Lucian Blaga University of Sibiu, Romania

Faculty of Sciences

Department of Informatics

MDIS 2011 - SIBIU

Second International Conference on Modelling and Development of Intelligent Systems

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Editor Cristina Răulea

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PREFACE

The aim of the conference is to bring together computer scientists, mathematicians, researchers and students working in fields which can be connected with modeling and development of intelligent systems.

The topics of the conference includes but is not limited to the following subjects:

- Evolutionary computing
- Grid computing and clustering
- Data mining
- Ontology engineering
- Intelligent systems for decision support
- Knowledge based systems
- Pattern recognition and model checking
- Motion recognition
- Hybrid computation for artificial vision
- Knowledge reasoning for artificial vision
- Geometric modelling and spatial reasoning
- Modelling and optimization of dynamic systems
- Large scale optimization techniques
- Adaptive systems
- Multiagent systems
- Swarm intelligence
- Metaheuristics and applications
- Machine Learning
- Mathematical models for development of intelligent systems

Specialists from Bulgaria, Irland, Romania, Republic of Moldova, Serbia, Switzerland, joint together to this second edition of the conference to present and to discuss recent problems on mathematical models, design, development and applications of intelligent systems.

The conference's papers were reviewed by two independent reviewers and will be published in a proceedings volume edited by Lucian Blaga University Press. The proceedings will be indexed by Mathematical Review.

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Prof. PhD. Dana Simian

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OFFICIAL LANGUAGE

The official language of the Conference is English.

Plenary Lecturer

Web services: models, equivalence transformations, frameworks, implementations

Florian Boian

Until recently, data has been exported on the World Wide Web for human consumption in the form of Web pages. Most people therefore use the Web to read news/articles, to buy goods and services, to manage on-line accounts and so on. For this purpose, we use a Web browser and access information mostly through this medium.

From a publishing perspective, this involves converting the raw information, from a database, for example, into HTML or similar language so that it can be rendered in the correct form. Further, many Web sites collate information from other sites via Web pages, which is a bizarre occurrence involving decoding and parsing human-readable information not intended for machines at all.

This scenario works well for many applications but it is highly redundant because the conversion from the raw data into human-readable format for publication and availability does not support software interactions very well. What we really need to do is provide a mechanism whereby the raw data can be accessed in a similar fashion by machines as humans read Web pages now. Therefore, some special smart (usually standalone) client mechanism is required in order to enable true machine-to-machine communication to provide a machine-process able Web.

In the last ten years, three models of **web services** were studied: XML-RPC model, SOAP (+ WSDL and UDDI) model, REST (RESTfully) model. In our paper, the definitions and characteristics of each model are presented. The main our focuses are:

1. Internet resources and web applications: resource representations (XHTML, XML, JSON), transport : HTTP protocol, HTTP request methods (GET, POST, PUT, DELETE, HEAD), General Architecture of a web application, AJAX.
2. Middleware: RPC & MOM, RPC paradigms, Java servlets, RMI (+IIOP), CORBA, Pyro, Hessian, JMS.
3. Web service: What is? An example, WS types: XML-RPC, SOAP (with WSDL & UDDI), RESTful, Asynchronous WS: GWT
4. WS models, implementations, frameworks: XML-RPC: C# (XmlRpcCS), Java (Apache XML-RPC), PHP (Dumbill xmlrpc[s].inc), Python (xmlrpclib, SimpleXMLRPCServer), SOAP (+ WSDL, +UDDI): C# (.NET +IIS + *.asmx), Java (Apache JAX-WS), PHP (nusoap, SoapServer, SoapClient), Python (jpk/SoapLib, python-suds), RESTful: C# ((.NET +IIS + *.ashx), Java (Jboss RESTeasy), PHP (Da Silva packages), Python (CherryPy), Asynchronous WS: GWT Java (+ JavaScript automatically translated from Java code)
5. Our purpose for integration and transformations: WSWrapper

Plenary Lecturer

Ant colony optimization pheromone correction strategies

Milan Tuba

Most real-life problems can be represented as some kind of optimization problem. Easy optimization problems were solved long time ago so nowadays only hard problems are of research interest. Many discrete (combinatorial) as well as some continuous optimization problems are intractable, but of great practical interest. The oldest way to deal with such problems is Monte-Carlo method. Nature inspired

metaheuristics simulate various natural phenomena. We talk about bee colony food finding or ant colony path finding but in essence, in all these diverse mimicking, we do two things. We exploit good found solutions but also go to unknown places in order to avoid being trapped in local minima. The successfulness of any algorithm is determined by proper balance between exploitation and exploration. This paper examines ant colony pheromone correction strategies which change exploitation and exploration behavior of the original algorithm and applies these strategies to some combinatorial problems.

