Transactions of Georgian Technical University. AUTOMATED CONTROL SYSTEMS, No 2(3), 2007

საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY
ГРУЗИНСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

ISSN 1512-3979

შ რ ო მ ე ბ ი

მართვის ავტომატიზებული სისტემები

TRANSACTIONS

AUTOMATED CONTROL SYSTEMS

Т Р У Д Ы

АВТОМАТИЗИРОВАННЫЕ СИСТЕМЫ УПРАВЛЕНИЯ

№ 2(3)

თბილისი-TBILISI-ТБИЛИСИ
2007

ISSN 1512-3979

CONTENTS

- JOINT MASTER'S CURRICULUM IN SOFTWARE ENGINEERING
Bothe K. (Germany), Budimac Z. (Serbia), Cortazar R. (Spain), Zedan H. (United Kingdom) 11

THEORETICAL COMPUTER SCIENCE

- USE OF NONLINEAR PROGRAMING METHOD FOR OPTIMIZATION OF THE LOWER PART OF AIRCRAFT WING PROFILE
Prangishvili A., Obgadze T., Davitashvili I. 22

- ABOUT THE GENERAL METHOD OF ANALYSES OF THE COMPLICATED MASSIVE SERVICE SYSTEM Mikadze Z., Shurgaia I., Mikadze I.Z. 32

- VN-NET. Samkharadze R. 40

- THE TASK OF OPTIMAL CONTROL FOR THE SOFT LANDING TO THE MOON
Mosashvili I., Mchedlishvili N. 46

- ULTICRITERIAL DECISION MAKING TASK FORMALIZATION AND COMPUTER SUPPORT IN MANAGEMENT Macharadze T. 53

PRACTICAL COMPUTER SCIENCE

- ALGORITHM FOR COMBINED PROCESSING OF SCANNED INFORMATION
Kartvelishvili I., Djlantiashvili A. 60

- OBJECT-ROLE MODELLING FOR THE AUTOMATED CONSTRUCTION OF STRUCTURES OF DATABASES
Surguladze G., Topuria N., Motzonelidze N. 65

- PERFECTION OF SYSTEM OF ORGANIZATIONAL MANAGEMENT ON THE BASIS OF BI-TECHNOLOGY Giutashvili M. 73

- CONVERTING OF THE INFORMATION FOR DATA WAREHOUSE
PetriaSvili L., Kashibadze M. 79

TECHNICAL COMPUTER SCIENCE

- ON THE ONE MATHEMATICAL MODEL OF THE SOUND WAVE PROPAGATION THEORY
Teimuraz Chilachava 85

- INTERCONNECTING MEASURING FAEILITY, AS AN EFFECTIVE WAY OF INCREASE OF AEEURAEY AND RELIABILITY
Mikadze I.S., Kaishauri T., Nachkebia Sh., Mikiashvili N. 94

- QUESTIONS OF TRANSPORTATION AND PROCESSING OF THE INFORMATION FOR MANAGEMENT OF THE POWER SYSTEM
Modebadze I., Murdjikneli G., Modebadze N. 99

APPLIED COMPUTER SCIENCE

- MODELING SOCIAL SYSTEMS 104
Meparishvili B., Janelidze G., Meparishvili T.

- ELABORATION OF AUTOMATED CONTROL SYSTEM OF ORGANIZING THE STUDY PROCESS IN HIGHER SCHOOLS 114
Sukhiashvili T.

- RESEARCH OF SERVICE DISTRIBUTION IN EDUCATIONAL NETWORK 120
Kartvelishvili M., Kartvelishvili O.

- USING THE NET MODEL TO ANALYSE THE ECONOMICAL DYNAMIC 125
Sesadze N., Sesadze V., Bazuashvili T., Gemazashvili V., Abramidze E.

- THE ANALYSIS OF ECONOMY ON THE BASIS OF MODEL SOLOU 131
Sesadze N., Sesadze V., Bazuashvili T., Gemazashvili V., Abramidze E.

- DEVELOPMENT OF COMPUTER NETWORK' ARCHITECTURE FOR STOMATOLOGICAL SERVICE OF GEORGIA 137
Kamkamidze K, Manikov M., Tevdoradze M., Sanikidze R., Saldadze M.

- THE VALUATION OF COMMERCIAL BANK AND ITS STOCKS 143
Giguashvili N.

