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Section 1

Optimization

A Class of Partitionable Graphs with Maximum Number of Edges

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Abstract.

A graph G is called *O-graph* if there are an optimal coloring of the set of vertices of G and an optimal coloring of \overline{G} , the complement of G , such that any color-class of G intersects any color-class of \overline{G} . The main result of this paper is to characterize this class by forbidden induced subgraphs.

Keywords: (α, ω) -partitionable graphs, *Paw* graphs, P_4 graphs, (p, q) -decomposable graphs.

A C-Scaling Algorithm for the Minimum Flow Problem

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Abstract.

We present a scaling decreasing path algorithm for the minimum flow problem, which is a network flow problem that was not treated so often as the maximum flow problem in the literature on network flow.

The minimum flow problem in a network can be solved in two phases: (1) establish a feasible flow and (2) from a given feasible flow, determine a minimum flow. There are three approaches for solving the second phase of

the minimum flow problem: (1) using decreasing path algorithms, (2) using preflow algorithms and (3) finding a maximum flow from the sink node to the source node in the residual network. Our algorithm is a decreasing path algorithm. It begins with a feasible flow and always decreases flow along a path with a “sufficiently large” residual capacity in order to effectuate a small number of flow decreases. To identify a path with a “sufficiently large” residual capacity, our algorithm works on the \bar{r} -residual network, which is a subgraph of the residual network that contains only the arcs whose residual capacity is at least \bar{r} . Using the \bar{r} -residual networks, we can obtain a decreasing path with a “sufficiently large” residual capacity in $O(m)$ time. Our algorithm runs in $O(m^2 \log \bar{c})$ time.

A Generalized Multifacility Location Problem

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Abstract.

In this paper, we introduce a generalized multifacility location (GMFL) problem, which is a generalization of the euclidean multifacility location (EMFL) problem. For the perturbed GMFL problem, we prove that a hyperboloid approximation procedure (HAP) is a descent algorithm, and we study its convergence.

A Heuristic Algorithm for the List Multicoloring of a Random Graph

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Abstract.

Let $G = (V, E)$ a graph and $L(v_i)$ a set of colors associated to every node $v_i \in V$. A *list coloring* of G is an assignment of a color $c(v_i) \in L(v_i)$ to every node $v_i \in V$ such that no two adjacent nodes are assigned the same color. A *list multicoloring* requires the assignment of a set $C(v_i)$ of colors to v_i , where $C(v_i) \subseteq L(v_i)$ such that $C(v_i) \cap C(v_j) = \emptyset$, where $(v_i, v_j) \in E$.

Significant theoretical research on these special cases of the classical coloring problem started about the last decade. Clearly these coloring problems belong to the class of *NP*-complete problems. Real life applications can be modeled in the framework of the above concepts, e.g. job scheduling, traffic phasing, and channel assignment. In the corresponding literature algorithms for the list coloring are referred for particular classes of graphs, see trees.

In this paper a heuristic algorithm is developed so to achieve a list coloring for a given random graph G , whenever G has such a coloring. The paper is integrated with a relative computational experiment, and a small numerical example is presented.

***A Modified External Flow Algorithm for Solving the
Optimum Circulation Problem***

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Abstract.

We present a modification of our algorithm for solving the well-known optimum circulation problem in directed networks. It uses the Prim's algorithm in the initialization step for finding a maximum spanning tree in a graph with special arc weights, which makes it much faster. The running time is $O(Kmn^2)$, where m and n are the arc and node numbers, respectively, and K – a constant depending on the input data.

A New Simplex Type Algorithm for the Minimum Cost Network Flow Problem

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Abstract.

A new primal simplex type algorithm for the Minimum Cost Network Flow Problem (MCNFP) is presented. The proposed algorithm belongs to a special “exterior simplex type” category. Contrary to the network primal simplex algorithm, the new algorithm computes two flows. One flow is basic but not always feasible and the other is feasible but not basic. The pseudo code and analytical descriptions of the pivots are given. Furthermore, the necessary steps are analytically shown through an illustrative example. Finally, some preliminary computational results comparing the new and the classical primal simplex algorithm are also presented.

Keywords: Operation Research, Network Optimization, Minimum Cost Network Flow Problem.

A Quick Review of Data Distribution: Steam - Leaf Graph

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Abstract.

In scientific studies, to know distribution and structure of data is important from the selection of statistical analysis point. Frequency curve, histogram, steam-leaf graph are the graphical methods used for studying of data distribution.

In this study, steam-leaf method, which is useful to review quickly distribution of data, was studied using numerical samples.

Keywords: Steam - leaf, data, distribution, statistics.

About Computations in Lie Algebras

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Abstract.

In this paper we shall present a reasonable way to compute the nilpotent and the solvable radical of a Lie algebra.

Analysis of the Transport Problem in Objectives Space

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Abstract.

The algorithm present a dynamic programming problem based on the destinations: at destination j , $2 \leq j \leq n$, only the associate costs can be used. The main problem of the algorithm is to find the polyeder's vertexes at the each iteration. To result the efficiently solutions for the multiobjectives transport problem.

Differential and Affine Differential Methods in Optimization on Manifolds

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Abstract.

We extend classical techniques from optimization on numerical spaces or on Riemannian manifolds to techniques on affine differential manifolds or even differential manifolds.

Both sets convexity and functions convexity are discussed.

Geometric Optimizations for Weighed Approximations

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Abstract.

Multivariate interpolation problems arising in different domains on one hand and the intense use of probability densities for modeling problems in the same domains imposed a multidimensional geometry for a certain space of probability densities. Different metric tensors and associated connections are studied on this space.

Graph Optimization Algorithm – a Case Study

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Abstract.

The paper shows the problem solving task of finding the graphs shortest paths by using the Dijkstra's algorithm, matched with contemporary methods, instruments and techniques developed within geographical information systems (GIS). The concept of digital cartography is defined as well as the advantages of digital maps usage. The paper gives an idea of a layout of future digital maps and suggests various possibilities offered by GIS with the purpose of spatial positioning of moving objects. The paper is complemented with presentation of practical implementation of GIS in the process of solving the problem of determining the graphs shortest paths, giving the several suitable examples, which helps us to present, in very simple way, effective connection between an algorithm for graph optimization and up-to-date technological solutions.

Keywords: graph optimization, shortest path, GIS.

Kuhn-Tucker Conditions and Duality for Multiobjective Fractional Programming with n -Set Functions

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Abstract.

In mathematical programming of the n -set vector functions there is considered a framework where the Kuhn-Tucker efficiency conditions are equality relations.

For a multiobjective fractional program involving generalized (ρ, b) -vex n -set functions there is defined a multiobjective fractional dual program with inequality constraints for which weak, direct and converse duality theorems are established. These results are extended for a multiobjective fractional program with mixed constraints involving generalized (ρ, b) -vex n -set functions.

***Maxentropic Reconstruction of some Probability
Distributions with Linear Inequality Constraints***

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Abstract.

The maxentropic reconstruction is a technique for finding an unknown probability distribution from some known information.

In this paper we obtain the maxentropic reconstruction of some probability distributions from the knowledge of a prior distribution and of some lower and upper bounds for the mean values of some random variables. For this we use the Csiszár's I-projection theorems and the geometric programming method. If some average values of the prior distribution are computed, we obtain a refined form of our solution. Finally, we give several examples for this approach.

Keywords: relative entropy, I-projection, maxentropic reconstruction technique, geometric programming method, weak/strong duality theorems.

***Modeling Inventory Control Process Using Colored
Petri Nets***

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Abstract.

An approach to inventory control, based on Colored Petri Nets, is presented and illustrated in the paper. Complete approach is illustrated here on the example of inventory control in a publishing and printing house Politika a.d, publisher of the oldest daily in the Balkans.

Processes of ordering and stocking, as main processes in inventory control system, are observed and modeled. The AS-IS model is created using Colored Petri Nets as a general tool for modeling, simulation and analysis of system processes. The produced net is hierarchical, stochastic (timed) Colored Petri net. Based on that model, the several TO-BE models are created. The first one model includes improvement of ordering strategies for obtaining optimal order quantity and reorder point with safety stock. Microsoft Excel is used for inventory optimization. Simulation of obtained TO-BE model demands only the change of initial marking of Colored Petri Nets AS-IS model. Another TO-BE models include change of process itself. The core of process is detained, and the activities as annual inventory control, inventory classification and coordination between participants in process are proposed. These TO-BE models demand change of Petri net structure. After the simulations of all models, expected improvement of time performances is confirmed. Applying well-know software package CPN Tools, simulation and performance analysis have been performed.

***Necessary Optimality Conditions for Discrete
Inclusions***

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Abstract.

We consider the following optimization problem

$$(1) \quad \text{minimize } g(x_N)$$

over the solutions of the discrete inclusion

$$(2) \quad x_i \in F_i(x_{i-1}), \quad i = 1, 2, \dots, N, \quad x_0 \in X_0,$$

with end point constraints of the form

$$(3) \quad x_N \in T_N,$$

where $F_i : \mathbf{R}^n \rightarrow \mathcal{P}(\mathbf{R}^n)$ is a given set-valued map, $i = 1, 2, \dots, N$, $X_0, T_N \subset \mathbf{R}^n$ and $g : \mathbf{R}^n \rightarrow \mathbf{R}$ is a locally Lipschitz function.

We prove that the reachable set of a certain variational discrete inclusion is a derived cone in the sense of Hestenes to the reachable set of the discrete inclusion (2). This result allows to obtain sufficient conditions for local controllability along a reference trajectory and a new proof of the Maximum Principle for problem (1)-(3).

We note that the optimal control problems given by discrete inclusions have been studied by many authors ([1], [2], [3] etc). In the framework of multivalued problems sufficient conditions for local controllability along a reference trajectory and necessary optimality conditions for problems described by discrete inclusions are obtained in [2]. In contrast with the approach in [2], the methods present in our approach seems to be conceptually very simple, relying only 2-3 clear-cut steps and using a minimum of auxiliary results from finite dimensional analysis.

At the same time we propose an approach concerning second-order necessary optimality conditions for problem (1)-(3).

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***New Idea Algorithm for Construction of a Binary Tree
from its Traversals***

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Abstract.

A new idea algorithm for construction of a binary tree from its pre-order and post-order traversals in linear time and space is presented.

***Nondifferentiable Minmax Fractional Programming
with Square Root Terms***

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Abstract.

We establish necessary and sufficient optimality condition for a class of nondifferentiable minmax fractional programming problems with square root terms involving (η, ρ, θ) -invex functions.

Subsequently, we apply the optimality condition to formulate a parametric dual problem and we prove weak duality, strong duality, and strict converse duality theorems.

On a Class of Fractals

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Abstract.

Fractal dimensions are the most important attributes of fractals and Hausdorff dimension as well as the Box counting dimension are widely used. It is well known that the Weierstrass function is a continuous but nowhere differentiable in some cases.

Usually it is not so easy to determine dimensions. So, in this paper we con-

sider a class of generalized Weierstrass functions and we try to estimate the Hausdorff h -measure of the graph of these functions, for different measure functions, h .

*On an Auxiliary Task in Treating the Traveling
Salesman Problem*

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Abstract.

We study the set of feasible solutions of the traveling salesman problem, i.e. the set of Hamiltonian cycles in the corresponding complete graph. The sets of Hamiltonian cycles having a common eigenvector belonging to the second largest eigenvalue of the adjacency matrix are characterized in terms of some local transformations.

On an Open Question in 1-Dimensional Cutting

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Abstract.

In this paper some questions related to the Integer Round Up Property in

connection with the 1-dimensional cutting stock problem are discussed.

***On Exact Penalty Function for Interval Constraints
Nonlinear Programming Problems***

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Abstract.

In this paper an algorithm that uses sequential quadratic programming techniques in conjunction with a two-parameter penalty function is described. It is considered the nonlinear programming problem with interval constraints (NLP)

$$\{\min f(x) \mid a \leq c(x) \leq b, x \in \mathbb{R}^n\}$$

The approach taken is to replace the NLP by the more tractable problem of minimizing a nondifferentiable penalty function chosen so that the solutions of the NLP are also solutions of the penalty function problem. The exact penalty function used in this paper is based on the infinity norm of the constraints violations.

On Numerical Structure of Nonlinear Optimization

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Abstract.

The authors propose an extension of optimization model given by Polak with components $R : N \times T^n \times T^n \rightarrow T^n$ and $C : N \times T^n \times T^n \rightarrow N \times N$, given by Delahaye J.P., and they give a new algorithm *ALG* which permits to determine a subsequence which converges to the optimal point. The

numerical structure proposed by the authors has the following form:

$$\left[\begin{array}{l} a : T \rightarrow T, c : T \rightarrow \mathbb{R}, C : N \times T^n \times T^n \rightarrow N \times N, \\ R : N \times T^n \times T^n \rightarrow T^n, \quad ALG \end{array} \right]$$

where: T is a subset of a Banach space, $a : T \rightarrow T$ is a search function, $c : T \rightarrow \mathbb{R}$ is a stop rule. The functions proposed by Delahaye and the algorithm ALG are justified by a convergence theorem of a subsequence generated by ALG , subsequence that converges to the optimal point.

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On Symmetric Duality in Quadratic Programming and Matrix Game Equivalence

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Abstract.

In Dantzig [1] (1951), some equivalence results between linear programming duality and a matrix game are given. Similar results, for the infinite-dimensional case, have been obtained by Tijs [2] (1969), for semi-infinite programming, and Forgo [3] (1969) and Underwood [4] (1976) for continuous linear programming. Also some analogues equivalence results for certain classes of nonlinear programming problems were given by Chandra, Craven and Mond [5] (1985), Mond and Weir [6] (1981), Preda [7] (1994) and Kim and Noh (2004).

In this paper we consider the line of Kim and Noh (2004) and we get some equivalence results between symmetric duality in quadratic programming and matrix game.

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***Optimality and Duality for Non-differentiable
Multiobjective Variational Problems***

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Abstract.