A Methodology for Investigation the Change in Visual Detection of Motion in the Elderly

Kiril Alexiev, Nadejda Bocheva, Simeon Stefanov

The current research is focused on constructing tools for modelling and analysis of changes in motion perception that occur with age. Created software tools allow conducting psychophysical experiments for estimating the sensitivity to motion direction of two age groups. The results were analysed and compared to evaluate the major changes in cognition with age. The differences in visual motion integration and in the decision-making strategies were assessed by a procedure for objective scenario estimation. In the framework of this procedure a trajectory detector estimates and classifies useful statistics for each test. A special measure is proposed for estimation of the temporal characteristics of the random scenario that determines the correctness of observer's decision. The interpretation of the results reveals new information about the age-related characteristics of visual processing of motion information. Moreover, it allows detecting subjects with significant degradation of visual processing.

Gallbladder description in ultrasound images ontology

Natalie Bruc, Galina Magariu, Tatiana Verlan

The process of ontology elaboration for gallbladder ultrasound images on the base of knowledge enclosed in decision support system SonaRes is described in this article.

Ultrasound diagnostics system SonaRes: structure and investigation process

Liudmila Burtseva, Svetlana Cojocaru, Constantin Gaindric, Olga Popcova, Iulian Secrieru

In this paper the recent approaches to development of Diagnostic Decision Support Systems (DDSS) are examined. The solutions used in the SonaRes system, which combines knowledge-based and image-based techniques, are described.

The Analysis of Continuous Variables in the Decision Model of Bankruptcy Risk using Bayesian Networks

Mihaela-Daciana Crăciun, Dominic Bucerzan, Crina Rațiu

This paper is concerned with the modeling using bayesian network (BN) of bancruptcy prediction (BP) from the economic model proposed by Anghel [5]. Within the simulation the paper is focused on the choosing a discretizing method for the used interval, depending on the performance of the three methods chosen.

Comparison is made between a normal solution, Bracket Medians discretizing method and Pearson-Tukey discretizing method. The BN construction process, respectively the simulation was realized using the AgenaRisk software. Simulation results were obtained from sensitivity analysis table and graphic.

On some fuzzy positive and linear operators

Anca Farcaş

The purpose of this work is to show that fuzzy Bernstein-Stancu operators introduced in [3] satisfy an A-statistical version of fuzzy Korovkin theorem. Some properties of these operators are also proved. An example of new fuzzy positive and linear operators is presented.

A Parameter Adjustment Tool for CompuCell3D

Xuefeng Gao, Sabin Tabîrca

The aim of this paper is to present a graphic user interface (GUI) tool for parameter adjustment in CompuCell3D, an open source multi-cell modeling framework and software packages. We provide an overview of this software and its underlying Glazier-Graner-Hogeweg (GGH) algorithm. To enhance the parameter adjustment approach in CompuCell3D simulations, we develop an easy-to-use tool - ParaAdjuster - using Python and PyQt. We briey present a case study of using ParaAdjuster combined with CompuCell3D to simulate a solid tumor development.

Argumentation-Based Ontology Maintanance

Adrian Groza, Raluca Mechno

The study proposes a method for ontology update based on the large amount of semi-structured data available from the semantic wikis. An argumentation reasoning process evaluates the contradictory pieces of knowledge posted by different users in order to adjust the axioms of an ontology or to decide each individual to what concept it belongs.

Center of a Set of Points in Three-dimensional Space Using Triangular Metric

Petko Lalov, Stefan Dimitrov

The triangular distance between two points A(xa, ya, za) and B(xb, yb, zb) in three-dimensional space is defined as follows:

$$R_T = |x_a - x_b| + |y_a - y_b| + |z_a - z_b|$$

In the present paper is discussed and solved the following problem: given a set of points to be found such a point , denoted center, that minimizes:

$$\max R_T (M, A_i) \quad (1)$$

Based on the results in [1], where the two-dimensional case is analyzed, the authors prove that (1) has not a single solution and in the general case it is a two-dimensional convex simplex which is an intersection of n octahedra. The graphical solution is obtained by a developed computer program.

