

Cost of reaching the consensus in a group of agents based on a psychology of opinion change

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Abstract: We deal with consensus reaching, and its related decision support system. We assume that consensus reaching proceeds in a small group of agents who shows their preferences with respect to a set of options. We propose an approach based on the cost of reaching the consensus in the sense of evaluation of preference updating, based on psychological and sociological reasons. We use a model with nonlinear functions representing human behaviour over the interaction of some endogenous and exogenous forces.

Keywords: *group decision making, consensus, psychology of opinion change, cost function*

[The article](#)

Modelling warehouse layouts based on Fuzzy Situational Maps

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Abstract: The main target of this research is to introduce a new way of thinking in a special field of logistic processes. This process is the inbound process in a simple general type warehouse. The methodology chosen is the use of multicomponent fuzzy descriptors: signatures and situational maps, as they properly reflect the uncertain and sometimes non-deterministic nature of the conditions and constraints in this problem class. Our intention is to reach an optimal, or at least as close as possible to optimal warehouse layout for any given case.

Keywords: *warehouse layout, fuzzy situational maps, warehouse inbound process*

[The article](#)

Obstacle avoidance in dynamic environments based on Q-learning and neural networks

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Abstract: The presented research targets the problem of mobile robot navigation in environments that contain both static and dynamic obstacles. The aim of this article is to present a new path-planning algorithm that provides a collision-free trajectory within an uncertain workspace. The developed solution is based on a mix of 2 AI techniques: Q-learning and neural networks. The experimental results prove the value of the approach.

Keywords: obstacle avoidance, neural networks, Q-learning

[The article](#)

Point-and-command Paradigm in Human - Robot Interaction

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Abstract: This paper presents an interaction concept aimed to provide an easy-to use and intuitive way of interaction with humanoid robots in domestic environments. The interaction is performed through gesture commands and dialogue mechanism to provide ‘natural’ means for user to command assistive robots which performs some given tasks. “Point-and-command” concept was evaluated using two Nao robotic platforms. A DSS based on Fuzzy Logic was implemented for selecting between two robots when one of them becomes unusable.

Keywords: human-robot interaction, pointing gesture, humanoid robot, assistive robotics

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Multi-objective optimization for brachytherapy robotic interventions

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Abstract: Brachytherapy (BT) is a procedure used to treat cancer by inserting needles into a patient to deliver radioactive sources direct to the tumour tissue. The efficiency of the procedure is determined by the number of needles inserted and by the precision of the trajectories of the needles. This paper presents an approach for needle insertion trajectory planning for a BT parallel robot based on a genetic algorithm. Given the locations of the seeds points and the 3D virtual model of the treatment area, the proposed solver allows to minimize the number of inserted needles and to define needles trajectories that avoid high risk areas.

Keywords: *robotic brachytherapy, optimization, genetic algorithm.*

[The article](#)

Electric Vehicles Control using Biological Paradigms

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Abstract: This paper it want to emphasizes on importance bio-systems paradigms the in design of new and optimized solution for technical systems. The homeostasis and allostasis are remarkable phenomena and these are revealed in case of bio-systems representing, in the same time, sources of inspiration for optimal design of the control systems. The functions discovered and also the organization and structure of bio-systems can be considered as optimized. An example is detailed, in regarding the management of energy and starting system for a diesel hydraulic locomotive.

Keywords: *bio-systems, control, homeostasis, allostasis*

[The article](#)

Radio Dust - Decentralized Spectrum Sensing for Cognitive Broadcasting

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Abstract: This paper proposes some models for optimizing the spectrum sensing needed for cognitive broadcasting in radio-congested environments by using different techniques in acquiring data from a “radio dust” - a network of inexpensive SDR devices. Practical solutions cover not only cost-effective SDR receivers but also local intelligence with a spectacular addition: mobility.

Keywords: *spectrum sensing, software defined radio, cognitive broadcasting*

[The article](#)

Packet Processing for Streaming Filtering on ATCA Platforms

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Abstract: The paper presents the hardware and software integration of packet processing on an Advanced Telecom and Computing Architecture. The Continuous Computing PP50 sub-system is introduced, with its multi-processor architecture, various firmware and management solutions. With the purpose of flow discrimination by deep packet inspection, it is presented the development environment, software configuration and application management in a use-case for DSTP filtering.

Keywords: ATCA, packet processing, DPI, RMI-OS, Linux

[The article](#)

Software-Defined Networks for Secure Distributed Industrial Communications

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Abstract: The security of distributed Ethernet-based industrial networks is critical, as vulnerabilities of these systems could affect national resources, civilians and the environment. Next-generation firewalls combine application awareness and deep packet inspection to give companies more control over applications while also detecting and blocking security threats. While most industry solutions are physical deployments of industrial switches with firewall capabilities, we propose a network security implementation of distributed middleboxes, dynamically deployed as Linux Containers and centrally managed by a controller, based on Software Defined Networks.