- ROLE OF THE SUPPLY WITH INFORMATION FOR SUCCESSFUL ACTIVITY OF FIRM 149
Magradze M., Jvania T., Burduladze A.

- ON GRAPH MODELING, EXTENSION AND TRANSFORMATION OF STRUCTURED INFORMATIONAL RELATIONS 154
Nikolaishvili V., Kapanadze D., Zhvania T., Kiknadze M.

- MAIN FUNCTIONS AND CHARACTERISTICS OF QOS IN COMPUTER NETWORKS 160
Lobjanidze L., Tevdoradze M.

- AUTOMATION OF THE PROCESSES OF ADMINISTRATIVE JURISPRUDENCE 164
Gvinepadze Gela, Kekelia Valeri, Leonidze Natia

JOINT MASTER'S CURRICULUM IN SOFTWARE ENGINEERING

Klaus Bothe - Humboldt University Berlin,
Zoran Budimac - University of Novi Sad, Serbia,
Rebeca Cortazar - University of Deusto, Bilbao, Spain,
Hussein Zedan - De Montfort University Hawthron Building, UK
Project Web page: http://perun.im.ns.ac.yu/msc-se/

Summary

Developing a joint curriculum across different institutions is a unique and novel initiative to harmonize university education in Europe, sharing the efforts of curriculum development (hence reducing their cost), and to improve the quality of education. Our project covers seven partner institutions from five countries – four in the role of beneficiary partners and three have an advisory role. This paper outlines the principles adopted in the creation and development of an MSc in Software Engineering that is compliant with the Bologna agreement.

THEORETICAL COMPUTER SCIENCE

USE OF NONLINEAR PROGRAMING METHOD FOR OPTIMIZATION OF THE LOWER PART OF AIRCRAFT WING PROFILE

Prangishvili Archil, Obgadze Tamaz, Davitashvili Irma
Georgian Technical University

Summary

When studying the problems of profile flow around with viscous fluid Navier-Stokes mathematical model is often used. The respective algorithms developed for this model are so complicated and the errors are so grave that they become unsuitable for the problems of aerodynamics. Therefore, in practice the corresponding calculations are based on semi empirical formulas and relations. We construct the algorithm based on classical experiments and laws of mechanics. We consider incompressible viscous fluid and then using recalculation formulas, pass over to aerodynamic indices for compressible fluids. The article is based on nonlinear programming method for minimization of efficiency function – integral error consisting of kinematic conditions, boundary conditions and modified function of wing quality when integral laws of conservation of mass and energy for viscous fluids are presented in the form of limitations.

In order to demonstrate the new algorithm the problem of flow around of aircraft wing profile is presented. The upper part of aircraft wing is presented with the matrix of coordinates of profile points, while lower part is presented with cubic polynomial crossing the two given points (front and rear edges). The components of the vector field of the required speed are determined as the polynomials of two variables with unknown coefficients. The problem of determination of the lower contour of profile is stated and solved on condition of maximum quality.

ABOUT THE GENERAL METHOD OF ANALYSES OF THE COMPLICATED MASSIVE SERVICE SYSTEM

Mikadze Saal, Shurgaia Irakli, Mikadze Ilia Z.
Georgian Technical University

Summary

This article deals with the analysis of a complicated system of massive service using one of the methods (offered by Mikadze-Kakubava) of math modeling.

VN-NET

Roman Samkharadze
Georgian Technical University

Summary

In clause the new approach to visualization of change of conditions of processes and planning of loading of processors is offered. The new type of network Petri - a VN-network which allows visualization the processes proceeding in a computer at work of operational system is developed. On the basis of a VN-network models and algorithms of visualization of change of conditions of processes and planning of loading of processors, and also corresponding educational program simulators are developed.

THE TASK OF OPTIMAL CONTROL FOR THE SOFT LANDING TO THE MOON

Mosashvili Ia, Mchedlishvili Nino
Georgian Technical University

Summary

A fuel optimization task in work for a soft landing on the Moon, has been completed. The control is determined with Pontryagin's minimum principle. The mathematical model of system included Maximum Principle with transversality conditions and the boundary conditions to find the optimal solution. Computer designing of optimal system for the soft landing on the moon is realized with use of system Matlab.

A detailed investigation of the constrained trajectory optimization of the Moon landing problem has been presented. The resulting trajectories were analyzed based on state and control histories, effect on fuel and usages, operational feasibility, etc..