In this paper, a non-differentiable multiobjective variational problem is considered. First, we extend the (F, ρ) - convexity introduced by Preda to vector valued functions. Using the generalized (F, ρ) - convexity concept, we state sufficient optimality conditions for the considered problem. We formulate the Wolf type dual and Mond-Weir type dual problems and we prove weak duality theorems under (F, ρ) - convexity assumptions. Also, we prove strong duality and converse duality theorems under generalized (F, ρ) - convexity assumptions. Some of these theorems, generalize the results obtained by Kim and Kim, J.M.A.A., 274 (2002), 255-278.

***Optimality Conditions and Duality in Multiobjective
Programming with (Φ, ρ) -Invexity***

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Abstract.

The theory of mathematical programming has grown remarkably after generalized convexity has been used in the settings of optimality conditions and duality theory. In 1981, Hanson showed that both weak duality and Kuhn-Tucker sufficiency for optimum hold when convexity was replaced by a weaker condition. This condition, called invexity by Craven (1981), was further studied for more general problems and was a source of a vast literature. After the works of Hanson and Craven, other types of differentiable functions have been introduced with the intent of generalizing invex functions from different points of view. Hanson and Mond (1982) introduced the concept of F -convexity and Jeyakumar (1985) generalized Vial's ρ -convexity (1983) introducing the concept of ρ -invexity. The concept of generalized (F, ρ) -convexity, introduced by Preda (1992) is in turn an extension of the above properties and was used by several authors to obtain relevant results.

The (F, ρ) -convexity is generalized to (Φ, ρ) -invexity by Caristi, Ferrara and Ştefănescu, and it was shown that the main theoretical results of scalar optimization hold under this new condition. The problem to be considered here is the multiobjective nonlinear programming problem:

$$\min f(x), \text{ s.t. } g(x) \leq 0, x \in X_0 \quad (\text{VP})$$

where X_0 is an open nonvoid subset of \mathbb{R}^n , and $f = (f_1, \dots, f_p) : X_0 \mapsto \mathbb{R}^p$, $g = (g_1, \dots, g_m) : X_0 \mapsto \mathbb{R}^m$ are assumed to be differentiable. We introduce vector type (Φ, ρ) -invexity to establish sufficient and necessary condition for weak efficiency, efficiency and proper efficiency. Duality theorems in the Wolfe, respectively, Mond and Weir settings are also proved.

Optimizations with Weighed Approximations

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Abstract.

Multivariate interpolation polynomials applied to a wide range of optimization problems, especially in connection with detection, classification and selection of regionalized data for different domains in geostatistical analysis, are studied in connection with the Kronecker product of weighed orthogonal polynomials. While a detailed analysis for the geometric structure is provided in a subsequent paper, applications are shown for certain types of probability density functions.

Search Game on Three Arcs with any Starting Point

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Abstract.

We consider a search game for an immobile hider on three arcs of unit length which join two points and the starting point of the searcher is anywhere. We find optimal strategies of the players and the value of restricted game (the set of the pure strategies of the searcher is restricted) which are probably optimal strategies and the value of nonrestricted game. This game shows how optimal strategies and the value of the game depend on the starting point.

Solving Method for Fuzzy Multiple Objective Integer Optimization

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Abstract.

Starting from the idea of Wang and Liao (2001) for solving fuzzy non-linear integer programming problem and taking into account the multiple criteria aggregation in fuzzy environment, a solving method for fuzzy multiple objective integer optimization problem is developed here. Theoretical analysis on efficient solutions for multiple criteria optimization problem and computational results are also presented.

Some Experimental Results on Multiobjective Shortest Path Problem

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Abstract.

In a recent paper we have shown that the number of efficient points in the criterion space grows polynomial with the dimension of the multi objective combinatorial optimization problem when the problem coefficients are rational numbers although the number of Pareto optimal solutions in the feasible set grows exponentially. Our experiments on the multi objective shortest path problem with randomly generated edge weights show that the number of efficient points is surprisingly low and little dependent on the problem dimension. This will be illustrated by the examples.

Keywords: combinatorial optimization, multi objective, Pareto optimality, shortest path.

***Some Properties of the Transportation Problems with
Interval Coefficients***

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Abstract.

The purpose of this paper is to investigate the minimum cost and minimum time transportation problems where transportation costs and times are interval numbers. We characterize weak minimum cost transportation solutions and weak minimum lexicographic time transportation solutions. We suggest some procedures in order to find the absolute robust transportation solutions. We consider also interval transportation problems, where the objective parameters, sources and destination coefficients have been expressed as interval values. We show, for interval cost transportation problem, that by solving a two-objective linear cost transportation problem and an usual auxiliary linear cost transportation problem the optimal solutions of this interval transportation problem can be obtained. A similar approach is given for interval time transportation problem.

Keywords: Uncertainty, absolute robust transportation solution, lexicographic time transportation problem, interval transportation problems

***Sufficient Optimality Conditions for Generalized
 ρ -locally Arcwise Connected Functions***

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Abstract.

A nonlinear programming problem with equality and inequality constraints is considered, where the functions involved are ρ -locally arcwise connected, ρ -locally Q -connected and ρ -locally P -connected and differentiable with respect to an arc. Sufficient optimality conditions are obtained in terms of the right differentials with respect to an arc of the functions.

The Generalization of the Interior-Point Method for Solving the Convex Quadratic Programming Problems

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Abstract.

In this paper is described how to efficiently solve a convex quadratic programming problem using a generalization of the interior-point method.

The Interior-Point Method to Determine the Edges of Symmetrical Elements in the Convex Programs

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Abstract.

In this paper is described how to determine the edges for problem

$$\max \{ \alpha \in \mathbb{R} \mid x + \alpha(y - x) \in C; x, y \in C \}$$

using the interior-point method.

Two Global Characteristics of the Graphs

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Abstract.

Given adjacent vertices v and w of a graph $G = (V, E)$, the Randic weight or simply weight of the edge $\{v, w\}$ is $R(\{v, w\}) = (d(v), d(w))^{-\frac{1}{2}}$, where $d(v)$ and $d(w)$ are the degrees of v and w . The Randic weight or simply weight of a graph G , $R(G)$ is the sum of the weights of its edges. This weight was first introduced by M. Randic in 1975. B. Bollobas and P. Erdős [1998] defined, for $\alpha \in \mathbb{R}, \alpha \neq 0$, the weight $w_\alpha(e)$ of an edge $e = \{v, w\}$ of a graph to be $w_\alpha(e) = (d(v)d(w))^\alpha$. Thus $w_1(e)$ is simply the weight $w(e)$, and $w_{-\frac{1}{2}}(e)$ is the Randic weight of the edge. For the graph G they defined $w(G) = \sum_{e \in E(G)} w(e)$ and $w_\alpha(G) = \sum_{e \in E(G)} w_\alpha(e)$.

The special degree of the node $v \in V$, introduced by M.Cocan and V. Proşcanu [2], is a number $GS(v) = (s_1 s_2 \dots s_n)_{(b)}$ calculated in b basis, $b \in \mathbb{N}^*, n > 1$, where:

s_1 - represents for the degree of the node v ;

s_2 - represents for the degrees sum of the direct descendants of the node v (the neighbouring nodes of the node v), after the node v has been eliminated;

s_3 - represents for the degrees sum of the direct descendants of the direct descendants (in other words the degrees sum of the secondary descendants) of the node v , after the direct descendants of v have also been eliminated, and so on.

The special degree is a global feature of the node, which depends on the entire graph; it is a number that expresses how "strong" the respective node is, depending on its degree and the degrees of all its descendants.

The special degree can also be extended on multigraphs and unconnected graphs.

M.Cocan [1999] introduced a global characteristic of a graph, named the graph connection power. He will determine this value by using the concept of special degree of a graph vertex.

Both the Randic weight and the connection power are global characteristics of a graph. The present paper aims at constructing a comparative study of the Randic weight of a connected graph and the graph connection power.

Keywords: connected graph, special degree, subgraph, incidence matrix, Randic weight graph, connection power.

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Use of the Path-following Method for Least-norm Solution of Linear Inequalities

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Abstract.

In this paper we consider two interior - point techniques (the primal-dual central path-following algorithm and the predictor-corrector algorithm) to obtain the minimum-norm solution of a large-scale system of linear inequalities.

Consider the problem:

$$\begin{cases} \min \frac{1}{2} \|x\|^2 \\ Ax \leq b, \end{cases} \quad (1)$$

where $A \in \mathcal{M}_{m \times n}$, $b \in \mathfrak{R}^m$, $x \in \mathfrak{R}^n$ and $\|\cdot\|$ stands for the Euclidean norm in \mathfrak{R}^n .

By the Karush-Kuhn-Tucker (KKT) theorem, the necessary and sufficient condition for $x \in \mathfrak{R}^n$ to be the optimal solution of problem (1) is to exist

$z \in \mathfrak{R}_+^m$ such that

$$\begin{cases} x + A^T z = 0 \\ Ax \leq b \\ z^T (b - Ax) = 0. \end{cases} \quad (2)$$

The problem (1) may be written as

$$\begin{cases} \min \frac{1}{2} \|x\|^2 \\ Ax + s = b \\ s \geq 0, \end{cases} \quad (3)$$

where $s \in \mathfrak{R}^n$. The only inequality constraints in this format are nonnegativity constraints for slack variables s_j , $j = 1, \dots, m$. One way of incorporating these constraints is to use a logarithmic barrier term:

$$\begin{cases} \min \frac{1}{2} \|x\|^2 - \mu \sum_{i=1}^m \log s_i \\ Ax + s = b, \end{cases} \quad (4)$$

where $s > 0$ and $\mu \in \mathfrak{R}^+$. Each value of μ gives rise to a different problem with its own optimal solution. The Lagrangean associated with problem (4) is

$$L(x, s, z, \mu) = \frac{1}{2} \|x\|^2 - \mu \sum_{i=1}^m \log s_i + z^T (Ax + s - b).$$

Applying the (KKT) conditions to problem (4) we find the following necessary and sufficient conditions:

$$\begin{cases} x + A^T z = 0 \\ Ax + s = b \\ s_i z_i = \mu, \quad i = 1, \dots, m. \end{cases} \quad (5)$$

This system is very similar to system (2), the only difference being the right-hand side of the third condition. If we solve a sequence of problems (4) with μ decreasing to zero, we might expect that the sequence of optimal solutions will converge to the least-norm solution of the original problem (1), since the impact of the barrier term is less and less significant.

Section 2

Modeling and Decision Making

A Base-stock Model for the Kit-Management Problem

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Abstract.

In this paper, we consider the problem of kit management. In this problem, whenever a kit demand occurs, only one item from the kit is used and the rest is returned. The item that will be used from the kit is not known in advance and the whole kit has to stay at the demand site for the whole duration. The motivation of our problem is from the implants used in surgeries but similar problems may arise in repair toolkits as well. We model the problem as determining the base stock level for each item in each of the toolkits with inventory and stock out considerations. Specifically, we derive the distribution function of outstanding number of units for each item in the kit. These distributions enable us to compute cost or stock out based performance measures of the system.

Modeling and Optimal with Local Performance Criteria Control Design of Structures

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Abstract.

The design of intelligent structures requires modeling and simulation techniques to analyse their dynamical behaviour. The choice of the control technique is important in ensuring suitable functioning of the structures under required conditions. The main goal of control design is to be built a system that will work in the real environment. The work aims are to present modeling and design of active vibration control for externally excited structures.

First, modeling of the structure and the subsequent finite element approximation are presented. Furthermore, the problem of active control is studied. The underlying concept within control theory to ensure proper operating of a system in realistic situation is feedback. An active negative feedback control algorithm is employed to actively regulate the response of the structure.

This paper considers a problem of analytic design of algorithms that ensure optimal transient response for the control systems. From practical point of view, it means stabilization of equilibrium and program trajectories of the structures. In the most papers the analytical design is implemented, as a rule, using integral performance criteria. Recently an interesting approach becomes the analytical control design based on minimization of local cost functions, which determine the behavior of the control system in the current time moment. In this work, the control problem is formulated as a problem of suppression of kinetic energy and the energy of accelerations of the structure. The designed control algorithms ensure asymptotic stability of the exited motion of controlled structures with respect to the not exited motion. Good virtue of these algorithms is that they make the structures robust in means of weak sensitivity to changeability of the parameters of the control plants.

***Modeling and Simulation of Processes in Livestock
Production***

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Abstract.

Production of livestock products, as part of total agricultural production, contains great number of options and connections, therefore this is very complex system. Because of the special importance in functioning of vital needs of the population, as well as connections that are being established with other systems of production of food of animal origin within one state represents field of special importance when economical investigations are in question.

Due to the importance of livestock production, different models aiming to present in the most realistic way and explain complex systems such as production of food are used. Production of food represents extremely favourable field for application of simulation models. Such simulation models provide to creators of business decisions information about possible results of the change in business policy, before these changes are introduced in the system.

***Modeling of Information Flows Impact on the Supply
Chain Key Performance***

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Abstract.

Survivor of supply chain in today's market directly depends of his competitive advantage with relation to other supply chains in the same type of industry. Determination of the level of competitiveness can be done by identification and comparison on qualitative and quantitative performance and performance measures of supply chain. Accuracy, availability and speed of information transfer on the one hand, and structure and available resource of the supply chain on the other hand is dominate factor relevant for value of qualitative and quantitative performance measure of supply chain, thus - on the survival of supply chain on the market, too.

In the first step, we will define key performance and performance measure for particular supply chain. In the second step, we will describe certain models and methods for quantification and potential optimization of the mentioned supply chain performance measure. At the end, we will compare that performance measure in the supply chain which is based on modern information technology and in the same supply chain, but with traditional information flows between their members.

***New Concepts in Establishment of a Common
Technical Framework for Modeling and Simulation and
Advanced Distributed Learning***

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Abstract.

Modeling and simulation (M&S) and advanced distributed learning (ADL) will provide the Romanian Armed Forces (RAF) a readily available, flexible, and cost-effective means to support defense reform by fundamentally improving its operational, education and training, peacekeeping, and analytical capabilities.