Keywords: SDN, Middleboxes, Linux containers, virtualization

[The article](#)

A Note on Coverings by Radial Rule Bases

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Abstract The paper discusses covering of an input space by a rule base of a radial fuzzy system. We address the question of what is the minimal degree of firing of a radial rule base across the input space? This minimal degree is called the degree of covering (DOC). For radial rule bases, a search for the DOC leads to a constrained optimization problem. This generally hard problem can be eased by passing to convex optimization, however, for the price of obtaining only a lower bound for DOC.

Keywords: radial fuzzy systems, convex optimization maketitle

[The article](#)

Distribution-Free Estimation of Conditional Quantile with Different Types of Conditioning Attributes

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Abstract: The paper presents a distribution-free procedure for calculating the value of a conditional quantile estimator. Thanks to a clear, near intuitive interpretation, the practical implementation of this method is very simple and it can easily be modified or generalized depending on the individual needs of atypical applications. In particular, conditioning variables can be taken into account – not only continuous (real), but also binary, discrete and categorized, or any of their combinations.

Keywords: *conditional quantile; nonparametric estimation; conditioning variables of continuous, binary, discrete and categorized types; numerical algorithm*

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Characteristics of the Global Innovation Process Based on Short Time Series Analysis

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Abstract: The study was aimed at verifying the existence of a global innovation process by applying Latent Growth Curve Modelling to a short time series of key field indicators. Setting a matrix of time series in the form of a structural model enabled testing functional forms of the processes' dynamics and verifying its dependence on initial levels of the analysed measures. The study unveiled a growth tendency of innovation indicators, pointing to varying functional forms of change, and relations with the initial level of the process. The method also underlined a lack of homogeneity in measurement techniques for innovation statistics.

Keywords: *Latent Growth Curve Model, global innovation process, innovation strategy.*

[The article](#)

Modelling Repeated Measurements Data on the Example of Systolic and Diastolic Blood Pressure

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Abstract: The relationship between blood pressure and various medical, demographic and socioeconomic characteristics, on the example of the longitudinally collected data, was examined. The correlation between the repeated measurements on the same experimental unit was modelled using random effects. Significant predictors of systolic and diastolic blood pressure were identified.

Keywords: *blood pressure, repeated measurements, random effects*

[The article](#)

Genetic Programming Based Rule Classifier for Data Streams with Heterogeneous Features

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Abstract: Classification of data streams is currently a very important task. Datasets characterized by constant influx of data are predominantly massive and often have various types of features. Even more challenging is to classify evolving streams. Various approaches have been proposed to deal with this problem. In this paper we will present a new method based on mixture of genetic programming and rule-based classifier designed for that task. The motivation for choosing this approach is provided by the fact that tree-like structures are easy to understand and interpret. What is more continuous generation and optimization of rules reminds real-life scenario, where changing conditions cause natural selection and adaptation. The approach was preliminarily tested on data sets that are changing in time and have heterogeneous features.

Keywords: *data streams, rule-based classifier, genetic programming, heterogeneous features, concept drift*

[The article](#)

Tuning Neural Networks with Krill Herd Algorithm

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Abstract: In recent times, several new metaheuristic algorithms based on natural phenomena have been made available to researchers. One of these is that of the Krill Herd Algorithm (KHA) procedure. It contains many interesting mechanisms. The purpose of this article is to compare the KHA optimization algorithm used for learning an artificial neural network (ANN), with other heuristic methods and with more conventional procedures. The proposed learning method has been verified positively for the classification problem. For this task, benchmark examples drawn from the Irvine Machine Learning Repository were used. For comparison purposes, both the Classification Error and Sum of Square Errors were employed.

Keywords: *Krill Herd Algorithm, Biologically Inspired Algorithm, Metaheuristic, Neural Networks, Optimization.*

[The article](#)

Generation of Software Tests on the Basis of Cause-Effect Graphs

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Abstract: Cause-effect graphs are applied for preparing efficient functional tests for software. A graph established on the basis of the software specification is required to be evaluated. The evaluation results in the test cases consisting of the Boolean-logic combinations of causes. A cause-effect graph is equivalent with a combinational logic network. This paper presents an exact algorithm for producing the test cases of the software. The algorithm applies a three-valued Boolean algebra, and is based on the successive justification of logic values in a combinational logic network, where the primary inputs are the causes, and the primary outputs are the effects. The computations are performed by traversing a decision tree, where backtracking is required if a decision leads to a logic contradiction. The main advantage of the algorithm is that it reduces the number of decisions to a great extent by using don't care values in the process. The calculation principle is comparatively simple. It is based only on successive line-value justification, and it yields an opportunity to be realized by an efficient computer program. The logic model introduced in the paper is completely general, in that it is applicable to any kind of cause-effect graphs, without any constraint. The final part of the paper is concerned with the computational complexity of the presented algorithm.

