

4. INFORMATION AND COMPUTER TECHNOLOGIES

Abstracts

Artemov A.G. **Problems of the three-dimensional object reconstruction from two images**

The article is devoted to the problem of the three-dimensional reconstruction. The problem of big range of fundamental matrix coefficients is considered. A way of modification of classic 8-point algorithm is suggested. Also, the whole metric-reconstruction algorithm using calibrated camera is carried out. The results are analyzed and compared.

Grishkin V.M., Korolev A.I., Sukhmel V.A., Timoshenko D.M. **The static passphrase speaker verification system**

The problem of speaker voice verification is quite actual nowadays. In the paper the static passphrase hybrid verification system based on a text-dependent, text-independent and fusion method decisions is considered. The problem of preprocessing and signal quality evaluation is touched upon. A front-end passphrase phonetic variability estimation algorithm is proposed for verification system's efficiency gain. Hybrid verification system is tested on four real-life test bases.

Grishkin V.M., Jakushkin O.O. **Service-oriented architecture development in C++**

In the paper development of a modular cross-platform service-oriented system in C++ is considered. Native programming language was chosen due to its high performance capabilities and deep system integration. Algorithms used for core components creation and testing are described. Main role in a system is given to services, such as: video streaming, images manipulation and user administration. Libraries for future services expansion are shown. Described project was used for remote access to high-performance faculty cluster and has proven its effectiveness and reliability.

Ivanov A.N. **A numerical implementation of the matrix formalism**

The matrix formalism as a numerical approach for solving of ODE equations is considered. The given approach has several advantages over classical step-by-step integration methods and allows to present the solution as a set of numerical matrices. A complete derivation of the equations based on which this method is constructed is shown. Problems of symplectification and computing performance are briefly mentioned. The result of the research is an application that provides a tool for differential equations solving.

Kuznetsov P.M., Gorin A.V., Ivanov A.N. **Modification of visual odometry algorithm with optical flow estimation**

In the paper a slight modification of visual odometry algorithm is proposed. Proposed algorithm uses an optical flow estimation by Lucas-Kanade method, while state-of-the-art approach relies on descriptor-based feature point matching. This makes it possible to significantly increase the speed of visual odometry computation compared to existing approaches. Our algorithm has been implemented and tested on mobile robot platform. Its effective work is shown.

Maksimov A.J. **The development of PC user activity automation idea**

One of the urgent problems nowadays is the PC user activity automation, including the automation of industry, business processes, design, planning, organization, control processes and so on. The paper offers a program which allows to simplify a lot of listed problems. It has been a long time since automation has become an issue and today it has a number of solutions. Many of them have been analyzed in order to make a new solution considering the weaknesses and advantages of the existing ones. Some experiments have been made using the new program and significant results were obtained.

Mezentceva P.V. **Using subject field ontology in the problem of information retrieval**

In the paper the application of ontology based on the semantic searching algorithm in combination with the vector space searching model is considered. Main steps of semantic algorithm are stated, the composite formula for calculation of documents' relevance to user's retrieval request is proposed. The estimations of the combined algorithm demonstrate the improvement of retrieval power, which is provided by ontology based approach.

Nvohiri A.M., Chernobrovkin D.I. **Design of webometric tools and their testing on Nigerian university websites**

The article provides a brief description of Webometrics tools designed and the results of their testing on websites of Nigerian universities. The connection between Webometrics ranking and number of links between Nigerian universities and universities in the U.S., UK, and Australia is analyzed.

Nefyodov D.E. **Computer vision problems in motion control of robot crawler**

In the work such problems of computer vision as determining the turning angle coordinates and determining the distances to objects are considered. The problem of camera calibration is covered as subsidiary stage. Some algorithms of determining the known in advance templates on the robot way are shown. Version of obstacle avoiding algorithm is suggested.

Ryabusha V.A. **The conception of «Virtual accelerator» implementation based on cloud infrastructures**

The paper is devoted to the consideration of the new conception of «Virtual

accelerator» (VA) implementation by involving a new technology of cloud computing. It is shown that the use of cloud technology based on virtual machines and networks in the implementation to VA model provides the necessary properties as scalability, reliability, flexibility, distribution, efficient use of hardware base.

Sevostyanov R.A. **Real-time program support of the control processes for the tracked robot**

In the work the example of realization of the tracked robot based on the Arduino platform and two control modes are considered. The communication protocol and microcontroller program are described. Also the description of the computer software is presented.