First, analysis was performed considering only two-dimensional translational motion. The baseline trajectory, which represented a minimally constrained landing trajectory, was found to be operationally infeasible. Operational constraints were imposed to obtain a more viable solution. A parametric study was performed varying the perilune height of the descent orbit and an impulse-like burn was observed in cases that targeted a positive descent orbit perilune height. The final vehicle attitude and landing approach of the vehicle were found to be very shallow (horizontal), which motivated the inclusion of rotational kinematics in the equations of motion in order to constrain the attitude characteristics of the vehicle. Attitude kinematics were included in the equations of motion and a constant scaling of the angular acceleration command appended to the cost function in order to minimize the rotational motion of the vehicle during the flight. The vehicle was constrained to land at a near vertical attitude (within 0.5 *deg)* with zero angular rate. Fuel penalty metrics were obtained for both the terminal attitude and attitude rate constraints, as well as further constraining the throttle to maximum thrust. It was found that the fuel usage increased by further limiting the throttle bound to maximum thrust. During the final portion of the trajectory, the final throttle profile was observed to decrease to a specified lower bound as the vehicle rotated to a vertical orientation, which suggested the optimum was a minimal, or possibly zero, engine thrust during this interval. To investigate this, and to provide for navigational error margin, a terminal vertical descent phase was included in the trajectory.

ULTICRITERIAL DECISION MAKING TASK FORMALIZATION AND COMPUTER SUPPORT IN MANAGEMENT

Macharadze Tengiz
Georgian Technical University

Summary

The task of multicriterial decision making in management Is formalized. Considers of decision making model construction, based on linear convolution function, intergrates the particular criteria and its realization as a decision making support subsystem.

PRACTICAL COMPUTER SCIENCE

ALGORITHM FOR COMBINED PROCESSING OF SCANNED INFORMATION

Kartvelishvili Iosif, Djlantiashvili Avtandil
Georgian Technical University

Summary

The thesis presents the algorithm for combined processing of scanned information. Each algorithmic block is designed to carry out certain function for automatic identification. Each algorithmic block is presented in such a way that it makes possible and simplifies the programming process.

OBJECT-ROLE MODELLING FOR THE AUTOMATED CONSTRUCTION OF STRUCTURES OF DATABASES

Surguladze Gia, Topuria Nino, Motsonelidze Nika
Georgian Technical University

Summary

Questions of automation of processes of designing of the conceptual scheme of the distributed problem area and construction of corresponding logic structure of a database on the basis of object-role modelling and visual programming are stated. Results are adapted for the account, statistical processing and monitoring of hydroresources of the rivers of Georgia on the basis of information computer system. Program realization of system is executed on platform MsSQL Server and ADO.NET.

PERFECTION OF SYSTEM OF ORGANIZATIONAL MANAGEMENT ON THE BASIS OF BI-TECHNOLOGY

Giutashvili Megi

Georgian Technical University

Summary

In article perfection of enterprise information systems on the basis of BI-business Intelligence technology is presented. Software tools for information processing and making quick and exact decisions in the enterprise systems are considered. On an example process of projects processing in department of organizational management, selection and management of intelligence resources of the company, with use of automated mechanisms of gathering of the information, the analysis and decision-making is shown. The basic stages of realization of organizational management automated system by means of modern informational technologies are processed.

CONVERTING OF THE INFORMATION FOR DATA WAREHOUSE

Petriashvili Lily, Kashibadze Marina, Okhanashvili Maia

Georgian Technical University

Summary

Converting of the information for data warehouse of the big corporate systems is complex process. It is characterized by high labour input. The structure of process of converting in data warehouse of is offered. Problem of the dependence between processes of converting and decision-support are researched.

TECHNICAL COMPUTER SCIENCE

ON THE ONE MATHEMATICAL MODEL OF THE SOUND WAVE PROPAGATION THEORY

Teimuraz Chilachava
Sukhumi State University

Summary

The questions have been connected with the existence and singularity of the solution of boundary value problem for Helmholtz equation with variable coefficients are represented with the significant interest in the theory of differential equations with partial derivatives. In this previous articles a sound field created by point-like harmonic sources in a three-dimensional nonhomogeneous wave conductor with a ruffled surface and an uneven bottom was found by an asymptotic method of a small parameter. It is confirmed that the sound field pertubation is represented by the continual sum of diverge secondary waves, the source of which is the nonhomogeneously of medium and the rouhgness of boundarys. Besides the wave amplitudes are proportional to the small parameter and are depended on the parameters of all modes (normal wave).

