetics reduces the risk of new fractures of the femoral neck in the elderly.

Due to mathematical modeling in Ansys Workbench simulated loads in three versions: horizontal, vertical and rotational. Analysis of the results showed the feasibility of using implants and was the reason for the further introduction of the developed implants into practice.

Algorithm of the creation of hygienic compatibility three-dimensional game models / O. Sydelov, T. Selivorstova // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 72-78: Pic. 8. – Ref.: 4 title.

Computer graphics has firmly entered into modern day-to-day life. Used: when creating a variety of special effects in the cinema industry; when developing a modern user interface for software and network information resources; for creative expression of a person (digital photography, painting, computer animation, etc.). A special place in the field of computer graphics - the direction of creating three-dimensional models of high complexity, which are used for three-dimensional, and in some cases, for spatial-temporal reconstruction of the behavior of complex objects. 3D models of high complexity were the most popular in the field of computer games.

The aim of the work is to propose an algorithm for creating three-dimensional gaming models of high complexity, to analyze the stack of software used in the field of computer games for today.

Using the proposed basic algorithm for creating three-dimensional high-complexity models, A typical game character was created, however, the algorithm can be varied depending on the goals and scales of use. The choice of stack of applications may vary depending on the development industry, the company and even the team developers.

A three-dimensional gaming application as a means to increase the effectiveness of the work of the technical center site / Y. Sklema, E. Glibko, M. Maksimova // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 79-83: Pic. 6. – Ref.: 8 title.

The paper deals with the creation of a multifunctional interactive Internet representation of the technical center «HYDROPOWER» for car maintenance. In order to improve the efficiency of the enterprise and the expansion of the target client audience has been developed a gaming application. This application has been created using three-dimensional geometric models which providing additional promotional offers for users who have used it.

In view of the considerable competition in the market for the provision of services for the repair and maintenance of vehicles, under the other conditions of equal importance, a favorable visual range of the Internet representation of the enterprise and the availability of additional promotional offers offered by one or another performer play an essential role.

The purpose of the work is to create an online representation of the real customer – car repair company «HYDROPOWER» whose main purpose is to attract new customers and encourage existing ones, extending the target audience with the help of a three-dimensional gaming application.

As a result of the work was created a modern interactive site with an entertaining gaming application which allows the user not only to get information about the activities of the technical center but also to order an online set of necessary services in the form of an order with an additional bonus, to know their price and to set the suitable date. As a result of the introduction of the site it increased the number of clients who used the services of the technical center «HYDROPOWER».

Geometric recognition method of rectangular areas on images / I. Ustenko, S. Ustenko // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 84-88: Pic. 3. – Ref.: 4 title.

In this paper, a method of geometric recognition of rectangular areas in images obtained by statically standing cameras is proposed. This method refers to the method when a deep analysis of the characteristics of the image is made, in particular, various geometric characteristics are determined.

The first step in solving the information recognition problem will be to pre-process the image, which consists of the following stages: 1. Image reduction in two times. 2. Transform an image using an LUT transform to reduce the time required to apply an image transform. 3. For the final smoothing of noise in the image, applying blurring. 4. Use of the Canny Edge Detector.

The second stage of the solution is the recognition of a rectangular area in the image. As a result of the solution, it is necessary to indicate the coordinates of the area inside the image of the rectangular area. The stage includes the following steps: 1. Definition of straight lines on the processed image. 2. The choice of the obtained line segments, the angle of inclination of which corresponds to the specified, taking into account the specified error Δ , as well as perpendicular to them. 3. Removal of lines whose length is less than the specified one. 4. On the basis of cluster analysis, those lines are selected that constitute the required rectangular area. 5. Based on the obtained set of lines of four types, defined a rectangular area of the table. 6. To reduce the rectangular area, relative to its center, by a given relative value.

As a result of the work, a method of geometric recognition of rectangular areas in images obtained by statically standing cameras was developed. This method is implemented as a software product. As a result of his testing, acceptable results were obtained.

In the future we plan to develop a method of geometric recognition of parcels and their sizes, located in a rectangular area of the desktop. It is also planned to implement the method of geometric recognition of parcels and their sizes as an application.

Geometrical modeling of multi-parameter environments using n-dimensional interpolation / Y. Kholkovsky // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 89-92: Pic. 1. – Ref.: 4 title.