Selezneva O.V. **Restoration of images distorted by noise with the help of Wiener filter**

In the work the problem of restoration the images distorted by noise is considered. To solve the problem, the Wiener filter is used.

Serdyuk Y.A. **The algorithm for detecting the content-bearing words by serial clustering and its experimental study**

In the paper the algorithm of detecting content-bearing words is described and tested. It is based on the observation that content-bearing words have very unevenly distribution in texts. The method is tested with two encyclopedias: The Great Soviet Encyclopedia in Russian and The Encyclopedia Britannica in English.

Xue Y. **Computer simulation of vehicle motion control system**

In the paper the mathematical model describing the dynamics of the transverse motion of the vehicle is considered. A computer modeling system that allows to synthesize automatic control laws and to investigate the relevant dynamic processes in a closed system is developed. As a basic method of synthesis the LQR-approach to the optimization of linear systems is accepted. It is shown that by choosing the weighting factor in the integral quadratic functional we can affect the intensity of control, trying to achieve the desired dynamic properties of automatic control systems.

Fedotova A.O. **Neural network approach to the identification of a linear model of the dynamics of ships**

The actual problem of providing the parametric identification of linear models for dynamical systems is discussed. Marine ship is accepted as controlled plant. The solution of this problem based on the ideology of neural networks is proposed. Modeling and verification of the presented approach is carried out using MATLAB environment.

Khromov A.A. **Compression of spectral images using principal component analysis and wavelet transform**

The spectral image is a data cube containing $M \times N \times K$ numbers. The storing of such quantity of information is a very inappropriate. In the paper the compression algorithm of the data cube using a principal component analysis and wavelet transformation with quantization is described.

Sholokhova A.A. **Algorithm for monitoring of fulfilment of basic plan target by the medical organizations**

One of lines of activity of Territorial fund of obligatory medical insurance in Saint-Petersburg is monitoring of fulfilment of basic plan target by the medical organizations. In the paper the monitoring algorithm of the performance targets in the context of medical organizations and in the context of the medical insurance organizations is described.

Scheglov A.K., Scheglov D.K. **The modernization concept of the exploitation control system for ground-based space infrastructure on the present stage of information technology development**

The basic preconditions and modernization features of the exploitation control system for operation of ground-based space infrastructure facility are considered. Short characteristics of control units as a part of this system is presented. General requirements to information support of operational processes are formulated. The base architecture and the system construction algorithm are offered.

Yalov A.L. **Realization of genetic algorithm for the problem of speaker verification**

The system of two algorithms those are independent and give the probability of identity input to the template is considered. The general solution is a linear combination of decision algorithms. The challenge is to find the best coefficients of this linear combination.

Aleynik S.V., Grishkin V.M., Korolev A.I., Sukhmel V.A., Timoshenko D.M. **Automatic preprocessing technique for detection of corrupted speech signal fragments for the purpose of speaker verification**

Automatic speaker verification systems often have to contend with degraded quality of the input speech signals. If speech signals are corrupted (e.g., include noises, clipped segments, tone signals, power bursts, etc.), performance of the systems degrades sharply. On the other hand, it is not common case that input signal is totally distorted: usually only some fragments of the signal are of bad quality. In the paper, the preprocessing technique for automatic detection and rejection of the corrupted fragments of input signals is presented. This technique allows to detect clicks, tones, overloads, clipping, etc., as well as to discover the parts of good-quality speech signals. As a result the performance of the speaker verification system increases significantly.

Kato K., Klyuev V.V. **Google App Engine: How use and work**

Google App Engine is a very useful tool provided by Google to make web applications easily. App Engine lets us run web applications on Google's infrastructure and App Engine Framework supplies three languages to design high quality applications. We have been working with Google App Engine for one year. We discuss the pros and cons of different technologies utilizing Python. Thus recommendations for the novice users are provided.

Zeng Yi-Ching Li, Klyuev V.V., Shih-Hung Wu **Opinion Extraction from Chinese Web Blog Corpora**

In recent years, blogs have become a popular communication tool among internet communities. Blogs allow users to express their ideals, comments and share them with others. Many authors write opinions about things in their blogs. Opinion analysis in Chinese is a challenging task. In this paper, we discuss blog opinion analysis issues. To find opinion terms in blogs, we segment the sentences utilizing open source software. After that we utilize a sentiment dictionary. We use a support vector machine to define the opinions in the blogs. It detects both the positive and negative opinions in the selected blogs. We use blog documents provided by PIXNET (Taiwanese Internet service provider company) to test our approach.