The “Strategic Plan for establishment of a defense simulation capability for the Romanian Armed Forces” is designed to support programming and budgeting decisions by providing a time-phased list of critical implementing tasks and by identifying resources required to conduct each task suc-

cessfully. The major goals of the RAF M&S and ADL program are to: integrating M&S and ADL capabilities at all appropriate levels of command and staff; increasing the readiness levels and overall proficiency of the armed forces; enhancing military education programs; making training more effective and efficient; using technology and simulations to conduct operational analysis; applying technology to assist in long-term force structure modernization, defense reform, experimentation, and transformation; using M&S technology to increase the ability to operate and integrate within the North Atlantic Treaty Organization (NATO) and with other regional and international forces; developing the capability to participate in, host, and conduct distributed exercises.

The common technical framework provides interoperability standards for modeling and simulation and advanced distributed learning software applications that define technical architectures (including associated application programming interfaces, rules, and conventions) to allow effective, coherent exchange of information among software tools. Standards for data interchange minimize inefficiency, miscommunication, and confusion that can arise as information is shared.

This communication presents, which are some of the new concepts in establishment of a common technical framework for modeling and simulation and advanced distributed learning.

*On the Formulation and Evaluation of Alternative
Transportation Routes through a Multi-Agent System*

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Abstract.

A basic disadvantage of the existing freight transportation management applications is the requirement for extensive human interference in the cargo freighting process, in that an expert should be responsible for the management of critical issues, such as carrier selection, delivery date matching, route planning, and transportation pricing. Furthermore, the above ap-

plications are characterized by a limited ability in providing optimal or suboptimal solutions, as far as the transportation's cost and duration are concerned. Their route planning procedure does not involve a detailed consideration of modular solutions, as far as alternative carriers or alternative paths are concerned, in that it is based on a customer's request about a specific direct route. Moreover, the matching of a customer's request with the appropriate carriers is based on data extracted from static databases. Generally speaking, these systems do not offer adequate automation of the problem's solution, while they do not guarantee any optimization of critical factors such as the transportation's duration, cost and route selected.

To remedy these problems, this paper presents a multi-agent system that efficiently addresses the multiplicity and complexity of the issues involved in freight transportation management, paying particular attention to decision making processes concerning the formulation and evaluation of alternative transportation routes with respect to the customers' preferences. Our approach has been based on the specification of the appropriate ontology model for the setting under consideration. It is based on flexible models that achieve efficient communication among all parties involved and coordinate the overall process. The agents of the proposed system represent and act for any user involved in a transportation scenario, while they cooperate and get the related information in real-time mode. Much attention has been also paid to the system's extensibility in order to easily integrate additional features and functionalities.

Keywords: Freight Transportation Management, Multi-Agent Systems, Decision Making, Internet Services.

Risk Management During the Transport of Dangerous Substances

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Abstract.

We are the witness of a number of accidents that included dangerous chemical substances during transport. This fact is also important because the

Balkan peninsula is located on the crossroads of numerous important European communications where a lot of such transports are passing by. In that way many toxic substances, the threat of chemical war confrontation, environmental accidents in peacetime and terroristic acts can hardly damage human environment for a very long period of time. During such a transport, we usually do not have a real time information about its all aspects. These information are crucial for us to perform protective plans and measures. And that gives sense for idea of planning unique Balkan NBC and accident defense system. Such a system could give us possibility to, after qualified planning, establish possibilities for preventive and protective measures, terrain preparedness, informatic systems and many other activities that will enable successful fight for the healthy environment. One of requests is also a existence of a high mobility rapid reaction unit, located at some of NBC training centers, and capable for successful, real time reaction. This work is our intention to discover the best way of high risk transports insurance, throughout the analyses of impact factors, different perimeters, operational research, contemporal means of monitoring, sophisticated equipment, protection and survey.

Keywords: Human environment, chemical accident, dangerous substances, transport, contamination, monitoring, protection, decontamination, mobile system.

Seismicity as a Multidimensional Stochastic Process

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Abstract.

One of the main tasks in engineering seismology is the analysis of potential effects of future earthquakes on the objects and systems of objects built in the region with high seismic activity.

Seismic hazard for the region, i.e. probability of the earthquake occurrence in the specified time period and at specified region, is the basis for evaluation of seismic risk, i.e. expected consequences of the future earthquakes.

Seismic history of the region is the basis of different analysis that can be made about seismic risk and hazard.

Occurrence of earthquakes is stochastic in many ways and the approach that is developed and often used is based on the fact that seismicity can be observed as multidimensional stochastic point process. Stochastic point process models have become essential in the assessment of seismic hazard and risk, and in this paper will be discussed some aspects, statistical bases and possibilities of such approach.

The main components that are most often used in modeling are place, magnitude and time of earthquake occurrence. From the history of seismicity and geological analysis of the region with high seismicity, potential earthquake sources are identified and parameters needed for the analysis can be defined. In this paper will be described and discussed some ways of modeling seismicity as a multidimensional stochastic point process and will be presented some examples and results of such modeling.

Some Applications of Network Programming for Solving Real Problems

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Abstract.

We present some models of real problems like: Optimization of production planning using certain technologies, Time minimization of pieces production and Optimum cutting of arbitrary formed pieces. We give also some numerical illustrative examples in order to show how algorithms run.

Section 3

Stochastic Models and Risk Analysis

A Study of Functions with Values in Probabilistic Normed Spaces

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Abstract.

Probabilistic normed spaces (briefly, NS spaces) were first defined by A.N. Šerstenev [2] in the early sixties, deriving a fruitful theory in a concordance with the theory of ordinary normed spaces and of probabilistic metric spaces. In [1] Alsina, Schweizer and Sklar gave a quite general definition of PN spaces. Many interesting results for these more general PN spaces have been recently achieved.

In this paper we consider a study of functions defined on a subset of the extended real line with values into a PN space of this more general class. The continuity, types of convergence, the approximation by polynomials is analyzed and some results are obtained. The periodicity for such functions is also considered. In addition to the inside importance these results can be applied to the study of functions depending of a random parameter which are, in fact, random processes.

- [1] C.Alsina, B. Schweizer, A. Sklar, On the definition of a probabilistic normed space, *Aequationes Math.* 46 (1993), 91-98.
- [2] A.N. Šerstnev, On the notation of a random normed space, *Dokl. Akad. Nauk, SSSR*, 149 (1963), 280-283.

Adaptative Designs

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Abstract.

In typical clinical trials, the randomised play-the-winner rule is used for the allocation of the patients to two treatments. The generalized urn model of Polya for k treatments was treated by L. J. Wei (1979). This model generates a particle of type k for a success on k treatment, $k = 1, 2, \dots, K$, and $\frac{1}{K-1}$ particles for everyone of the others $K - 1$ types, for the failure on k treatment. The model was extended by Li, W. (1995), who proposed a design which generates only particles of the type of success and which adds nothing in the case of failures.

In this paper an adaptative design is proposed. It generates a particle of type k for a success on k treatment, $k = 1, 2, \dots, K$, and for a failure on treatment k - particles of the others $K - 1$ types, proportionally to the success rate of the other $K - 1$ treatments.

The generalized urn model of Polya in clinical trials can be found in Rosenberger, W. F. (1996) and biostatistics applications in Hu, F. and Rosenberger, W. F. (2000), Rosenberger, W. F. and Grill, S. E. (1997).

Extreme Financial Risk and Levy Processes

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Abstract.

In this paper, we discuss some approaches to modeling extreme events in financial time series. Extreme value theory provides a practical, flexible, mathematically elegant framework in the area of financial risk modeling. Value - at Risk is a parameter of extremes. It is of great importance for those

in change of managing risk to understand how financial asset returns are distributed. Empirical evidence show that return distributions are more leptokurtic than normal. In a heavy-tailed distribution the likelihood that one encounters significant deviations from the mean is much greater than in the case of the normal distribution. Lévy processes are able to take into account important stylised features of financial time series. In here, a Normal Inverse Gaussian Lévy process used to model stock returns and identify risk measures for extreme events. Furthermore, we investigate pricing some exotic options driven by exponential NIG Lévy processes.

Keywords: Lévy processes, Extreme events, Financial risk, NIG Lévy process, Extreme value theory, Exotic options.

Forecasting the Annual Consumption of Electric Energy for Commercial Use in Greece with Exponential Growth Curves

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Abstract.

In this paper, in order to obtain forecasts of the annual consumption (demand) of electric energy for commercial use in Greece, we work as follows:

- a) First we apply simple identification rules in order to find the suitable trend curve for this case, which is the (simple) exponential.
- b) We estimate the parameters of this curve with linear and non-linear least squares techniques and test their significance.
- c) Diagnostic checks: we examine the residuals for autocorrelation, heteroscedasticity, normality, etc. We also apply (i) the Wold tests for omitted and redundant variables and (ii) stability tests (Chows, Ramsey's and recursive residuals tests).
- d) We re-estimate the model with correlation for 1st order autocorrelation and
- e) We calculate the forecasts and compare their ex-post accuracy using var-

ious forecast-evaluation techniques. We conclude that this simple process gives very useful results in this case.

Keywords: electricity forecasting, trend curves.

Loss Functions and Optimal Predictors

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Abstract.

A loss function is a mapping L with the meaning $L(x, y) =$ "How much do I lose if I predict the value y instead predicting the true value x ". If X is a random variable and L is a loss function then $\arg \min EL(X, y)$ is called the optimal predictor of X given L .

We answer the following questions:

1. When the optimal predictor does exist?
2. When it is unique, provided the fact that it exists?
3. Denote $L \sim L^*$ if L and L^* give the same optimal predictors. How can one characterize this equivalence relation? and point out some (for us) open questions.

Model Selection and Methods for Meta Analysis

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Abstract.

Meta analysis is carried out to re-analyses the reported or unreported

data done for any subject to obtain a certain decision according to pre-determined question or criteria (Mosteller et al., 1996).

In this study, selection of a model and methods used for meta analysis were studied and Mantel-Haenzel technique was investigated in detail.

For this purpose, four studies investigating possible effects of crossing on milk yield were pooled using Mantel-Haenzel method, and interpreting of the results were discussed with an assumptional-numerical example.

Keywords: Meta analysis, Mantel-Haenzel, model selection

On Bayesian Premium Approximation for a Class of Loss Functions

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Abstract.

Bayesian techniques have the main advantage that they can allow the use of prior information. This is very important in actuarial science, because usually, in addition to the data, there is a large quantity of prior information available.

Since an exact analytical form of the Bayesian premium is not also possible to be obtained, we derive in this paper an approximation of the Bayesian premium when the loss function has a general quadratic form. This approximated premium will be then compared to the exact Bayesian premium, if the last one can be derived. In order to compare the exact to the approximated Bayesian premium we use a measure of relative error.

We also show how the Bayesian premium can be re-expressed as a credibility formula when the loss function is of the general type proposed in this paper.

As by-product, we derive a generalized Buhlman – credibility factor, when the loss function belongs to the class mentioned. At the end of the paper we will provide a numerical example.

Simulation of non-Gaussian Random Fields

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Abstract.

The stationary non-Gaussian random fields are used to modeling dynamic actions generated by wind, waves and seismic motion. These fields represent also some uncertain material properties (e.g. soils, concrete, composite).

This paper presents some methods and the corresponding algorithms to simulate the stationary non-Gaussian random fields, characterized by power spectral density function or equivalently autocorrelation function and the marginal distribution functions.

These methods include the simulation of stationary Gaussian random fields based on the spectral representation theorem and their memory less transformation in stationary non-Gaussian random fields.

Some Recursive Procedures Used in Risk Theory

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Abstract.

The classical risk theory is based on the fact that the counting process of sinisterness is a Poisson process. There are studied methods for evaluating the cumulative distribution of the loss in a specified period. Assuming that the counting process of the sinisterness is a Poisson process, the cumulative distribution of the loss is a composed Poisson distribution.

In a heterogeneous portfolio there is not possible to use the Poisson dis-

tribution. The heterogeneity is described by the variation of the Poisson distribution's parameter between the policyholders. As a consequence, it is given by a random variable L , which reflects the dimension of the risk inside a risk group. If the counting process is given, it follows a composed Poisson law. If a person is randomly chosen from the portfolio, the counter of the loss caused by him follows a mixed Poisson law.

We present recursive formulae for the cumulative distribution functions of order t and the distribution function with queue of order t for a mixed composed Poisson distribution, in the case when the mixing density belongs to a special class.

Steady State Numerical Solutions of Markov Chains

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Abstract.

Markov processes provide very flexible, powerful, and efficient means for the description and analysis of dynamic (communication, computer) system properties. Performance and dependability measures for communication networks can be derived and evaluated. In this paper is suggesting an approach for computation of the steady state probability vector of ergodic Markov chains. Direct methods and iterative methods for numerical solution are concerned. Direct methods operate and modify the parameter matrix, and use a fixed amount of computation time independent of the parameter values, but are subject the accumulation of round-off errors and have difficulties with sparse storage. Among the techniques most commonly applied are Gaussian elimination algorithm and Grassmann's algorithm, which is a numerically stable variant of Gaussian elimination procedure. Grassmann's algorithm is based on arguments from the theory of regenerative processes and is used for analysis of ergodic, discrete-time Markov chains.

The main advantage of iterative methods over direct methods is that they

preserve the sparsity the parameter matrix, because efficient sparse storage schemes and efficient sparsity-preserving algorithms can be used. Iterative methods are based on the property of successive convergence to the desired solution. The evaluation can be terminated if iterates are sufficiently close to the exact value. The main disadvantage of iterative methods is that convergence is not always guaranteed and depending on the method, the rate of convergence is highly sensitive to the values of entries in the parameter matrix.

On the base of comparison of numerical solution methods is suggesting an algorithm for calculation procedure for computation of the steady state probability vector of ergodic Markov chains. A numerical example for heavy tail traffic with long range dependences between parameters is shown.

Structural System Reliability

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Abstract.

Structural reliability theory has underground significant advances in the last 15 years. System reliability analysis can be based either on a limit state determination (the static formulation) or failure mode enumeration (the kinematic formulation).