Keywords: *Software testing, cause-effect graphs, three-valued Boolean algebra, combinational logic networks, line-value justification, computational complexity.*

[The article](#)

The internal relations of fuzzy situational map nodes

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Abstract: Computational tasks involving intelligent agents often need to process complex structured information. The way of describing this information greatly influences the performance of the agent. Therefore, a big issue is how the complex data describing that valuable information is not lose while it can also be processed in tractable time. Fuzzy signatures and their multidimensional geometric extension, fuzzy situational maps, are used to describe such complex structured data. These problems are examined in the context of a cooperative mobile robot task and a new method is developed for the simplified describing and processing of the complex inner relations in fuzzy situational maps. This paper mainly deals with the fundamentals of this method.

Keywords: *fuzzy signature, fuzzy situational map, node relation.*

[The article](#)

Performance Enhancement of the Fuzzy Rule Interpolation Method FRISUV by Rule Weights

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Abstract: Fuzzy rule interpolation based on subsethood values is a low complexity FRI method. In this paper, we present its enhanced version that makes possible the weighting of the individual rules. Thereby FRISUV becomes better tuneable and adaptable.

Keywords: *fuzzy rule interpolation, FRISUV, clonal selection*

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Possible manners of Fuzzy Cognitive Maps' state reduction

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Abstract: Fuzzy Cognitive Maps (FCM) is a powerful tool to analyze and model the behavior of complex systems. One of the most important elements of FCM is the connection matrix. This square matrix describes the direction and weight of the connections between the different parts (called concepts in FCM theory) of the modeled system. If the number of concepts is only 5-10, the model is clear and easy to use. However in some cases the whole system cannot be described with so many concepts to achieve the appropriate accuracy. The increased number of concepts helps to make the model more accurate but makes the model complicated as well, therefore confusing and less usable. Sometimes it is not obvious at first sight for the modelers, which concepts are really important and which ones are not. The state reduction methods described in this paper can help to reduce the number of concepts in FCM models and keep the accuracy at an acceptable level.

Keywords: Fuzzy Cognitive Maps, state reduction

[The article](#)

Flexible fuzzy relation equations

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Abstract: Adjoint triples have been considered in several frameworks, such as in logic programming, formal concept analysis and rough set. Multi-adjoint relation equations are based on these triples and provide a general and flexible setting which cover a large range of applications. This paper presents these equations and several results, which are given thank relationship to concept lattice theory.

Keywords: *Fuzzy relation equations, Galois connection, residuated operators.*

[The article](#)

Fuzzy Signature State Machine-based Building Refurbishment Chain Optimization

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Abstract: The historic district of Budapest, Hungary that was mainly developed before the Second World War consists of urban-type residential houses. The external view of these buildings indicates that the physical condition of these houses are acceptable, however, a thorough professional examination may contradict to this supposition at the same time. Among others, the absence of any effective decision support tool that helps the owners in determining the refurbishment chain hinders the retrofit of such old residential houses. This paper represents a new formal method and approach for generating such tool that considers the costs and feasibilities of alternative refurbishment solutions with professional data obtained from building diagnostics surveys and official contractors' billing database.

Keywords: *urban-type residential house, building renovation chain, fuzzy signature, fuzzy state machine*

[The article](#)

Sensitivity Analysis of Fuzzy Signatures

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Abstract: We briefly summarize our results on the sensitivity of the weighted generalized mean (power mean) aggregation operator and their application on the sensitivity analysis of fuzzy signatures.

Keywords: *fuzzy signature, sensitivity, aggregation operator, weighted general mean, power mean*

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Uncertainty Models in Ontology Management

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Abstract: The knowledge base is the kernel module of any intelligent information systems. The main tool in knowledge representation is ontology which is used to perform an explicit conceptualization of the problem domain. A unique characteristic in modelling of agent's knowledge is the representation of subjective knowledge. This model may contain some uncertainty factors. This paper provides a survey on the different uncertainty models and presents a new vector-valued representation formalism for truth values. The proposed model is tested in an implementation developed in the OWL ontology language.