INTERCONNECTING MEASURING FAEILITY, AS AN EFFECTIVE WAY OF INCREASE OF AEEURAEY AND RELIABILITY

Mikadze Ilia, Nachkebia Shalva, Kaishauri Tinatin, Mikiashvili Nana
Georgian Technical University

Summary

In automatic computer control technical devices in case of random failure the common constant reservation with substitution and rehabilitation is widely spread. The advantage of reservation method is more completely shown when measuring devices are supplied with analogue output. They are effectively applied in local subsystems of complex automatic systems. In such subsystems as the redundant information processing unit some devices are often used for realizing the function of rehabilitation. Significant increase of reliability is achieved in case when in the algorithm of redundant information processing, signal comparison logical operation of different measuring units is introduced. In the paper. A model of reliability for parallel – reserved systems with substitution and rehabilitation without significant limitations in the modes of failure and rehabilitation distribution rules is investigated.

QUESTIONS OF TRANSPORTATION AND PROCESSING OF THE INFORMATION FOR MANAGEMENT OF THE POWER SYSTEM

Modebadze Iuri, Murdjikneli Guram, Modebadze Nato
Georgian Technical University

Summary

The article covers information collection, integration, transmission and processing issues for ensuring energy system remonte management. Also, the need of necessary information for electrical energysystem efficient management is considered and information preciseness and delivery to the final destination with high quality is demonstrated i.e. mistake should be completely avoided. For raising reliability of system, information transfer and processing alternative waus by means of fiberoptical and computer systems application are considered.

APPLIED COMPUTER SCIENCE

MODELING SOCIAL SYSTEMS

Meparishvili Badri[1] , Janelidze Gulnara[1] , Meparishvili Tamar[2]
1. Georgian Technical University,
2. Tbilisi State University, Georgia
Georgian Technical University

Summary

This paper is consecrated to the new concept for a formal description of the society complexity with respect to the viewpoint of modelling social behavior, that is conditioned by the existence of a human being as of nonlinear and fuzzy factor, respectively with very high degree of freedom of behavior. The state of human society as a system is described by the different degree of dissatisfaction or satisfaction with the social, political and economical rules. Originality of this work is in the description of society in a form of the neural graph with synaptic connections between them, where every interaction between any two social clusters forms the new united cluster, provokes redistribution of synergy-entropy, its balance and fitness. Behavioral diversity of the society is conditioned by social homeostasis and heterostasis. In the given context, the criterion of society security is associated with stability, and in biological viewpoint with the idea of homeostasis or fitness-function.

ELABORATION OF AUTOMATED CONTROL SYSTEM OF ORGANIZING THE STUDY PROCESS IN HIGHER SCHOOLS

Sukhiashvili Teimuraz
Georgian Technical University

Summary

Resume: Building an automated system envisages studying the existing control system and creating an adequate model of its functioning. The article discusses stages of building automated control system of organizing study process in higher schools by object-oriented approach, starting from assigning demands for the system and ending with formation of the mechanisms for their realization.

RESEARCH OF SERVICE DISTRIBUTION IN EDUCATIONAL NETWORK

Kartvelishvili Mikheil, Kartvelishvili Otar
Georgian Technical University

Summary

This article presents the service distribution analysis in network flows of the external traffic of the Georgian Research and Educational network and its application to the detection of typical and anomalous traffic patterns. As a result of this analysis the most used services were identified for different parts of the network. Network statistics collection was performed by the software system, that was constructed by optimal interconnection of different Netflow and SNMP protocol components, which gave the opportunity to acquire much more detailed statistical information.

USING THE NET MODEL TO ANALYSE THE ECONOMICAL DYNAMIC

Sesadze Neli, Sesadze Valida, Bazuashvili Tekla,
Gemazashvili Valeria, Abramidze Erekle
Georgian Technical University

Summary

Modern economical theory as the level of micro and macro economies, uses mathematical methods and models as the essential and natural elements. Using the mathematics in economy, gives us an opportunity to separate and formally describe especially, important and existing relations between the main economical values of the object. According to the method of deduction, which is based on the initial data and their relations, we shall receive an adequate conclusion about the object, which would be studied by us. The mathematic and the statistic methods give us a chance to receive some new information about the object and to estimate the values and the dependence on their forms and parameters. In this article is considered: The Net model, which gives us an opportunity to investigate the stability of price and volume on the market by using the traditional demand and supply curves, when they are delayed in time. We also investigate the behavior of manufacture volume and the price, while the initial point does not coincide with the equilibrium.