In this paper I present the general case of random loads and resistance with arbitrary probability distributions for failure caused by simple plastic mechanisms and a combined simulation/linear programming approach. Each simulation determines load and resistance proportionalities, and the associated failure mode is identified by linear programming as a vertex on the system polytope.

***Traffic Flow Prediction by Recursive Estimation of the
Parameters of the Seasonal Box-Jenkins Model***

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Abstract.

In this paper a detailed survey of seasonal models and algorithms for prediction of traffic flow volume are given. The general multiplicative seasonal model $ARIMA(p,d,q) \times (P,D,Q)_s$ is considered. A traffic flow prediction algorithm is developed in which the standard Box-Jenkins seasonal model is adopted for one-step prediction, which is desirable from the traffic control point of view.

In this paper an algorithm that estimates parameters of the seasonal Box-Jenkins model in a recursive fashion is applied. For minimisation of the prediction error we use the Gauss-Newton parameter estimator in a recursive form. The Gauss-Newton parameter estimator consists of the gradient and the Hessian and they are updated at every time instant when new data become available.

Some experimental results are also given, illustrating the main properties of the proposed method.

Section 4

Operational Research Applications

A Novel Heuristic Approach for Scheduling Inspections on an Extensive Bridge Network

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Abstract.

The quality of transportation services offered by a highway network is highly related to the condition of the network's infrastructure. Bridges are a vital as well as a sensitive part of that infrastructure. In order for highway authorities to maintain their bridges in an adequate condition, the later have to be inspected regularly (at least once yearly). Given the constraint that human resources are limited and, as far as inspectors are concerned there are strict work rules to be applied, agencies need to develop optimal schedules for bridge inspections.

The objective of this study is to propose a novel heuristic approach for developing inspection schedules on an extensive bridge network. The approach is successfully applied to the Egnatia Motorway Network in Northern Greece and the empirical results are presented.

Agile Software Project Management Methodologies – Prospects of the Greek IT Market

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Abstract.

Software Project Management and IT Project Management in general, deals with a variety of problems and difficulties resulting in time and budget overrun. According to a Standish Group research published in 2000, only 25% of USA's IT projects are completed on time and on budget, including all of the originally-proposed features and functions.

During the last years, a number of new, more flexible software project management Methodologies, referred to as Agile Methods have been introduced in well-developed countries, (concerning the area of IT), and especially in the USA. According to the "Agilists", these methods can propose a solution to the above-mentioned problems derived from the usage of traditional, bureaucratic methodologies, based on a quite different approach that includes: **iterative development** (small versions of the software with rapid development cycles), **customer collaboration** (customer in fact participates in all phases of software implementation), **adaptability** (last minute changes is allowed).

This paper aims to describe shortly the evolutionary steps and the reasons beyond the appearance of these methods, as well to identify the preconditions and the limitations for their acceptance, intending to examine the possibilities for the adoption of the Agile Methods in the Greek IT market. Despite of the factors that influence the adoption of Agile methodologies in Greece, the extent of usage and familiarity with these methods (by presenting the results of a relevant survey conducted by the University of Macedonia), is also examined.

Keywords: IT Project Management, Software Project Management Methodologies, Agile Methods.

An Agent Based Virtual Medical Devices

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Abstract.

In this paper we present the telemedical environment based on VMDs implemented with Java mobile agent technology, called aglets. The agent based VMD implementation provides ad-hoc agent interaction, support for mobile agents and different user interface components in the telemedical system. We have developed a VMD agent framework with four types of agents: data agents, processing agents, presentation agents, and monitoring agents. Data agents abstract data source, creating uniform view on different types of data, independent of data acquisition device. Processing agents produce derived data, such as FFT power spectrum, from raw data provided by the data agents. Presentation agents supply user interface components using a variety of user data views. User interface components are based on HTTP, SMS and WAP protocols. Monitoring agents collaborate with data and processing agents providing support for data mining operations, and search for relevant patterns. Typical example is monitoring for possible epileptic attacks. We have applied VMDs to facilitate distributed EEG analysis. We have found that the flexibility of distributed agent architecture is well suited for the telemedical application domain. This flexibility is particularly important in the case of an emergency, enabling swift system reconfiguration on the fly.

Keywords: Health Care, telemedicine, software agents, perceptual user interfaces.

***Applying of Analytic Hierarchy Process in Measuring
and Evaluation of Corporate Operating Board
Performances***

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Abstract.

A critical factor of successful corporate operating is the Operating Board mission realised within corporate management. Within the context, elec-

tion of Operating Board members, evaluation of their work and the work of committees and Corporate Board members ought to be taken into particular account, bearing in mind all the interested stakeholders as management, union and public bodies. Divergence of their goals and preferences strongly emphasize multicriterial nature of measuring Operating Board performances. Thus, compromise is the only possible conflict solution and is to be realised by taking all the criteria into consideration. Evaluation methods hitherto developed have been based on self-evaluation of directors, mutual evaluation among Operating Board members and an independent body's evaluation, have all shown certain advantages but disadvantages as well. Consequently, this paper deals with possible applying of multicriterial methodology, particularly with Analytic Chierarchy Process method and its support software application – Expert Choice, as an instrument for evaluation and ranking of a hypothetical Corporate Operating Board members.

Keywords: corporation, operating board, multicriterial problem, analytic hierarchy process, ranking

***Biology of the Whiting (*Merlangius merlangus euxinus*
Nordmann, 1840) in the Marmara Sea***

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Abstract.

In this study, age, length, weight distributions; the relations between the

age-length, the age-weight, the length-weight, condition index and the reproduction characteristics of the Whiting (*Merlangius merlangus euxinus* Nordmann, 1840) caught on the Marmara Sea were investigated.

The condition index of the Whiting was found 0.746 in 920 investigated males and females.

The growth of the Whiting was found to be allometric and its relationships between age-length, age-weight, length-weight positive and strong.

The stock in the investigated area consisted mainly of fish in age groups I-V and the abundance of fish was found in age groups I and II. The length-weight relationship was $W=0.005L^{3.14}$ and total mortality rate was found %66.9.

The spawning time of Whiting extended from January to December, with a maximum in November-January and March-April.

According to our researchs it has been concluded that the Whiting's fishing length must be minimum 17 cm.

Keywords: Fecundity, Conduction Factor, Whiting, Marmara Sea, Turkey.

Bullwhip Effect Analysis for Different Prediction and Replenishment Policies

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Abstract.

The impact of different demand prediction and inventory replenishment policies on the bullwhip effect in the supply chain is considered. For the purpose, a simulation model as a hierarchical Petri net is developed and implemented using software package CPN Tools and Excel. It is supposed that (a) supply chain consists of four stages: retail, wholesaler, distribution, and factory, (b) the customer demand is according to the prescribed pattern, and (c) demand prediction and replenishment policies may be de-

fined on various ways. Supply chain is then simulated and its performances are calculated. This program can be used for educational purposes as well as for evaluation of different management strategies in the supply chain.

***Certification Status Validation Time in the Public Key
Complex Infrastructures***

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Abstract.

The modern approach to the electronic transactions security in e-business applications implies the selected application of the cryptographic systems and mechanisms within PKI (Public Key Infrastructure). The digital certificate of a subject of e-business (user) represents a cryptographic mechanism with the highest security level.

As the security of each PKI transaction has been based on a current certificate status (valid, revoked), the certificate status should be checked for each transaction. An average time of this demanding operation can be of great importance to acceptance of PKI applications. On the basis of the known solutions to the more efficient validation of certificate status in the complex PKI architectures, both the influences of the various PKI architectures and concrete applications on the certificate status validation time have been especially reviewed. In this respect, the influences of hierarchical and bridge PKI architecture have been analyzed, and within each of CRL (CertificationRevocation List) and OCSP + MiniCRL (Online Certificate Status Protocol) certificate status validation have also been analyzed. The influence of the given PKI architectures and validation types has been an-

alyzed within B2B (Business-to-Business) applications operations, with a variable number of PKI users, from 10000 to 600000, and an average number of validation requests from 10 per day per user.

The simulation approach has been used in the analysis and the model for denoting an average certificate status validation time has been presented. By comparative analysis of the obtained results it has been shown that the bridge PKI architecture yields a shorter average certificate validation time. Within the bridge PKI architecture CRL validation type is more efficient for a smaller number of users, while for a larger number of users OCSP + MiniCRL certificate validation status type is significantly more efficient.

***Comparing Linear and Mixed Integer Linear
Programming Solutions for Operational Harvest
Planning Problem***

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Abstract.

In forestry, operational harvest planning (OHP) is a complex task. Technical, economical, environmental, and social/institutional constraints have forced to be found a feasible and applicable solution. However, planning is an efficiently way to minimize the operational costs in annual budget concept. OHP organizes proposed process and actions to achieve intended goals of operation. In this manner, various quantitative and qualitative solution approaches were traditionally developed to solve large or small scale harvest operation planning problem in literature. Mathematical programming such as Linear Programming (LP) is a common tool used for the planning problem.

In this study, it was firstly developed a main model based on LP to optimize operational harvest planning problem under economical, technical, environmental, and social-institutional constraints. In the main LP model, continuous variables were previously used for coefficient of decision variables of objective function focused on unit cost minimization. Its result displayed that LP solution was not applicable for real world forest harvest

planning problem because of divisibility character and fractional results of LP. That is, harvesting units, which had been previously divided according to transportation boundary, were again divided into more small operation blocks by LP solution. So that LP solutions could be interpreted, semi-continuous variables $\{0-1\}$ were secondly used in objective function. It facilitated interpretation, but it couldn't naturally changed applicability of LP solution.

Afterwards, the main LP model was generated by converting of continuous and semi-continuous variables to binary $[0/1]$ variables. The new model was a 0/1 Mixed Integer (Linear) Programming (MILP) model. Under same constraints, traditional LINDO solver was used to solve both models. When compared with LP and MILP solutions; it was obtained that objective function value of main model was minimized by LP more than MILP aspect of operational cost optimization. However, although it was required long solution time, MILP offered spatially acceptable and applicable solution for operational harvest planning problem due to indivisibility of harvest units and exact results.

Keywords: Operational Harvest Planning, Linear and Mixed Integer Programming, Mathematical Modeling, Cost Minimization

Data Warehouse Management System – a Case Study

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Abstract.

In the last decade data warehouses have become the basis for support in business decision making. This paper will show our framework for the data warehouse management system as well as advantages and disadvantages of this approach in relation to the current data warehouse management systems. Many approaches to the development of data warehouse emphasize

the importance of meta data yet none of them sticks to that principle. The basic characteristics of our approach is based on meta data. We have also implemented significant changes in dimensional model based upon flexible and loose dimensional hierarchies which enabled us to use special methods of creating aggregations and important advantages in data visualization. What makes this approach different is the concept of intelligent creation of aggregations based on observation of history of users queries and the use of modified data mining algorithm APRIORI.

Keywords: data warehous, meta data, dimensional modeling, data mining.

Decentralized Suboptimal LQG Control of a Platoon of Vehicles

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Abstract.

In this paper the Stochastic Inclusion Principle is applied to decentralized LQG suboptimal longitudinal control design of a platoon of automotive vehicles.

Starting from a stochastic linearized platoon state model, input/state overlapping subsystems are identified and extracted after an adequate expansion. An algorithm for approximate LQG optimization of these subsystems is developed in accordance with their hierarchical LBT (lower-block-triangular) structure. Vehicle controllers obtained after contraction, which leaves local Kalman filters uncontracted, provide high performance tracking and noise immunity.

Denims Production and the Fabric Quality Parametres

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Abstract.

In this study, production processes of denim fabrics from yarn to finishing, and their quality characteristics were examined. For this purpose, five denim fabrics were obtained from a firm that produces denim fabric in Adana region, and were tested for their performance.

With these tests, the aim was to see the effects of weaving construction, raw material and production process of weft yarn on performance of the fabrics. Some of the results of these tests that weaving construction and raw material did not influence weft movement alone, but when evaluated together found that weft movement on the 3/1 Z broken twill with lycra was less than the other fabric tested. The weaving construction and raw material together affect tensile strength. It was seen that tensile strength on 3/1 Z twill with %100 cotton and 3/1 Z broken twill with lycra higher than those of others.

Keywords: Denim production, quality parameters.

Designig of Forward Pick Area

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Abstract.

Order picking process denotes set of activities by which customers orders, regarding to quantity and assortment of desired products, being satisfied. Mentioned process may be observed as the most laborious activity in a warehousing system. Many of warehouses have a system for order picking with forward area (used for order picking) and reserve area (used to

replenish the forward area).

Designing of the forward area is very complex problem that can be analyzed from different aspects (shape of the area, size, products allocation, technology etc.) However, in the case when the size of forward area is restricted, very important problem is how to allocate available space to different products assortment. Mentioned problem in literature is known as forward-reserve problem (FRP). The FRP problem has been mostly solved by using heuristics. Also, it may be said that only some of specific cases were under consideration.

Intention of this paper is in further extension in solving FRP, first of all with aim to bring the problem closer to real order picking systems design. The paper presents both proposed model based on a nonlinear programming techniques, and some numerical results.

Effect of Carotenoids from Red Pepper and Marigold Flower on Pigmentation, Sensory Properties and Fatty Acid Composition of Rainbow Trout

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Abstract.

In this study, effects of carotenoid sources on pigmentation, sensory properties and fatty acid composition of rainbow trout (*Onchorhynchus mykiss*) were investigated. The fish (120.51±0.75 g) were fed with diets containing 1.8% marigold flower, 5% red pepper, 70 mg kg⁻¹ synthetic astaxanthin and a control group for 60 days. Synthetic astaxanthin provided the highest carotenoid accumulation in the fish, and this was followed by red pepper and marigold flower (P<0.05). Dietary carotenoid sources did not

significantly affect fatty acid composition of the fish fillets. Trout muscle coloured with synthetic astaxanthin was more preferred than the others by the sensory panellist.

Keywords: rainbow trout, pigmentation, sensory property, fatty acid composition, red pepper, marigold petal.