Decision-making system in E-marketing strategies

Valentina Lazăr, Cristina Răulea

The project aims the marketing process from the moment when the customer interact with marketing environment until the construction of new marketing strategies to enable sales and gain the customer loyalty, qualities absolutely necessary for the existence and profitability of business. That for, in developing process it was concluded that the use of applications based on threads is more expensive in terms of query time, effort and updating user data, than if it would use a system based on intelligent agents.

Dependency Injection using Spring.NET. Case Study

Daniel Luca

This paper presents a case study where the new technique of Dependency Injection was used with excellent results and can be an inspiring example for future developments of the application or for other similar projects. As we will present here, the Dependency Injection, imported from the Java World, can be applied in .NET using the Spring Framework without any loss in productivity.

Fuzzy Expert System Design for Medical Diagnosis

Diana Ofelia Man

In recent years, the methods of artificial intelligence have largely been used in the different areas including the medical applications. In the medicine area, many fuzzy expert systems (FES) were designed.

We study the possibilities of using fuzzy logic in building agent software assuming the role of an experienced medical person, which benefits of a vast medical knowledge regarding symptoms and diseases and has the role to orientate the young resident doctors in the process of diagnosis establishment.

A cluster analysis for recommender systems evaluation metrics

Ionela Maniu, George Maniu

Evaluation of recommender systems is a challenging task due to the many possible scenarios in which such systems may be deployed. Comparison between recommender systems it becomes difficult to achieve due to the large diversity of published metrics that have been used to quantitatively evaluate the accuracy of recommender systems. In this paper, we present a cluster analysis whose goal is to offer a classification of binary evaluation function in order to establish standardization within this field.

Web based applications for children. Design considerations.

Ioana Moisil , Alina Elena Pitic

Designing software for children poses a number of unique challenges. In this paper we describe a participatory design method used in the development of educational software, in which a group of children participate actively in different stages of the design process. The theme of the example application is "raising awareness towards energy saving amongst children". Some particular design challenges that have arisen in the development of the application are analysed. We describe how the children (aged 7-12) contributed to the graphical design of the user interface. We also present the technological challenges we had to overcome in order to properly integrate their input into the design of the application.

Versatile integration of data mining techniques of description and prediction in Web informatics systems of Business Intelligence

Mircea Adrian Muşan

Using data mining techniques in computer applications for the digital economy, but not only, opened new possibilities for handling information in real time and their movement between all the factors involved. Computer applications based on these techniques assist successfully entrepreneurs in making decisions to achieve a higher degree of economic efficiency at company / organization level.

A prolongation technique for solving partial diferential equations with a multigrid method

Gabriela Nuț

The purpose of this paper is to introduce a new prolongation method for solving partial differential equations by a numerical method of multilevel type. This new technique is compared with others already existing in the literature, by means of some numerical results.

Methodological aspects concerning digital libraries for children.

Alina Elena Pitic

Digital libraries are today offering a huge quantity of resources in different formats, for a wide spectrum of users. Making some of these resources available to children poses a number of specific challenges, especially when it comes to designing the user interface and to modelling the user interaction. This paper is part of my Ph.D. thesis and describes research aspects concerning digital library interfaces for children between 7 and 12 years old. The adopted methodology involves using the creative input from a number of children, in order to improve the specificity of the application. Children were considered design partners. The results were analysed in terms of user experience and accessibility.

Several methods of approximation for second order nonlinear boundary value problem with boundary conditions at infinity

Daniel N. Pop, Radu T. Trîmbiţaş

Consider the problem:

$$\begin{cases} y''(x) + f(x,y) = 0, & 0 < x < \infty \\ y(0) = \infty, \quad y(\infty) = 0 \end{cases}$$

where $f(x,y) \in C([0,\infty] \times R)$, $y(x) \in C^1(0,\infty)$. This is not a classical two-points boundary value problem since $y(0) = \infty$, $y(\infty) = 0$. To solve this kind of problems we need to know the values in two inner points $a,b \in (0,\infty)$, $a \neq b$. The aim of this work is to present three approximation procedures:

1. A combined method using collocation method on B-splines of order (k+2) with a (k+1) order *Runge-Kutta* method.
2. A pseudospectral collocation method with *Chebychev* extreme points combined with a *Runge-Kutta* method.
3. MATLAB function `bvp4c` combined with a *Runge-Kutta* method.