THE ANALYSIS OF ECONOMY ON THE BASIS OF MODEL SOLOU

Sesadze Neli, Sesadze Valida, Gemazashvili Viktoria,
Bazuashvili Tekla, Abramidze Erekle
Georgian Technical University

Summary

There is the description of model of economic growth of R. Solou. The article also includes all the basic conclusions, made as a result of the analysis of economy on the basis of given model. It is shown, that a condition of the accelerated growth in a steady condition is speed of technological changes and increase of a level of savings can lead to increase in rates of growth if to use spillovers.

DEVELOPMENT OF COMPUTER NETWORK' ARCHITECTURE FOR STOMATOLOGICAL SERVICE OF GEORGIA

Kamkamidze Konstantin, Manukov Mikhail, Tevdoradze Medea,
Sanikidze Revaz, Saldadze Merab
Georgian Technical University

Summary

Questions of using of computer technologies in stomatology of Georgia are discussed in the given article. Main aspects of using of computer and characteristics of main types of systems, which are usable in stromatology, are given. On the basis of mentioned questions architecture of computer network, which supports of all possible variants of using of computer in stomatology, is developed. Main problems of using of network are defined and main parameters of estimation of functioning of network are formulated

THE VALUATION OF COMMERCIAL BANK AND ITS STOCKS

Giguashvili Nona
Georgian Technical University

Summary

In this work are estimated the value of Georgian commercial bank (namely TBC Bank) and its stocks on base Discaunted Cash Flow model. Here are established the relations between ROA and ROE of Georgian commercial banks. There is made the forecast of common financial Ratios on base linear Regression. Are shown the peculiarities of Georgian commercial banks.

ROLE OF THE SUPPLY WITH INFORMATION FOR SUCCESSFUL ACTIVITY OF FIRM

Magradze Manana, Jvania Taliko, Burduladze Alexander
Georgian Technical University

Summary

In the aticle is shown, that in conditions of market economy it's inconceivable the successful working of the firm without information maintenance. Information departments are concerned with it. They ensure information procuring, estimation, editting with high quality service and perform it with dexterous form for management – to make a decision. There are examined needful technologies for information rapid procuring, verification, optimum conservation, getting right and for problem determination of optimum analysis.

ON GRAPH MODELING, EXTENSION AND TRANSFORMATION OF STRUCTURED INFORMATIONAL RELATIONS

Nikolaishvili Vanzet, Kapanadze David, Zhvania Taliko, Kiknadze Mzia

Georgian Technical University

Summary

Visual modeling of informational relations and logical reasoning by using graph of mapping is considered. Possibility of graph representation of the structured information by reducing to the extension and transformation of connections among graph components of some concrete mapping is stated.

MAIN FUNCTIONS AND CHARACTERISTICS OF QOS IN COMPUTER NETWORKS

Lobjanidze Lili, Tevdoradze Medea
Georgian Technical University

Summary

It is described the mechanism of the Quality of Service (QoS). It is classified network ability to provide the different levels of service by categories of data transfer. It is described and characterized the different functions of QoS and connected preferences and possibilities with them. It is shown the realization of the algorithm "token bucket" for mechanism of traffic shaping. It is shown the importance of management of resources. It is described the main characteristics of the realisation network connection: delay, packet loss, packet jitter, load of network, bandwidth, control of intensivity of trafic.

AUTOMATION OF THE PROCESSES OF ADMINISTRATIVE JURISPRUDENCE

Gvinepadze Gela, Kekelia Valeri, Leonidze Natia
Georgian Technical University

Summary

Unlike the earlier systems, a computer system which is to be projected, works according to the territorial principle, in a net environment assigned for time distribution. For the so-called actors, a new approach towards the creation of the system has necessitated the requirement of the detailed definition of rules for the work on legal cases. Together with the necessity of taking control of the activity of court personnel, this system is first of all considered to be the device which should be subordinated to the needs of the consumer. It serves as a warning system which notifies about the 'narrow' places in advance and retrieves the information having been saved in the base in any desirable form. Computer system is created on the base of SQL Server 2000. Programs are processed by the use of DELPHI 7. An operating system is Windows 2003.