***Effect of Hot or Sweet Red Pepper (*Caspicum annum*)
on Pigmentation and Sensory Properties of Rainbow
Trout (*Oncorhynchus mykiss*)***

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Abstract.

In this study, the effect of diets including various hot or sweet red peppers on pigmentation, growth and sensory properties of rainbow trout was investigated.

The fish (57-60 g) were fed diets supplemented with 0.5, 2 and 4.4 % hot or sweet red pepper, and control group for 80 days. Carotenoid concentration, growth and sensory properties between the fish of fed with diets containing the same percentage of hot or sweet red pepper were not significantly different ($P>0.05$). Both red pepper types did not affect on growth and sensory properties of fish. On the other hand, the more carotenoid amount increased in diet, the more carotenoid accumulation of fish fillet increased. A red pepper (hot or sweet) additive equal to or higher than 2 % in the diet increased carotenoid deposition in comparison with control group. The level of (4.36-4.27 mg kg⁻¹) carotenoid accumulation of fillet of the fish fed with 4.4 % hot or sweet red pepper was only just adequate to desired colouration.

***Effect of Testosteroneundeconoate on Growth of
Golden Grey Mullet (*Mugil aurata* RISSO, 1810) in
Fresh Water***

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Abstract.

Effect of testosteroneundeconoate on growth of golden grey mullet (*Mugil aurata* RISSO, 1810) in fresh water, was investigated, in this study.

Fish, adapted to fresh water, were fed diets supplemented with 0 (control), 10, 20 and 30 mg/kg testosteroneundeconoate dosage during 60 days. Samples were taken randomly once every twenty days. At the end of the experiment, it was found that means of body weights were 11.16 ± 0.21 g, 18.62 ± 0.0 g, 14.80 ± 0.49 g, and 11.57 ± 0.94 g respectively. Total length averages were 10.26 ± 0.0 cm, 12.10 ± 0.0 cm, 11.18 ± 0.12 cm, and 10.60 ± 0.20 cm respectively. Mortalities observed in all groups were ranged between 42.9 % and 80.0 %. Differences among groups were significant statistically ($P < 0.05$). Fish fed 10 mg/kg testosteroneundeconoate, grew 2.5-fold larger than control groups and fish fed 30 mg/kg testosteroneundeconoate but 1.5-fold larger than fish fed 20 mg/kg testosteroneundeconoate.

As a result, dosage of testosteroneundeconoate (10 mg/kg) administered to first group is recommended for the culture of this species in fresh water.

Keywords: Testosteroneundeconoate, *Mugil aurata*, Fresh Water, Growth.

***Effects of Betain on Adaptation to Sea Water of
Tilapia (*Oreochromis aureus*)***

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Abstract.

This study was performed to determine the effects of betain on adaptation of tilapia to sea water. Fish were fed with feed containing of different doses of betain (control dose, 1%, and 2%) during 43 days in fresh water then transferred and adapted to sea water in seven days. Fish were fed with the same feeds during 22 days in sea water. Measurements of Na⁺/K⁺/ATPase activity of gill and histological analysis of osmoregulative tissues (gill and kidney) were carried out.

Na⁺/K⁺/ATPase activity values of gill which were taken in beginning, 4th, 8th, 15th, and 22nd days were measured. Whereas its value was the lowest in 4th day after transferring in fish fed control feed, the groups of 1% and 2% betain were high (0.819±0.03 and 0.963±0.03, respectively). Differences among the Na⁺/K⁺/ATPase activity of the groups were significant statistically (P<0.05). In following days (8, 15 and 22), the activity values of this enzyme were not significant statistically (P>0.05).

Histological investigation of osmoregulative tissues (gill and kidney) supported these results.

Keywords: Tilapia, betain, Na⁺/K⁺/ATPase activity, gill, kidney, sea water.

Effects of Different Diets on the Growth of Blackmoli (Poecilia Latipinna) Juveniles

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Abstract.

In this study, the effects of different diets on the growth of blackmoli (*Poecilia latipinna*) juveniles were examined.

Initial weight of the juveniles about 1 month-old were between $66,5 \pm 0,32$ and $75.8 \pm 0,60$ mg. Blackmoli juveniles were fed different kind of foods which mikroalgae Spirulina, Artificial diet, Tubifex, Artificial diet+Spirulina, Artificial diet+Tubifex and Spirulina+Tubifex. At the end of the 2 months of the experiment the best growth was obtained with Artificial diet+Spirulina ($p < 0.05$). Considerable differences have been noted for the survival rate of the juvenil fed on the Spirulina ($p < 0.005$). Blue-gren algea Spirulina which contains 60-65 percent protein suggested for the blackmoli juvenils as a diet because of supply the good growth and survival rate.

Keywords: Juvenile Feeding, Blackmoli, Spirulina, Tubifex.

Estimation of Heritabilities for Some Traits for Species of Oreochromis Niloticus

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Abstract.

This research was carried on *Oreochromis niloticus* species at the Fresh Water Fishes Research and Production Station (FWFRPS), Faculty of Fisheries, Çukurova University.

The Experiment was designed and analysed with the hierarchal classification. Heritabilities of body weight, total length, standard length, body height, caudal tail height, head length with standard errors were found to be as 0.06 ± 0.23 , 0.05 ± 0.26 , 0.02 ± 0.23 , 0.04 ± 0.34 , 0.0 ± 0.11 , 0.10 ± 0.23 for 180 days old, 0.06 ± 0.17 , 0.05 ± 0.16 , 0.04 ± 0.16 , 0.10 ± 0.15 , 0.0 ± 0.10 , 0.10 ± 0.13 for 210 days old; 0.34 ± 0.39 , 0.21 ± 0.31 , 0.31 ± 0.35 , 0.28 ± 0.30 , 0.22 ± 0.27 , 0.28 ± 0.29 , 0.27 ± 0.23 , 0.10 ± 0.16 for 300 days old of female;

0.31±0.35, 0.28±0.30, 0.22±0.27, 0.28±0.29, 0.27±0.23, 0.10±0.16 for 300 days old of male *Oreochromis niloticus*, respectively.

Keywords: *Oreochromis niloticus*, Heritability, Hierarchal Classification.

Estimation of Heritability for Some Qualitative and Quantitative Traits in Guppies from Aquarium Fishes

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Abstract.

The experiment was established completely randomized design but analyzed hierarchal classification and heritability of body weight, total length with standart errors were found 0.042±0.100, 0.014±0.115 for sires of 60 days old 335 *P. reticulata*, 0.036±0.141, 0.050±0.120 for sires of 90 days old 250 *P. reticulata* and 0.013±0.073, 0.199±0.183 for sires of 120 days old 222 *P. reticulata*; body weight, total length, standart length, head length, caudal fin height, caudal fin length, dorsal fin length, body height, gonopodium length and orange spot numbers with standart errors were found 0.148±0.243, 0.072±0.249, 0.016±0.179, 0.195±0.270, 0.140±0.205, 0.045±0.256, 0.003±0.213, 0.101±0.207, 0.045±0.272, 0.450± 0.409 for sires of 150 days old in male 106 *P. reticulata* respectively; 0.097±0.217, 0.104±0.281, 0.176±0.254, 0.098±0.276, 0.115±0.204, 0.174±0.734, 0.130±0.280, 0.031±0.182, 0.054±0.246, 0.441±0.418 for sires of 180 days old in male 100 *P. reticulata* respectively; 0.014±0.163, 0.003±0.218, 0.054±0.190, 0.264±0.371, 0.038±0.178, 0.551±0.622, 0.008±0.280, 0.028±0.170, 0.313±0.360, 0.432±0.418 for sires of 210 days old in male 100 *P. reticulata* respectively; body weight, total length, standart length, head length, caudal fin height, caudal fin length, dorsal fin length and body height with standart errors were found 0.051±0.294, 0.044±0.219, 0.319±0.318, 0.022±0.168, 0.110±0.296, 0.263±0.295, 0.228±0.331, 0.113±0.272 for sires of 150 days old in female 103 *P. reticulata* respectively; 0.023±0.173, 0.093±0.211, 0.119±0.275, 0.140±0.288, 0.068±0.336, 0.160±0.251, 0.379±0.388, 0.215±0.311 for sires of 180 days old in fe-

male 96 *P. reticulata* respectively; 0.118 ± 0.244 , 0.076 ± 0.207 , 0.307 ± 0.356 , 0.009 ± 0.212 , 0.267 ± 0.350 , 0.271 ± 0.453 , 0.094 ± 0.245 , 0.043 ± 0.193 for sires of 210 days old in female 93 *P. reticulata* respectively.

Keywords: Heritability, Hierarchical classification, *Poecilia reticulata*.

Farming Strategies of the Green Tiger Shrimp *Penaeus Semisulcatus* ***in Subtropical Coasts***

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Abstract.

Growth performance of *Penaeus semisulcatus* under semi-intensive and intensive systems in pond/tank culture conditions with pre-seasonally or over-wintered animals was studied in sub-tropical climate conditions of Turkey between 2002 and 2003.

In Pond A, the pre-seasonally produced post-larvae (PL) grew linearly from 0.2 g to 22.6 g in 140 days ($Y = 0.19 X - 2.69$, $R^2 = 0.97$) with DGR (daily growth rate) of 0.06 g day^{-1} . In Pond B, the over-wintered juveniles grew from 3.8 g to 30.5 g with DGR of 0.41 g during the first 30 days (weight gain of 14.42 g) and 0.13 g between 30 and 140 days (weight gain of 14.32 g). Regression equation for growth was calculated to be $Y = 9.62 \text{ Log}(X) + 4.51$ ($R^2 = 0.99$). Compensatory growth due to starvation or over-winter fasting has, for the first time, been demonstrated in this penaeid shrimp species in the present study. The results showed that food deprivation during the winter months resulted in growth compensation after re-feeding under appropriate culture conditions. During the compensatory growth period (first month after re-feeding) the shrimps gained an average weight of 2.87 g week^{-1} , but after this period, growth rate declined to 0.91 g week^{-1} (over three-fold less) for the rest of the growth period (between 2nd and 5th months). This preliminary finding is a promising area on which studies should focus on, as fasting and re-feeding strategy at low temperature can provide a chance to increase marketable size of shrimps or to even produce two crops per year in the sub-tropics.

In intensive systems with a stocking density of 30-50 animals per m², a linear inverse relationship between stocking rate and survival ($Y = -0.43X + 78.26$, $R^2 = 0.95$) whereas, logarithmic inverse relationships between stocking rate and weight ($Y = -8.45\text{Log}(X) + 21.29$, $R^2 = 0.74$) or growth ($Y = -1.09 \text{Log}(X) + 6.51$, $R^2 = 0.83$) were found in the present study. The shrimps (0.2 g) reached to 13.7 g at 30 PL per m² (DGR 0.10 g), 6.44-7.37 g (DGR 0.05 g) at 40-50 PL per m² in 140 days. The estimated yields were 880-1150 kg ha⁻¹ in semi-intensive ponds and 1597-2673 kg ha⁻¹ in intensive ponds. The shrimps grown in concrete Tanks displayed even poorer growth performance resulting in only 879 kg and 793 kg of yield per ha.

Keywords: *Penaeus semisulcatus*, grow-out, over-wintering, growth, feed conversion rate.

Food and Feeding of the Spurdog (*Squalus Acanthias linnaeus*, 1758) in the Southeastern Black Sea

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Abstract.

This study has been carried out for the identification of natural food and feeding of spurdog (*Squalus acanthias*) collected from the Northeastern Black Sea coast of Turkey. It was found that this species is an indiscriminate feeder. Their natural diet was mainly composed of teleost fishes, followed by Crustaceans, Nematodes and Actinarians (= sea anemones). Whiting was the predominant prey item among their fish diet. Demersal fishes formed the majority of the diet, and there was no difference ($p > 0.05$) among the food items of immature, maturing and mature individuals of both sexes.

Keywords: Southeastern Black Sea, Spurdog (*Squalus acanthias*), Food and Feeding.

***Matching Algorithm for the Vehicle Routing in
Containers Delivery and Collecting Problems***

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Abstract.

In this paper the problem of transporting commodity from/to a set of suppliers to a depot with a fleet of vehicles is considered. Namely, the problem of distributing and collecting of ISO, and small containers may be described as a variant of Vehicles Routing Problem with Backhauls (VRPB), which may be formulated and solved as a nodes' matching problem.

In VRPB vehicle is loaded at the depot with aim to serve demanding customers (linehauls), and to collect containers from supplying customers. Collected goods should be brought back to the depot (backhauls). For the case of 40ft containers, where only one commodity may be carried on, the problem corresponds to bipartite matching, but in case of 20ft, and small containers the problem becomes more complex, and needs multiple matching of supply – demand nodes.

Mentioned problems arise in different logistics systems, but typical examples for the case of ISO containers are sea port containers. Similarly, for the case of small containers which represent new city logistics concept, the problem of supplying urban areas means multiple matching of delivery nodes with nodes where empty containers should be collected.

The paper formulates mentioned vehicle routing problems, and proposes matching heuristics. Numerical examples presented are based on the data related to Izmir seaport container terminal.

***Measuring Students' Satisfaction Level in a Greek
Graduate Technological Education Institute***

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Abstract.

Student satisfaction barometers are of vital importance for the education institutes because they promote their internal re-organization, strengthen their image and emphasize on meeting the expectations and needs of students. Measuring student satisfaction by emphasizing on components of service quality delivered to students is an effective performance evaluation index.

Students' satisfaction is mainly related to their objective evaluation of the various outcomes and experiences that are connected to their education. Their satisfaction is influenced, not only by the quality of teaching provided, but also by other benefits that they receive. So, students' satisfaction is identified from different dimensions and represents the evaluation criteria they use to assess the quality of services provided.

The paper presents an original study that measures the students' satisfaction of a Business Administration Department of a Greek Graduate Technological Education Institute. For the analysis of the survey results the multicriteria methodology MUSA (Multicriteria Satisfaction Analysis) was applied.