Keywords: ontology, uncertainty representations, many-valued logic

[The article](#)

On Possibilistic Portfolio Selection Models

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Abstract: We consider optimal portfolio selection problems in a possibilistic setting. Using the possibilistic framework, we can integrate more efficiently the experts' knowledge and the investors' subjective opinions into a portfolio selection model. In 2002 Carlsson, Fullér and Majlender considered portfolio selection problems under trapezoidal possibility distributions and presented an algorithm of complexity $O(n^3)$ for finding an exact optimal solution to the n -asset portfolio selection problem. In this paper we will give a short survey of some works, which extend and develop this possibilistic portfolio selection model.

Keywords: Fuzzy number, Possibility, Portfolio selection

[The article](#)

Decision Support Based on the Evaluation of Residential Buildings

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Abstract: From the point of view of the sustainability of the building stock it is significant to be aware of the condition of the load bearing structures. In general the assessment of condition is done by visual inspection in the case of residential buildings therefore the experts assessing the condition of buildings have only limited information. Thus the assessment of an expert is subjective, which might cause the inaccuracy of the assessment. Two fuzzy logic based models have been created for qualifying the buildings. Sensibility of buildings was examined, to see to what extent the final assessment changes upon slight changes of input values.

Keywords: *decision support, fuzzy signatures, real-fuzzy sets*

[The article](#)

Studies on the sustainability of integrated waste management systems

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Abstract: The EU Waste Management Strategy's requirements emphasize waste prevention; recycling and reuse; and improving final disposal and monitoring. Integrated waste management system (IWMS) can be defined as the selection and application of suitable and available techniques, technologies and management programs to achieve waste management objectives and goals. In this paper, the concept of 'key drivers' are defined as factors that change the status quo of an existing waste management system in either positive or negative direction. Due to the complexity and uncertainty occurring in sustainable waste management systems, we propose the use of the Fuzzy Cognitive Map (FCM) approach to support the planning and decision making process of integrated systems.

Keywords: *integrated waste management systems, sustainability, factors, expert workshop, Fuzzy Cognitive Map (FCM)*

[The article](#)

Fuzzy Handling of the Effects of Noise and Insertion Loss

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Abstract: In several areas – in absence of optical networks – telecommunications companies have to provide digital services with high data transfer rate using copper wire based cables of the telephone network. These telephone networks are not evolved for broadband communications technologies, thus, using them, current demands can be satisfied only within certain limits. These limits, e.g. the maximal available data transfer rate that can be reached by using a certain wire pair (line), have to be known by the service providers. The process which is used to produce this information is called performance evaluation (or pre-qualification). In this paper we represent a novel, fuzzy based performance evaluation method for SHDSL connections of telecommunications access networks which uses measured electrical line parameters and which reliability exceeds the reliability of other, generally used methods.

Keywords access networks, SHDSL, fuzzy systems, performance evaluation

[The article](#)

Developing a new method to model the causal relationships in stakeholder management at companies by using Fuzzy Cognitive Map Approach

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Abstract: The aim of this paper is to investigate the operation of a Stakeholder Relationship Management System (SRMS) as a method for business management and project support by fuzzy approach. The criteria defined in connection with the SRMS will be modelled by using the Fuzzy Cognitive Map (FCM) approach in order to define the causality and weights of interconnections between the factors and to support decision making in that way.

Keywords: *Stakeholder Relationship Management System, Fuzzy Cognitive Map, Bacterial Evolutionary Algorithm, factor reduction model*

[The article](#)

Integration of Model Based Prediction into Complex Event Processing Applications

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Abstract: This paper reviews two major data-consumers: Complex Event Processing and Machine Learning. Although they have different targets and outputs, they are complementary rather than competing technologies. CEP, through its rich set of operations, may contribute to data integration and data cleansing, which is a vital part of ML process. On the other hand, ML produces inferential models which can be further integrated as user-defined functions in CEP workflows. The ML paradigm enriches CEP by its different vision: the models are data-driven and produce insights which may be hard to be detected, even by experienced human experts.

Keywords: *Complex event processing, machine learning, integration pattern*

[The article](#)

Using Signatures for Expert System Modeling Concepts definitions

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Using Signatures for Expert System Modeling Case studies

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Abstract The new modeling approach presented in the previous paper is formulated as an original three-step algorithm that maps the signatures onto expert systems. The algorithm has two inputs represented by the knowledge base (the rules) and the data base (the facts). The algorithm constructs the signatures which represent expert system models. This paper is organized as follows: a short overview on signatures and on their operators is presented in the next Section. Section 1 validates the theoretical approach by two case studies focused on the construction of models of a deterministic and of a Bayesian expert system. The conclusions are outlined in Section 5.

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