ABSTRACT AND REFERENCES

INFORMATION TECHNOLOGY. CONTROL SYSTEMS

TEXT IMAGE COMPRESSION BASED ON STATISTICAL ANALYSIS AND CLASSIFICATION OF THE VERTICAL LINE ELEMENTS (p. 4-15)

Vladimir Ivanov, Yuryi Lomonosov, Michael Lyubarsky

A new original method for text data image compression is presented. Vertical line elements rather than connecting symbols of the text image are used as the main processing element. The given probability model quite accurately describes possible distortions of the vertical line elements, caused by printing and scanning noise. Based on the accepted probability model and statistical analysis methods, minimum most plausible set of undistorted elements in the entire set of the investigated vertical line elements is found. For each vertical element, the probability that this element is a distortion of an element of the set of undistorted line elements is found. Classification of the vertical line elements of the text image is based on a probabilistic assessment of the classified elements belonging to a single center. The end result of the proposed method is forming a dictionary of connecting symbols of the text image, where each class is represented by its most probable image and an allocation map of connecting symbols on the plane of the studied image. The proposed text image processing method has allowed to obtain a relatively high compression ratio with good quality of the reconstructed image. Comparison with the currently best special text image compression algorithm - JB2, within the format DjVu, has shown that the proposed algorithm has the advantage in data compression ratio of about 37 % in processing a text page image with a resolution of 300 dpi.

Keywords: text image compression, vertical line elements, statistical analysis, classification.

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INVESTIGATION OF POSITION ESTIMATION ACCURACY OF CELESTIAL OBJECTS ON THE CCD FRAMES (p. 16-22)

Mihail Bezkrovniy, Vadim Savanevych, Nataliia Sokovikova, Iana Movsesian, Artem Pogorelov, Anna Dashkova, Mykola Dikhtyar, Alexandr Bryukhovetskiy, Liubov Mykhailova

High position estimation accuracy of objects is needed for better detection of celestial objects with nonzero apparent motion, and further clarification of the motion parameters of objects by a small number of measurements. However, the studies of the accuracy of currently used methods for position estimation of objects at the moment have not been carried out.

The estimation accuracy of equatorial coordinates of thirty most productive observatories in the world was investigated in the paper. The analysis was conducted by comparing the estimates with their predicted values, obtained on the Minor Planet Center website. Mean values of residuals by right ascension and declination, estimates of the standard deviations of the position estimates of objects, the average module of the measurement residual were calculated for each observatory.

The study has shown a significant advantage of observatories, which use CoLiTec software for processing the observation results. According to the average module of residuals and standard deviation in pixels, CoLiTec observatories-partners have taken a leading position among the small aperture telescopes. High measurement accuracy indexes were obtained using sub-pixel Gaussian model.

Keywords: objects, position estimation, digital image, asteroids, CCD-frame, accuracy, telescope, aperture.

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THE METHOD OF THE INTERNET AUTHORIZATION FOR THE PROTECTION OF SHAREWARE PROGRAMS (p. 23-27)

Dmytro Andrushchenko, Galina Kozina

The possibility of providing users with a shareware version of the program is promising for software developers. In this case, the user may use a fully working version for a limited period, or only part of the program functions, but without time limitation. However, this possibility is often a weak point in the software protection. There are many cases of unauthorized use of shareware programs.

The authors have developed a software protection protocol, including shareware programs, which is based on using the electronic digital signature mechanism.

In developing the program, its paid features are placed in a separate dynamic-link library DLL. The original file of the library is stored only on a remote server and is not distributed with the program upon its purchase. The file is loaded into the program memory at the time of its launch by the authorization over the Internet.

Description of the protocol of data transfer between the program and the remote server, as well as the method of the paid functional protection in the software, is given in the paper. In addition, the software implementation of the protocol was executed and, on its basis, the computer program protection module was developed.

This method in contrast to the existing allows a developer easily distribute software through the Internet without the worry about the possible appearance of illegal copies. Developer has the opportunity to monitor the process of using the licenses provided, reveal offenses and block licenses. The server part allows to "follow" the user's actions such as starting a program, creating a new document, using the data handler, generating a report, etc. and block the program in case of unauthorized use.

Providing licenses over the Internet allows the user quickly renew the license or replace one license with another.

Keywords: computer program protection, piracy, authorization method, shareware, protocol, implementation, encryption.

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APPLICATION OF ADAPTIVE CLIENT CONCEPT FOR THE TECHNICAL DIAGNOCTICS COMPUTER SYSTEM (p. 28-32)

Mykhailo Horbiychuk, Marian Slabinoha

The concept of an adaptive client in the client-server architecture of an automated computer system for identifying the technical condition of industrial facilities was discussed in the paper. The existing solutions of the client-server architectures were considered, their advantages and disadvantages were given. The selection of hardware and software of a test system, meeting the set forth specifications, was justified. The task was to design an algorithm and software implementation of the concept of an adaptive client. The theoretical basis of the client was substantiated, the behavior was described and the operation algorithm flowchart for software implementation was given. The results of the adaptive client with respect to the same operation of "thin" and "thick" clients when making analytical calculations of the different levels of complexity. The conclusion about the feasibility of implementing this concept into the automated computer system of technical diagnostics was made. The advantages of this approach compared with other implementations of the client-server architecture were given.