The basic principle of MUSA is the aggregation of individual judgements into a collective value function, assuming that student's global satisfaction depends on a set of criteria representing service characteristic dimensions. MUSA uses a preference disaggregation model. In the traditional aggregation approach, the criteria aggregation model is known a priori, while the global preference is unknown. On the contrary, the philosophy of disaggregation involves the inference of preference models from given global preferences.

The most important results are focused on the determination of the weak and the strong points of the Department. One of the basic conclusions of

this survey is the high global satisfaction index of the students. At the same time the students appeared to be non-demanding in relation to the services provided. In other words, students express that they are satisfied, although not so big portion of their expectations is fulfilled. Finally, the results are compared to the ones obtained from a similar survey conducted in a Business Administration Department of a Greek Business University.

Keywords: service quality, satisfaction evaluation, multicriteria analysis, higher education.

Observing Activity of $\text{Na}^+ / \text{K}^+ / \text{ATPase}$ Enzyme of Sea Bass

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Abstract.

In this study the changes at the gill $\text{Na}^+ / \text{K}^+ / \text{ATPase}$ enzyme activities that are happened while the sea bass was transferred directly into the varied salty solutions from the sea (40%), was observed.

After transferring of the fishes into the 30%, 15% and 0% saltiness of water from the sea water which was assessed to be the control group directly at the 8, 16, 32, 64, 128 and 256 hours repetitively, exemplification was done. The gill $\text{Na}^+ / \text{K}^+ / \text{ATPase}$ activity at the freshwater (0%) was different from other groups ($p < 0.05$). The enzyme activity at the fishes which were transferred to the 30%, 15% and 0% saltiness of water was increased quickly by 32 hours and then decreased. In an order the $\text{Na}^+ / \text{K}^+ / \text{ATPase}$ enzyme activities at the 256 hours in 40%, 30%, 15% and 0% salinities were found as $14,88 \pm 0,08$ (m Pi /mg protein / hours, $9,72 \pm 0,23$ (m Pi /mg protein / hours, $6,61 \pm 0,14$ (m Pi /mg protein / hours and $13,54 \pm 0,06$ (m Pi /mg protein / hours. In addition, to determine the concentration of water of muscles and the contents of plasma of blood, examples were obtained at the 16, 64 and 256 hours and their contents were determined.

In conclusion the adaptation of sea bass to the tasty and sour water was observed physiologically and the adaptation was seen to become true after the 10th day of transfer.

Keywords: Sea Bass, *Dicentrarchus labrax*, Gill $\text{Na}^+ / \text{K}^+ / \text{ATPase}$.

On some Special Models of Loan Redemption through Bonds

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Abstract.

In cases when debtor is not able to provide a single creditor to borrow the whole credit, it is possible to divide the loan into bonds of the same or different nominal value; thus, loan (credit) is financed by greater number of creditors (physical entity, legal entity – bank, enterprises etc.). It is the case of credits of relatively high nominal value (they are launched by the state or big corporations, and creditors – bond holders-to be, are most often physical entities who subscribe to loan). In order to enable the greater number of interested subjects to subscribe a loan, it is usual to divide the whole credit (loan) into the greater number of bonds of the same or different nominal value. Sum of nominal values of all the bonds equals the loan.

Without paying attention to different numbering of bonds, we suggest that they could be marked by series and groups. In each group are the bonds of the same nominal value. What is typical for different ways of loan redemption using bonds is that principal (credit borrowed) is redeemed through bonds of nominal value given in advance, and interest is paid by coupons. Coupons are usually given together with bonds, but could also be given on separate sheet (coupon sheet), which are in certain number given while drawing interest. There are also variants where a part of interest is paid through coupons and a part is added to redeemed bonds and is paid as bonus.

Loans divided into bonds are redeemed either by choosing bonds or by redemption and by the combination of those two. There are also so-called lottery loans which are redeemed by choosing bonds (order of bond collection is established by their numbers and series). If bonds are redeemed by choosing, then chosen bonds referring to redeemed loan portion may still

be in combination to win.

This paper deals with theoretical analysis of loan redemption through bonds, where an exact algorithm of redemption is obtained and practical application given.

*On some Special Models of Rents Taken Anticipatively
with Decursive Capitalization*

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Abstract.

It is well known that rent calculation models are widely applied in practical matters regarding different insurance risks.

This paper deals with special models of rents taken anticipatively (at the beginning of each accounting period), where interest is calculated decursively, as in practice.

Beginning with standard models of rents, this paper presents originally derived the chain of exact algorithms and greater number of rents, such as: models of perennial rent, models of constant rent received in series, models of variable rents of successive growth or decrease according to arithmetical or geometrical progression. For each of the models obtained there are applications given to simulate practical situations of the rent applying. For each model there are relatively simple formulae, easily applicable for any interest rate value without Interest Tables.

Algorithms of all the models obtained are easily programmed. Thus, a great number of practical problems could be solved by using computer.

On the Estimation of Population Parameters for the Species of *Serranus Hepatus* from the Iskenderun Bay, Mediterranean

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Abstract.

In this study, reproduction periods, von Bertalanffy Growth Constants were determined for Brown Comber.

Reproduction periods were between May and September for Brown Comber. von Bertalanffy Growth Constants were estimated $L_{\infty}=37.3568\text{cm}$, $k=0.0741\text{year}^{-1}$, $t_0=-0.909$ year for total length $L_{\infty}=65.149\text{cm}$, $k=0.0184\text{year}^{-1}$, $t_0=-0.678$ year for standart length and $W_{\infty}=607.9135\text{gr}$. Also length-weight regression equations were calculated for total lengths as $W=0.03*L^{2.739}$.

Keywords: *Serranus hepatus*, Reproduction, von Bertalanffy Growth Constants, Length-Weight Regression Equation.

Operational Use of a Multi-Criteria Fuzzy Model to Evaluate Project Impacts in the Context of Sustainable Development of Mountain Areas: A Greek Case Study

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Abstract.

Ex-ante, *on-going* and *ex-post* project evaluation in the context of sustainable development of mountain areas involves multiple dimensions: environmental, social and economic.

Most of the attributes related to those dimensions are vague, subjective, uncertain or intangible and can be modeled more authentically by fuzzy concepts. A multi-criteria fuzzy model was developed through MEDMONT, a European funded project, to evaluate *ex-ante*, *on-going* and *ex-post* project impacts in the context of sustainable development of mountain Mediterranean areas. This paper presents results from the operational use of the model to evaluate an on-going forestry project in the province of Halkidiki, Greece.

***Overcoming Spatial Constraints in Forest Management
using Integer Programming: a Case Study***

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Abstract.

Forest management modeling has recently addressed concerns with resources other than timber. Considerable attention has been given to the spatial and temporal arrangement of wildlife habitat and forest management activities. Some forest regulations, for instance, place limits on the size and spatial relationships of harvest. Adjacency or “green up”, requirements are becoming increasingly common policies in many countries. Forest practices green-up rules, which act as adjacency constraints, are designed to restrict both the size of the forest openings and the length of time before adjacent harvest units can be harvested. The purpose for green-up and adjacency rules varies; some were put into effect due to concerns about the effects of clearcutting on forest fragmentation and other ecological processes. Forest practices laws may also include these constraints either as a response to public pressure regarding the aesthetic quality of large harvest areas, or in an effort to disperse the potential impact on water

quality from timber harvesting. Green-up rules are also often a requirement of forest certification schemes.

In this study, we present an integer programming model for a five-period harvest problem. Integer programming techniques have been used to produce management plans that recognize green-up (adjacency) requirements. Different planning alternatives were developed that maximizing timber volume with constraints on the maximum clearcut size and constraints on the length of time requirement.

This spatial forest planning process allows forest managers to examine a number of management options, from ecological perspectives, prior to selecting a preferred alternative. In addition, different outcomes could be composed according to the spatial layout of the stand treatments, and the results would be alternative spatial forest structures.

Keywords: Forest Planning, Harvest Scheduling, Adjacency Constraints, Integer Programming.

*Pigmentation of Gold Fish (*Carassius Auratus*) with Carotenoids from Alfalfa (*Medicago Sativa*)*

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Abstract.

In this study, the effect of diets including various alfalfa proportions on the pigmentation and growth of the goldfish was investigated. The fish (8.37 ± 0.36 g) were fed diets containing 5, 10, 15, 25 and 40% alfalfa, 75 mg/kg synthetic zeaxanthin and a control diet for 60 days. The diets including synthetic zeaxanthin and 15% alfalfa at the same amount of total carotenoid (100 mg/kg) had similar effects on total carotenoid accumula-

tion in the fish integuments (60.13 mg/kg and 57.10 mg/kg, respectively) ($P>0.05$) at the end of the experiment. For the groups fed with the high level of alfalfa addition (25 and 40%), the carotenoid accumulation rate decreased progressively after 45 days. An alfalfa additive equal to or higher than 25% in the diet had a negative effect on the growth performance of the fish ($P<0.05$).

Keywords: Carassius auratus, alfalfa, zeaxanthin, carotenoid, pigmentation.

***Population Characteristics and Growth of Spicara
maena (Linnaeus, 1758) Inhabiting in Babadilliman
Bight (Northeastern Mediterranean-Turkey)***

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Abstract.

This study was carried out between May 1999 to April 2000 in Babadilliman Bight. A total of 896 blotched picarel individual were trawled by monthly sampling and examined. It was found that, age composition of blotched picarel varied from 0 to III and they were composed of 41.96% females, 52.79% males, and only 5.25% juveniles. The measured mean total length and mean weight values for females, males and their pooled data were as follows respectively $8.12\pm 0.47\text{cm}$ - $6.30\pm 5.17\text{g}$, $8.22\pm 1.77\text{cm}$ - $6.77\pm 6.25\text{g}$ and $8.07\pm 1.67\text{cm}$ - $6.34\pm 5.72\text{g}$. In addition to this, the calculated length-weight relationships were $W=0.0077*L^{3.1416}$ for females, $W=0.0063*L^{3.2277}$ for males and $W=0.0070*L^{3.1812}$ for pooled data. According to GSI values, spawning were occurred from March to May.

Regional Socio-Economic Trends in Turkey

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Abstract.

During the last 80 years Turkey is constantly attracting the interest of socio-economic and political analysts due to its strategic location, its amazing economic and especially industrial progress and its relatively advanced, with respect to its Middle East Muslim counterparts, democracy. Recently, this interest is increasing rapidly, mainly due to the expected, this October, start of EE-Turkey negotiations that will hopefully end up (some time in the rather far future) with the award of the full EE membership prize to this country. It is apparent that the successful realization of the above process will drastically alter and shift the power equilibria both in Europe and the Middle East. As a consequence this process is raising critical geo-strategic questions that are demanding quick and safe answers.

This paper is focusing on the regional socio-economic structure of Turkey in an effort to explore its internal dynamics and its geo-economic equilibria that to a large degree determine its long term socio-economic stability.

The regional analysis of Turkey is performed with the employment of two basic methodological tools:

- (a) The Efficient Frontier Analysis in the context of which the Data Envelopment Analysis (DEA) model has been applied [1] on the system of Turkey's provinces to explore their efficiency with respect to a set of economic criteria.
- (b) The Gravity Center Analysis [2] in the context of which the Weber [3] model is applied in order to locate the social and economic gravity centers of Turkey and to explore their intra-time movements.

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Stimulatory Action of Neuropeptide Y (NPY) on Food Intake and Growth of Oreochromis Niloticus

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Abstract.

This study was carried out to investigate the effects of neuropeptide Y (NPY), administered intraperitoneally (i.p.) or orally on food intake and growth of tilapia *Oreochromis niloticus* (11.19 g) in two separate experiments. In the first experiment, which lasted for 24 h, NPY was injected at 0, 0.1, 0.3, 0.6 $\mu\text{g/g}$ body weight (bw). In the second experiment, NPY was orally given at 0, 0.125 and 0.25 mg/kg feed for 50 days.

In experiment 1; food intake was significantly increased by i.p. administration of NPY at 9 h post-injection, but the stimulation of food intake diminished at 24-h post injection. Food intake was 50% ($0.6 \mu\text{g g}^{-1}$ bw) and 8 % ($0.3 \mu\text{g g}^{-1}$ bw) higher compared to the control during the first 9 h. In experiment 2; final weight of the group fed on 0.25 $\mu\text{g g}^{-1}$ NPY was found to be approximately 13% higher than the control group. The specific growth rate, daily food intake and feed conversion efficiency were significantly higher at 0.25 $\mu\text{g g}^{-1}$ compared to the other groups ($P < 0,05$). The present results show for the first time that NPY either administered by i.p. injection or through feed has stimulatory effects on food intake as well as growth of *O. niloticus*.

Keywords: Neuropeptide Y, Food intake, Growth, *Oreochromis niloticus*.

Student Success Analyse System

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Abstract.

Exams' results recording and analysis of student success at S&M MA requires much work. There are some efforts to make that process easier but they are not good enough. The main objective of this project is to make a system that will provide the users an efficient access to the information they need in network environment.

Processes that need to be automated are as follows:

- student's data recording
- exams application registering
- exam scores registering
- term analysis
- printing of exams applications, exam scores listings, students lists etc.

The project we proposed also enables ad hoc analysis of student success.

The Effects of Using DL-Alanin, DL-Methionin and their Combination on the Growth of Carp (Cyprinus Carpio Linnaeus, 1758) Fingerlings

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Abstract.

In this study, the effects of diets including various DL-alanin and DL-methionine proportion on growth of carp fingerlings (*Cyprinus carpio* Linnaeus, 1758) were examined. Initial weight of the fingerlings was 14.13 ± 0.83

g. Feeding trial was conducted for 60 days. The research was composed of ten groups; the artificial diet (control diet) and the diet including 0.5, 1, 1.5% methionine, 0.5, 1, 1.5% alanine, 0.5, 1, 1.5% alanine+methionine.

At the end of the trial, the groups fed diets including DL-alanine and DL-methionine had higher weight gain than the control group ($P < 0.05$). Similar growth rate and body weight gain was observed between the groups fed DL-alanine and DL-methionine ($P > 0.05$). Survival rate of above 95% was obtained in all the groups ($P > 0.05$). The best results in terms of feed conversion (1.56) and daily weight gain (0.17 g/day) were obtained from the group fed on diet including 0.5% methionine.