Then we give a numerical examples and compare the costs (time U.C) using MATLAB functions `tic-toc`.

Modeling and Analysis for Social Media Network - Case Study: The Small World Type Network for Social Media Networks Analysis in PMML

Ioan Pop

Network of "small world" are exceptional models that can be adapted for modeling networks of "social media". This article proposes a model for complex networks of "social media" that we want to punm out a new approach to analyze these social networks. At the end of the work proposed implementation in PMML language (XML-based) model designed for analyzing social networks.

UML Modeling Concepts used for Decision Support Systems

Cristina Popenţa

While developing a software system, numerous design decisions including architectural decisions are made, which influence the architecture of the system as well as following decisions. Several tools already exist for managing design decisions, but also for guiding the user by proposing subsequent decisions. In model-based software development, many decisions directly affect the structural and behavioral models used to describe and develop a software system and its architecture. However, the decisions are typically not connected to these models. The UML modeling tool shows all decisions related to a model and allow extending or updating them.

Interface design can be done using language based tools (the interface is programmed using a programming language), based on graphic interactivity specifications (these tools allow an interactive design of the interface), and based on models (these tools use a model or a high-level specification for automating generation of the interface).
Development of user interface is difficult and a time-consuming activity when language based tools or graphic based tools are used. Most tools used for graphic interface development support only the development stage of the life cycle of the interface. Model based development of interfaces represents an emergent technology for the problem solving of the current technologies, by offering a support for the whole life-cycle and for the design methodology oriented towards users.
A design model is a formal model used for the development of a software system; UML is one modeling language for this purpose. A design decision describes changes in one or more design models due to a particular problem; it includes structural model changes, rationales, and consequences for subsequent

About Hash Function and Watermark Algorithms

Crina Rațiu, Dominic Bucerzan, Mihaela Crăciun

In today's corporate world, images and documents travel widely and rapidly through email, across the Internet and mobile devices. Controlling and protecting sensitive or confidential documents and images has become very important. [12]
To protect the ownership rights on digital audio, image, video and all forms of media content, digital watermarking techniques can be used combined with cryptography and hash functions.
In this paper we focus on different algorithms of digital watermarking for image applications and on several types of watermarking attacks which aim at its

robustness, its form and even at its removal. Also we propose a solution of digital watermarking completed with a hash function in order to increase the degree of security of the transferred data through today's uncertain environment. To sum up we present our view upon specific solutions in this field.

Adaptive Time Discretization for Retarded Potentials

Stefan Sauter, Alexander Veit

We consider retarded boundary integral formulations of the three-dimensional wave equation in unbounded domains. Our goal is to apply a Galerkin method in space and time in order to solve these problems numerically. In this approach the computation of the system matrix entries is the major bottleneck. We will propose new types of finite-dimensional spaces for the time discretization. They allow variable time-stepping, variable order of approximation and simplify the quadrature problem arising in the generation of the system matrix substantially. The reason is that the basis functions of these spaces are globally smooth and compactly supported.

In order to perform numerical tests concerning our new basis functions we consider the special case that the boundary of the scattering problem is the unit sphere. We will derive explicit representations of the exact solutions of these problems which will serve as reference solutions for the numerical experiments.

Playing with threads in Java 7

Ernest Scheiber

The new Java 7 version introduce the fork-join technique and the class Phaser. These techniques are compared with other tools introduced in earlier Java versions (join, CountDownLatch, CyclicBarrier, ExecutorService) in terms of the time to solve a simple embarrassing parallel test problem based on a synchronous algorithm for the successive approximation method.
In the same way a comparison is made between Java 6 and Java 7.

On some generalizations of Bézier curves

Dana Simian, Corina Simian

Bézier curves and surfaces are very important in Computer Aided Geometric Design. They are parametric curves and surfaces given in parametric form using Bernstein basis functions. In the last years, many studies were dedicated to new classes of modified Bernstein operators having good stability and convergence rate properties. Generalizations of Bézier curves and surfaces are directly connected with generalized Bernstein basis. The aim of this paper is to analysis many generalizations of Bézier curves and to use them for generation of modified spline Bézier curves of G^1 class. Implementation is made using MATLAB and allow the comparison of different classes of modified spline Bézier curves.