Keywords: diagnostic system, adaptive client, technical condition, computing power, functional module.

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IMPROVING NOISE IMMUNITY OF "SLIDING" CORRELATION ALGORITHM FOR PRINTABLE CHARACTERS RECOGNITION (p. 32-36)

Oleg Kushnirenko, Andrey Sadchenko, Alexander Troyanskiy

Solving the problem of character information recognition is relevant in the analysis of text documents, identification of the character information on printed circuit boards and electronic components, recognition of labels on containers and railway cars, etc.

Optimal matching algorithm, which provides the highest probability of a correct distinction, lies in calculating the correlation coefficient between the recognizable character and a set of all templates.

A simple noise-immune algorithm for character information recognition that does not use the procedure of pre-segmentation and contour filtering, based on the combination of the correlation method and the minimum code distance criterion was proposed in the paper.

The proposed algorithm allows significantly improve the probability of correct character recognition by slight complication of the processing algorithm and allows to determine the coordinates of characters, corresponding to one given pattern for one iteration.

The obvious advantage of this algorithm is the absence of multiplication operations. Herewith, the computational complexity of the algorithm is reduced due to the lack of multiplication operations and decrease in the total number of addition operations.

Keywords: character information recognition, sliding correlation, image binarization, Hamming code distance.

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RESEARCH OF CONTROL SYSTEM OF POLYMERIC EXTRUSION PROCESS UNDER CONDITIONS OF DISTURBANCES (p. 37-41)

Oleksii Zhuchenko, Oleksandr Anikeev

The analysis concerning the importance of maintaining a given temperature mode of an extruder while manufacturing polymer materials was carried out. An adaptive system of controlling the temperature mode of the extruder in a normal operating mode under conditions of disturbances of different nature was studied. The adaptive control system is based on the autoregressive-moving average model, uses the recursive least-squares method and its modifications for estimating the model parameters. The studies of the adaptive control system were carried out by introducing disturbances into the system operation. Changes of the power consumption of heat, for example, due to the dissipation of mechanical energy, were considered as the disturbances. The proposed control system of the polymer extrusion process has shown high efficiency under conditions of disturbances of different nature, confirmed by the given results of the conducted studies.

Keywords: extruder, system, control, studies, controller, disturbance, efficiency, temperature, mode, adaptation.

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THE PARALLELISM IN THE ALGORITHM OF THE SYNTHESIS OF MODELS OF OPTIMAL COMPLEXITY BASED ON THE GENETIC ALGORITHMS (p. 42-48)

Mykhailo Gorbiychuk, Vira Medvedchuk, Bohdan Pashkovskyi

An analysis of methods for constructing mathematical models has shown that one of the most promising methods for constructing such models is the inductive method of model self-organization that allows to obtain the model of optimal complexity. The disadvantage of this method is its high dimensionality, which limits the scope of this method. A method of the synthesis of models of optimal complexity based on the genetic algorithms, which has a much smaller dimensionality than the inductive method of model self-organization, can be an alternative to it. But for complex technical facilities with a large number of input variables, computing time expenditures are still quite noticeable. In order to reduce such expenditures, analysis of the method of constructing empirical models of optimal complexity based on the genetic algorithms of optimal complexity for parallelism by constructing the algorithm graphs was carried out. It was shown that this algorithm has an internal parallelism, which allows to develop an effective program of the algorithm implementation on a parallel-structure computer system, and this in turn would reduce the computer time expenditures at the practical implementation of the algorithm.

Keywords: empirical model, internal parallelism, algorithm graph, circle, circle width, algorithm graph height, computer system, parallel structure

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SIMULATION OF A SHIP'S ROLL UNDER DIFFERENT LOADING CONDITIONS (p. 49-53)

Vadim Miroshnikov, Vladimir Nesterenko, Inna Zavalniuk, Olga Zavalniuk

Despite the modern development of ship's technical measurement and automation equipment, new ships are equipped with the problem of real-time stability control for long service life merchant ships is relevant today.

Simulation of a ship's roll under different loading conditions, the results of which demonstrate the possibility of creating a device that allows real-time control of the ship stability by determining the metacentric height by the measured roll period was performed in the paper. It was found that the metacentric height is an important indicator of ship stability, which needs continuous monitoring in order to ensure the navigation safety. It was shown that the automatic determination of metacentric height requires a device, simple in design, not containing mechanical parts, excluding the human factor, as well as improving the measurement accuracy and skipper's decision-making speed.

Monitoring of the roll is proposed to carry out by the value of the change in the magnetic field intensity vector with the help of magnetic methods of non-destructive testing using magneto-modulation converters - ferroprobes.

Keywords: metacentric height, oscillation period, ship loading option, monitoring device

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