Keywords: Carp, DL-alanine, DL-methionine, Growth.

The Influence of some Physicochemical Criteria on Chlorophyll-a in Summer Season, Seydan Dam, Adana – Turkey

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Abstract.

This study was carried out between June, 2004 and September, 2004. Water samples were taken in weekly from two stations in which littoral and pelagic zones. Temperature, pH, conductivity were measured. Chlorophyll-a, nitrite nitrogen, nitrate nitrogen, ammonia nitrogen, orthophosphate and silica were analyzed according to the standard method.

Data were checked for normal distributions and homogeneity of the variances before statistical analyses. Regression analyses were used for finding influence factors on chlorophyll-a. The data were analyzed by using SPSS statistical package program.

***The Plant Location Problem Based on Network
Modeling Approach by a Expanded Linear
Programming Model***

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Abstract.

Plant location problems are one of the most strategic decisions of the management. The structure of the location decision is based on various criteria and this factor causes the dynamic and multi-objective nature. The effects of the given decision are not limited with a short period of time. Strategic nature of the decision brings the necessity of the operation research activities associated with the problem.

Plant location models are considered only with the aim of locating the plant without taking supplier and warehouse location problems. The models are developed on the idea that the minimization of the cost associated with the transportation of either raw materials or products would be an adequate methodology. However in the location problem, the general system should be considered as a network in accordance with the supply chain concept and the optimization of the upper system should be aimed rather than to be limited with the lower system optimization. The system should be modeled starting with suppliers and followed by plants, warehouses and markets. The multi-objective nature of the problem should be modeled by the consideration of factors such as taxes, tariffs and customer requirements.

The study stands on the systems approach and models the problem as a network considering all parties in the supply chain. A linear programming model is proposed for the location selection in the study. An application is conducted to show the relevance of the study to business decisions.

***The Potential of Phytoplankton-based Culture of
Tilapia (Oreochromis niloticus) in Floating Cages in
Seyhan Dam Lake***

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Abstract.

Overwintered Nile tilapia (*Oreochromis niloticus*) were cultured at extensive conditions in floating cages in Seyhan Dam Lake in Adana (Lat 36° 59' N – Long 35° 19' E). Fish (61.92±11.80 g) were stocked in 1m³ cages for 90 days. The stocking rate was 20 fish m⁻³. In this study growth rate and weight gain of fish which cultured in floating cages, without artificial feeding were investigated. According to final results tilapia showed a weight gain of 50.09±0.52 g., (from 61.92±11.80 g to 112.01±0.77 g.) reaching to 17.07±0.41 cm average length (mean ± standard deviation; n=40) by the third month. At the end of the culture period the daily weight gain (0.556±0.005 g per fish day⁻¹), the specific growth rate (0.654±0.27%) were calculated.

Keywords: Extensive fish culture, Floating Cage, Tilapia, Phytoplankton-based Culture.

***Water Resources Management using the AHP and
PROMETHEE Multicriteria Methods: the Case of
Nestos River - Greece***

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Abstract.

In this paper alternative irrigation projects in the greek part of the Nestos River catchment are evaluated, that aim to satisfy the water demand within three Prefectures of the East Macedonia-Thrace District. The sustainable management of river waters arises from the operation of two recently constructed hydroelectric dams in the region. The management of the water supply system should balanced the demand for irrigation, the needs of the Public Electrical Corporation for hydropower generation, as well as environmental requirements given the presence of valuable natural ecosystems in the area. In order to evaluate the projects, the Analytic Hierarchy Process (AHP) and PROMETHEE multicriteria methods are used. Evaluation is based on economic, social, environmental and cost criteria. Alternative scenarios on the availability of water resources are also incorporated in the models. The application of the two multicriteria methods result in some general conclusions.

Keywords: AHP, PROMETHEE, project evaluation, water resources management.

Section 5

Computer Support Systems

A Hierarchical Mixture of Experts Model for Image Segmentation

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Abstract.

The hierarchical mixture of experts (HME) is a particular class of the neural networks named committee machines, whose structure consists of K supervised modules called expert networks or simply experts, and an integrating unit called a gating network that performs the function of a mediator among the experts, consisting of a single layer of K neurons, with each neuron assigned to a specific expert.

The HME can be viewed as a conditional mixture model in which the distribution of the target variables is given by mixture of component distributions in which the components, as well as mixing coefficients, are conditioned on the input variables. The HME is also a tree-structured model for regression and classification, based on soft probabilistic splits of the input space. As with every other neural network, a good solution for the parameter estimation problem hinges on the selection of a suitable model for the problem at hand. In this paper we present an efficient HME model for the problem of image segmentation, in which each pixel is assigned to one of a predefined finite number of labels. Our model is applied to images of outdoor scenes, with class labels such as "sky", "road", "vegetation", etc. Such scenes are typically complex, involving many different objects and some of these objects can be highly variable.

A Method for the Single Direction Nesting Computation

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Abstract.

These days, the latest technology in construction machineries and computation resources significantly increased the productivity and goods quality. In those conditions the production activity request quick processing and analysis methods of the technological information. For instance, the high number of the structure pieces in ships building generates difficulties in preparing of cutting information and sensible loses of materials where improper distribution of the pieces into the row materials exists. The specialized software for development of projects usually includes modules for optimization of the row materials consumption, but those programs imply high expenses.

This paperwork presents a simple nesting optimization method for a single dimensioning direction (sum of lengths). The method consists in sequential generations of certain combinations searching for fine results using reasonable computation resources. The algorithm has been transposed in visual basic language for checks and exemplifications. The results consist in the exact sequence of the given pieces (lengths) along the row material bar (length) and indications regarding computation volume for the initial optimization conditions.

Extensions of VNS-based Software GLOB to General Constraints

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Abstract.

Recently developed software package GLOB is the first software based on Variable Neighborhood Search (VNS) methodology for minimizing a continuous function subject to box constraints. In this paper GLOB is modified to handle global optimization problems with general constraints. The potential of GLOB is tested on various test problems.

*Improving Quality Management in Countries in
Transition through Application of ERP Software*

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Abstract.

One of significant problems of countries in transition is inadequate quality of their products comparing to the standards of developed countries. As it is a complex problem, its solution must begin with education, not only of experts in quality, but also of top management. Considering that Japanese took more than 20 years, with support of top management, to reach the quality level of western countries, perspective inclusion of countries in transition does not seem very bright.

The paper explains a way in which this problem can be solved by installing ERP software into the enterprises of the countries in transition. According to one of the most commonly accepted concepts of quality, quality is viewed through three dimensions: quality of design, quality of conformance and quality of performance. Application of ERP software can contribute to significant improvement in all three dimensions. However, installing ERP software into production system which is based on totally different concepts is a different problem. The paper discusses a model of customization of ERP software, so the enterprises in transition could more easily apply it and, hence, hasten their development.

OPTCHOICE as Pervasive Internet Service

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Abstract.

In our days *INTERNET* undergo a fast services development. An Internet service is a pervasive one if and only if it is available *to any client, anywhere and anytime*. In this paper, one presents the *OPTCHOICE* pervasive software, which allows describing *Multi-Attribute Decision Making* mathematical models, defining on them *Optimal Choice* problems and solving these in informatics performance conditions.

The mathematical models are general, in conformity with the decision science commandments; their main entities are decision makers, state of nature, objects, and attributes whereas their link entities are objects' characteristics, importance of main entities and the set of productions rules for unstructured information acquisition. The attributes are also general, being of cardinal, ordinal, Boolean and fuzzy type. The mathematical model benefit from knowledge-based computing for inconsistency (incorrect / incredible / incomplete model definition) avoiding. An optimal choice problem defining is made by establishing its maximal extent aria in rapport with the model description and by précising the solving methods. There are two kinds of solving methods: first, methods that produce explicit object evaluations (by running a set of such methods, every object will have an associated evaluation vector) and second, methods that produce objects characteristics (these analysis methods will associate with every object a discriminators matrix). *OPTCHOICE* implements five methods of first category, namely the linear utility function, scores, Pareto, Topsis, Todim methods (which were extended for the multiple decision makers and multiple state of nature case) in conjunction with several normalization methods, and one method of second category, namely the dominance analysis. Since every evaluation method is based on a different point of view on the optimal choice problem solving, it is clear that applying different methods to the same set of data, will often lead to different solutions. A new type of inconsistency may occur, multiple solutions, which lead to a decisional dilemma. An inferential procedure correct this inconvenient and proposes a global solution by processing the facts given in the database, evaluation vector and discriminator matrix.

Web enabled optimization is a new trend in treating Operations Research field. *OPTCHOICE* software is one of the way openers. It is under last finishing and testing. People without a special training in mathematics and Internet computing will be able to use it.

Keywords: Decision Support Systems, Internet Computing, WEB Enabled Optimization, Multi-Attribute Decision Making, Knowledge Based Computing.

***Promoting Operations Research Education Using a
New Web – Accessible Didactic Tool***

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Abstract.

The scope of this work is to present a new tool with clear didactic orientation, which will serve as a complementary means in teaching graphs algorithms.

The proposed educational software can be used in courses like “Network Optimization” or “Operations Research” and has been implemented using the Java Programming language. This Java applet is freely available, platform independent and highly interactive. The most important feature is that it is Web – accessible and can be used from any remote place, through a common Internet browser. It features visualizations of the Depth First Search (DFS), Breadth First Search (BFS), algorithms for determining graph connectivity (strong or not), topological ordering and the Dijkstra’s shortest path algorithm. Furthermore, its use is analytically shown through an illustrative example. Benefits and drawbacks are thoroughly described in order to support the significance of this tool in Operations Research education and finally, possible future work is discussed.

Keywords: Operation Research Education, Network Optimization, Algorithm Animation, Visualization.

Reducing Fraud in Electronic Payment Systems

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Abstract.

Efficient and effective electronic payment services are already established and accepted by businesses and consumers. On-line banking and card payments over the Internet are now commonplace. Advances in e-commerce, expansion of modern technologies and global communication provide a large number of business opportunities, as well as new threats for the banking and financial services. The number of fraudulent activities is increasing dramatically in telecommunication networks, mobile communications, and E-commerce. Fraud is a major problem in electronic payment systems. For example, card fraud losses are growing every year. Consequently, fraud detection is becoming an important issue for research. Fraud begins to rise as new technologies and new weaknesses are found. Reducing fraud is a complex process which includes the knowledge from many scientific areas and demands a multidisciplinary approach. In this paper the problem of fraud prevention and detection is addressed. Several techniques for fraud prevention and detection are presented. It is important that fraud can be detected as it is happening. Detecting fraud in real-time is not easy so it is not surprising that many fraud systems have serious limitations. New solutions such as fraud management systems can reduce fraud significantly by using and combining many existing techniques, as well as new ones.

Keywords: fraud prevention, E-commerce, electronic payment systems, security.

Secure Mobile Banking

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Abstract.

This paper contains overview of key technologies for mobile banking client implementation and presents J2ME mobile banking client development. Banking applications follow a trend of mobile application expansion. Banking services on mobile device presents for current services new channels of distribution, implemented in order to satisfy ascending customer needs. This enables service access 24/7 from every place. This was enabled by new mobile devices, which possess excellent characteristics like large processor power, large amount of memory, enabled Java programming. On the other part, mobile providers implemented 2.5G networks, which use GPRS as information bearer. This type of networks enable greater amount of data to be transmitted between client and server, using much securer protocol and stable connection. User services were firstly realized using WAP applications, which had some disadvantages in terms of security. These applications were useful for less powerful mobile phones. Next generations of applications are client server mobile applications. These client applications need powerful mobile phones, because they are Java applications. These applications implement secure API and web service technology.

Keywords: mBanking, security, J2ME, mobile computing.

***Software Versus Hardware Temperature Error
Compensation Method of Strain Gage Load Cells***

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Abstract.

Thermal phenomena must to be taken into account during the design of a precise force transducers. The output signal of the foil strain gage force transducers is affected not only by the strain, but with the other environment variables. The temperature is one of the most significant influence quantities affecting a transducer weighing system and one of the main error source.

There are two basic techniques to minimise the temperature effects, hardware and software, which are briefly illustrated in this paper. It particularly

emphasizes the necessity of using software temperature compensation due to technical and economic reasons.

***Two Metaheuristics for a Network Design Problem
with Single Source-Multiple Destinations Flows***

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Abstract.

Network design models are used in many real-world applications such as telecommunications and computer networks, transportation and logistics systems, and water resources management. We propose a genetic and a simulated annealing algorithms for solving a variant of the capacitated network design problem. In this model flows from a central vertex are directed to demand vertices via the edges of an undirected network. Flows in each edge are bounded by its capacity. Edges are constructed by combining cables of standard capacity. Cable cost is subject to economies of scale and routing costs are negligible. The problem is NP-hard as it contains the fixed charge network design problem as a special case. Both algorithms attempt alternative paths for routing flows in order to improve design cost. We use the trie data structure to store the k-shortest simple paths. An extensive computational analysis was realized on randomly generated sparse networks using both algorithms. We report and compare these results, and we suggest some improvements of the algorithms.

Keywords: Genetic algorithm, k-Shortest paths, Metaheuristics, Network design, Simulated annealing, Trie data structure.

Section 6

Economics: Models and Decisions

A Chaotic Economic Growth Model in Aid Dependent Countries

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Abstract.

In aid dependent countries, we can model nonlinear economic growth.

“Aid dependence can be defined as a situation in which a country cannot perform many of the core functions of government, such as operations and maintenance, or the delivery of basic public services, without foreign aid funding and expertise. As a proxy for this, we use a measure of “intensity” of aid: countries receiving aid at levels of 10 percent of GNP or above. On average, low-income countries received just less than one percent of GNP in aid in 1997. But aid equaled 10 percent or more of GNP in more than 30 countries with populations over 1 million. Trends in aid as a percentage of GNP indicate that aid intensity has been on the rise since 1975, although it appears to have leveled off slightly since 1992.” (Brautigam, D, 2000, pg 2)

Irregular movement of the gross national product, GNP, can be analyzed in the formal framework of the chaotic growth model. The basic aim of this paper is to set up a chaotic growth model of the gross national product, GNP, including the rate of aid growth.