Supervised Approach to Learning Multivariate Linear Systems

Luminița State, Iuliana Paraschiv-Munteanu

We consider the problem of developing a learning from data scheme for the unknown input-output dependency of a system **S** of linear type in the sense that the *m*-dimensional output of **S** results by combining in a linear way the effects of *n* observable variables and the effects of several unobservable latent variables. The effects of the latent variables on the output is treated as additive noise, that is being given the observable vector *x*, the system computes the output $y = \beta^T \begin{pmatrix} 1 \\ x \end{pmatrix} + \varepsilon$, where β is a $(n + 1) \times m$ matrix and ε is a *m*-dimensional Gaussian variable. In the paper the mathematical arguments for the estimation scheme based exclusively on a finite size set of observations is provided.

We present an experimental evaluation of the quality of the resulted learning scheme in order to establish conclusions concerning their accuracy and generalization capacities, the evaluation being performed in terms of metric, probabilistic and informational criterion functions.

Considerations about the implementation of an ATL model checker

Laura Florentina Stoica , Florin Stoica

The problem of model checking is to verify if a finite-state abstraction of a reactive system satisfies a temporal-logic specification. The CTL logic is interpreted over Kripke structures, which provide a model for the computations of a closed system

(the behavior is completely determined by the state of the system). In order to capture compositions of open systems, we present an extension of CTL, the alternating-time temporal logic (ATL), which is interpreted over game structures. In this paper we will show how our original ANTLR-based model checker for CTL can be modified to check an ATL specification, using a data structure suitable for multigraph representation of a concurrent game structure.

A technique for constructing training sets in data stream mining: kSiEved Window Training Set

Sabina Surdu

One of the challenges that data mining is facing today is applying its techniques to dynamic data, *i.e.* data streams. Data streams are produced over time by data sources and systems that process them run continuous queries in a perpetual manner, in order to produce streamed results. New data management and query processing paradigms emerged in this context. Applying data mining algorithms on data streams requires adapting the classical methods of data mining to the novel processing paradigms. One of the main challenges in data stream processing is represented by limited system resources. Our goal is to provide a resource-aware technique that constructs training sets for a data stream mining algorithm, namely the kSiEved Window Training Set technique.

From Bernstein Polynomials to Lagrange Interpolation

Gancho Tachev

For a given continuous function f(x) on [0, 1] we construct sequence of algebraic polynomials based on Bernstein approximation. We prove that the limit of this sequence is the Lagrange interpolation polynomial of degree n. Application to the representation of polynomial curves will be given.

"Least Significant Bit" method in steganography

Gabriel Tudorică, Paul Stânea, Daniel Hunyadi

The purpose of this paper is to present a steganography application which uses the "Least Significant Bit" method. We will focus on a digital steganography technique, using Bitmap files as carrier files for our hidden messages, thus hiding it in plain sight. Even though the picture can be seen by others, only the sender and the intended recipient will actually be able to get the messages.

We built an application using C# capable of applying this steganography technique, and allowing the user to embed hidden messages in 24 bit Bitmap files. Additionally, we present a chat-like environment using 24 bit Bitmap files to send the encrypted data.

Estimation of the selectivity factor for a set of queries

Letiția Velcescu, Laurențiu Vasile

In this paper, we study the selectivity factor, extending this concept to the case of a queries set $Q_1,\ldots,Q_n$. These queries are performed on the tables of a transactional database. So, they are supposed to be updated dynamically and, consequently, the selectivity factor associated to each query may vary in different moments. Because the selectivity factor has an important role in database optimization, it is necessary to be able to estimate it. We propose an algorithm for the estimation of the generalized selectivity factor, the concept we introduce, and also a hybrid estimator for it.

Some of the aspects of decision design in development of the intelligent wire casting machine

Sergiu Zaporojan, Constantin Plotnic, Igor Calmicov

The process of microwire casting can be one of the methods of nanotechnology and advanced materials. The objective of this paper is to discuss the problem of decision design in the development of an intelligent machine for casting of microwire. The paper presents the decision making structure and describes its elements for microwire production based on direct casting from the melt. The most important element of the decision making structure is given by the drop model. According to this, important details of the model are discussed. The results presented here are intended to be used in the decision support system design for building of the intelligent casting machine.

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