Mathematical modeling of the state of multiparameter systems, processes and environments, for example, ecological, energy, climatic, hydrological, geomorphological, geological systems, with the possibility of forecasting their state, is a rather difficult task. Certain parameters and components of multiparameter systems, processes, and environments are measured at a specific time and place. Consequently, such information is clearly discrete. It is clear that the issue of developing rational algorithms for constructing mathematical models of multiparameter systems, processes and environments, as well as forecasting their state, are relevant.

The approach to simulating complex multi-parameter systems, processes and environments used in this paper, we will note as non-traditional. Discrete geometric models of the above-mentioned objects are constructed as some one-parameter sets with the use of certain interpolation schemes based on interpolation polynomials of Lagrange. This gives an opportunity to obtain some functional with a parameter vector that includes an interpolation parameter, coordinate variables, parameters characterizing the form and position of objects, certain functional characteristics of the media, etc. One-parameter sets obtained in this way are discrete mathematical models of multiparametric objects, processes, environments, and the functional F is an element of such sets.

On the example of ecological systems, we can constant that multi-parametric systems and environments can be quite complex structurally and parametrically. In such cases, it is advisable to use a device of two-dimensional and higher interpolation.

In this way, we are able to construct discrete mathematical models of complex multiparameter systems, processes and environments that are characterized by a large number of parameters and properties that have a diverse structure and some anisotropy in space and time.

Modeling the performance of computing systems based on models and software / O. Kho-shaba // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 93-98: Pic. 2, table 1, list. 2. – Ref.: 8 title.

Some problems and the relevance of solving the problems of computing system performance. One of the problems in studying the performance of a computing system is the lack of estimates of artificially created tasks. Usually, when we comparing the performance of a computing system, the work of archivers, application programs for solving algebraic equations, graphics processing, etc. is used. However, these tasks use the computational resources of the system in different ways. Therefore, the load ef-

fects in the form of application programs cause complexity in evaluating the performance of the computing system. Interaction with these, actual solutions of such processes as artificially created tasks (impact scenarios) with the studied features of the consumption of computing and information resources of the computing system. Another equally important area in the performance of a computing system is the execution of mathematical modeling of data.

Purpose of the study. The aim of the study is to simulate the indicators of the basic performance characteristics of a computing system using mathematical models and software.

The basis of using reliable events in the study of the performance of the computing system is a four-tier model in which the main characteristics of the receipt and processing of requests are determined based on the indicators and processes of the performance of the computing system. This model allows us to simulate the main characteristics of the receipt and processing of requests to the system (service) of the corporate server (node of the corporate network).

Implementation of the four-tier performance model in the computing system. In order to simulate the basic characteristics of the receipt and processing of requests for this performance model of the computing system, applied mathematical modules have been created that work in the Octave and Matlab systems. They determine the basic parameters of the services (computer network nodes). The input parameters of the program include the number of requests sent, the speed of processing requests, the nominal and the current queue length. The output parameters of the program are the state of the service (node), the length of the current queue (taking into account the processed data), the number of lost requests, the utilization rate and the availability of the service (node of the computer network). The program for modeling the main parameters of the computing system performance has a check of the correctness of the input values, the main part of the calculation of performance indicators and some test cases. Currently, this program consists of two modules.

Peculiar features of implementation for generation of the Poisson disk in terms of language C++ / O. Chunikhin, T. Chunikhina // Geometric modeling and information technologies. – 2018. – № 2 (6), October 2018. – P. 99-104: Pic. 2, table 1, list. 8. – Ref.: 5 title.

A sampling that creates points that are tightly packed, but not closer than the given minimum distance, leads to a more natural drawing of points that is called the Poisson disk. It is used in many graphics applications, including rendering, generating of samples from blue-noise distribution, ideal fit for many applications in visualization.

The purpose of this paper is to review the algorithm operation, description of implementation in C++ language, analysis of the optimal use of the STL containers of the List and Vector to save the set of potential points and track changes in the construction of the disk, depending upon the method of choosing of the next point for consideration.

The paper describes the algorithm for constructing of a Poisson disk using the Robert Bridson method in two-dimensional space with C++ language. The estimation of the algorithm is equal to $O(N)$, since for obtaining N points review of the candidate points is carried out exactly $2N-1$ times and does not have embedded cycles.

It is established that there are no descriptions of the Robert Bridson method and its implementation in Ukrainian-language sources. The algorithm works expediently when selecting the first point in the list for iteration which is achieved by generating “ k ” points in neighboring of this one. This way, you can replace usage of the container with a free access Vector to any successive container, such as e. g. the List.