Keywords: Aid, Rate of growth, Stability, Chaos.

About Asymmetric Information in Economic Models

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Abstract.

The informational structure, which subsists in a game run, receives specific connotations when particular contexts are analyzed, not only the theoretic ones. Under risk, the distorted perception of a situation, by the decision makers who are loss averters or by those who care about their image, is present especially in the case of probabilities having values close to extremes (low odds or high odds). For instance, the children or teenagers often take risky actions only as a challenge, in order to prove that they are not afraid. The concern for reputation could explain a wide range of behavioral anomalies. When skill shake hands with chance, the success or failure changes the informational structure related to the decision maker's behavioral endowment. Resuming the main economic models of asymmetric information within a risky context is one of our goals. The second objective consists in reviewing some specific problems regarding the computer implementation of these models.

Building Better Partnerships: the Advantages and Disadvantages of PPP Implementation in Greece

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Abstract.

If PPPs (Public Private Partnership) are to be a significant feature of the public service landscape in 2010 then much has to change. The association between private or voluntary provision of public services and cost-cutting will have ended. Partnerships will no longer be seen as privatization by

stealth. Public Managers will have the experience and confidence to allow more innovative partnership models to emerge and will be able to work alongside a diverse menu of leading edge public, private and voluntary organizations. Employees will be confident about how they will be treated by private providers and citizens will see partnerships as an opportunity rather than an obstacle to participation in decision-making.

Is this destination ever likely to be reached in Greece? Many would say not. It will require a commitment to sustainable increases in public funding, a political desire to make the case for partnership, a willingness to admit the flaws of some recent models of PPPs and a determination to make a reality of the rhetoric of evidence based policy. It will also require action to be taken now. High quality and popular universal public services need to be a defining feature of Greece in 2010.

As PPPs are a risk-sharing relationship based upon an agreed aspiration between the public and private sectors to bring about a desired public policy outcome, this paper aims at focusing on the foundations for partnership in Greece, their significance for the national economy, the lessons learned from the implementation of certain BOT (Build Operate Transfer) projects, the appropriateness of using certain kind of partnerships in Greece, how to make the public sector a better partner and the appropriateness of the partnership.

E-Business in Serbia: Cases Study

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Abstract.

After almost 10 years of isolation and 3 years of transition processes, business in Serbia, mainly speaking, is still not in good shape. But challenges in global business environment, set by Internet and Web technologies, brought a lot of good (and bad) examples of e-business solutions that are taking it's place on the market in Serbia and world-wide. As people in Serbia have pretty good tradition in making business and using new technologies, such a good practices can be found here. Lack of capital, technologies and world-wide recognized brands is making a lot problems, but survival is 'in the bones' of people everywhere, so you can see some excellent examples of Internet-based business systems, some brick & mortar solutions that are working well, but also some whole industries that are using e-business in it's basic parts. Authors of this paper will present some examples of e-business in Serbia that are characteristic for showing EC potentials and practice in this region.

Economic Analysis of Aquatic Products Farms on Yene Stream in Balkaya-Kirklareli Region**Mustafa S. Uzmanoglu**

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Abstract.

In this study, The Economic Analysis of Trout Farms on Yene Stream in Balkaya-Kirklareli Region has been investigated.

The greatest portion of active capital were ponds (25-40 %) and fish (26-40 %), secondly building (11-15 %) and tools-machines (8-14 %). The most gross outcome of per unit pond field was in enterprise A₁ (114 465 000 TL/m²). Trout production cost has been calculated as the lowest in enterprise A₂, the highest in enterprise A₃; the highest net profit in enterprise A₂, the lowest in enterprise A₁; the highest capital turn ratio in enterprise A₂, the lowest in enterprise A₃; the highest profitability in enterprise A₂, the lowest in enterprise A₃. All of the enterprises were small-scale "family-run" establishments, having a capacity between 18-30

tons per year. The total productions of all the enterprises were estimated 73 tons/year. Harvesting density of the ponds in these farms was found to be 20.55 kg/m³. Average survival ratio in these farms was 40%. Feed conversion ratio was computed 1.26.

Keywords: Trout enterprises, economic analysis, aquatic products.

Genetic Algorithm Application in Agent Learning at an Artificial Stock Market

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Abstract.

Artificial Stock Market model tries to explain various statistical facts found in financial economy data to have understanding of the micro cause, which is at individual level of market player. Agent-based simulation is a bottom-up system modeling approach to forecast and understand the behaviour of non-linear systems. The basic principle of multi-agent system is to arrange micro-rule of the system by modeling the agent's interaction pattern in order to computationally show several macro characters from the system in agregate.

A typical agent may be a fundamentalist investor (who believes the price will follow the fundamental value of the asset) or a trend-follower (who considers behaviour of other traders as the only source of information). In the paper, we use three general strategies from investors: a fundamentalist strategy – a strategy that has tendency to maintain price in a certain index value, a technical (chartist) analysis – a strategy that intend to take profit from time series data trend analysis, and a noisy strategy – a random strategy from investor. In our model, the inter-agent interaction will be monitored by an artificial market maker.

Genetic Algorithms (GA), originally developed by John Holland as a simple model of genetic evolution, have swiftly “evolved” to be used in lots of different areas, including learning models in economics. A genetic algorithm solves a problem using a process similar to biological evolution. It

works by the recombination and mutation of gene sequences.

Genetic algorithm agents are selfish like in the canonical model, but not perfectly rational. More specifically, they have limited memory, strive to choose good strategies but are not maximizing, have a limited depth of reasoning, are path-dependent, and actively experiment with strategies. This paper considers individual learning algorithms only.

In this paper we explore the consequences of using a GA to evolve a complete entry model, by discovering both the trading rules and the optimal parameters for those rules. A genetic algorithm can be viewed as a behavioral model for an individual agent. GA will be used to discover some rules from the great trading rules sample. A simple and effective method involves the construction of a set of rule templates. The term of genetic search applies to the use of a genetic algorithm to search through large set of potential solution to find those that are best, i.e., that have the greatest fitness. In the current application, the intention is to use the evolutionary process to discover sets of numbers that are translated to rule-based entry model with the greatest degree of fitness (defined in terms of desirable trading behavior). The idea of the algorithms is to store the best solutions of each generation into short-term and long-term lists. The short-term list contains the best rules in last period from simulation. On the other hand, the long-term list contains best solutions as long as the memory size permits. The final results are accumulated in the long term list.

***Heuristics for One Class of Minimal Covering Problem
in Case of Locating Undesirable Goods***

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Abstract.

Many facilities which are widely used and provide a service are known as “undesirable” or “obnoxious”. Those facilities generate different undesirable effects which can be felt over a certain geographical space, and making decisions about their spatial position is crucial when it comes to minimizing the environmental risks. In this paper, the specific problem of locating

undesirable goods has been considered. Such facilities should be located in some of the network nodes belonging to a known discrete set, under conditions of minimal safety distance, both between the warehouse facilities themselves and between the warehouses and other neighboring objects. The objective here is to maximize the quantity of goods stored while at the same time respecting minimal safety distances. This paper presents the problem formulation and proposes heuristic solution approaches which are tested on numerous examples.

Important Factors for Salesforces Evaluation

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Abstract.

This paper examines the impact and role of models for evaluation in sales department through various companies. Recent research has suggested that the one of most difficult tasks for the sales managers is evaluating the performance of salespeople under their control. We will describe behaviour based and result based models and give the comparison view.

Authors Anderson, Hear and Bush described that the results of salespersons depend on internal factors and external factors. We suggest a model which enables to explore three types of factors: external, personal (individual) and internal factors. This approach will enable better basis for analysis.

The study is based on data collection from salespersons and sales managers in companies from Belgrade in SCG. Our findings indicate important factors which have influence of salesforces evaluation.

On the basis analysis we identified how the policy of sales and organization of sales network were defined. We observed what the opinions of sales managers and salespersons about that.

We purpose guidelines for improvement of work in sales department and the possibility for efficient evaluation of salespersons.

Keywords: salesforces evaluation, factors, behaviour model, result model.

Improving the Business Process through the Six Sigma Approach

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Abstract.

The Six Sigma is a quality approach which strives to eliminate the defects from any process. It is a philosophy, a goal and a strategy. The philosophy and goal are to achieve a process that produces not more than 3.4 defects per million opportunities. The strategy provides the means to achieve this goal.

The aim of the paper is to explore the opportunities for the improvement of the business process through the Six Sigma approach. The Six Sigma is not only a quality approach, but also a management approach which leads to improvement in the organization and management of all the processes within a company. It addresses the “company –customer” relationship in the context of the contemporary market economy. The approach looks at business activity as a continuous process. Its aim is to minimize the gap between the “quality” and “value” of the company and the customer’s perception of “quality” and “value”. The Six Sigma approach guarantees the stability and the capability of the business process by continuous monitoring and improving of the organization and management.

This paper presents the definition of different projects and the role of some of the instruments used for analyzing and improving the business process. The attention is focused on evaluating the risk of implementing different Six Sigma projects. The potential failures and their effects on business are

studied using the Failure Mode and Effect Analysis (FMEA).

The FMEA is a structured approach to identifying the ways in which a product or a process can fail, estimating the risk associated with specific causes, prioritizing the actions that should be taken to reduce the risk, and evaluating the current control plan. The FMEA identifies the deficiencies in the process control plan, establishes the priority of actions, evaluates the risk of process changes, identifies the potential variables to be considered, guides the development of new manufacturing processes, and helps set the company for breakthrough.

This paper also draws attention to a case study research being carried out in a Bulgarian manufacturing company. The company is a typical representative of small and medium-sized enterprises operating in the conditions of transition to and early stages of market economy. Based on the data collected and experiments held, the paper demonstrates that implementing the Six Sigma approach leads to quality improvement, as well as improvement in the organization and management of the whole business process.

The results of the experiment prove that the Six Sigma approach is not only a quality management methodology, but a management approach too.

Market Indices and their Applications

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Abstract.

Market indices are very important variables that show market trends and changes. They are wide used by investors around the world like signals for potential investing. This paper contents overview of market indices, methods for their computing, and their applications.

We classify these indices according to method for their computation. In this way, we have two main groups of market indices: indices based on concept of average, or price pondered market indices and standard indices or value pondered market indices.

Further, we explain stock market indices used at United States of America

markets. The most known indices of these markets, DJA and S&P 500, will be fully explained.

Subject of this paper are, also, indices of fast-growing markets. In this group of indices, we describe ASX, KCSPI, WIG and CESI indices.

We give suggestions for indices on Belgrade stock market and their further application.

After computation different stock indices, we use them for two applications: first, for technical analysis of financial markets, and, second, for modeling the absolute returns of different stock indices and exploring the forecast ability of an alternative measure of risk.

***Objectives of Macroeconomics as the Basis for
Clustering of Countries in Integrated Europe***

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Abstract.

Today, at the beginning of the 21st century, all countries in Europe can be considered as the participants of the integrative process. Some countries are members from the beginning, some are joined later, there are countries that are waiting to join etc.

European Union in its economic, financial, technological, political and much other strength is leading power in the world. Every expansion of the European integration has brought new challenges, both to the countries in and out of the union, as well as to the performing functions of the Union itself. Motives for the institutional integration are numerous, but they can be sublimed in one: increase of prosperity in the countries of the Union.

Countries in Europe can be divided in many ways and on different bases. In this paper will be described and discussed classification, i.e. clustering, of European countries based on indicators of achieved objectives of macroeconomic.

Key objectives of macroeconomics are stable increase of national production scope, stable price level, high level of employment and equilibrium of trade balance. These are the categories that are used as the measure and estimation of macroeconomic performance for every national economy. In addition to mentioned objectives, foreign capital has important role in national economy development.

Parameters regarding objectives mentioned above for European countries will be analyzed and processed by the means of multivariate statistical analysis with the goal to cluster countries with similar macroeconomic national policies.

The clusters of countries based on objectives of macroeconomic will be discussed. These clusters will be analyzed to judge the role of economic flows in dynamics of integrative processes in Europe.

***Practical Aspects of Quality Assurance During
Complex Energy Projects Implementation***

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Abstract.

Many problems arise within the quality assurance process in case of complex energy project implementation, when many companies participate with different kinds of activities and services provided.

The scope of activities necessary for quality assurance is therefore quite expanded and diverse.

Due to the complexity of such projects, the Employer/Client is to develop specific procedures to regulate the activities of the major contractors, which have to produce quality deliverables to the Employer/Client.

Each Contractor has its own Quality assurance program, which conforms to the international and national standards. In addition, common quality and organizational procedures are to be developed between the Employer and the Contractors in order to cover common functions and operations.

The Contractors deliverables are to be made under their internal quality programs, and the respective quality plans are to be reviewed to ascertain that all quality steps have been verified and controlled by the authorized personnel. Contractors deviations to quality requirements are reflected in remarks to their deliverables prior to acceptance, and in case of persistent deviations, non-conformance reports are to be issued for corrective actions and avoidance of deviation recurrence.

This report describes different aspects of the quality assurance and management practical implementation according to the requirements of quality standards: ISO 9001:2000 and IAEA 50-C/SG-Q. Different activities application is included and described. Examples are given related to the definite quality improvement goals achievement in case of participation of big multinational and international companies.

Strategies for managing the convergence of Western European and Eastern European quality assurance frameworks are considered.

The feedback on the experience of application of these standards in multi-layered customer/supplier relationships is provided.

Practical experience accumulated at the implementation of Units 5&6 Modernization Program and lessons learned is used at the preparation of this report.

Suggestions and recommendations for improvement of the quality assurance activities during implementation of such projects are given in the report.

Problems to Predict Target Firms at the Undeveloped Capital Markets

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Abstract.

During the last decade, a significant growth of the global merger and acquisition (M&A) activity, has been observed. M&A transactions have been

intensified as the response of globalization, liberalization, increase in competition, regional economic integrations creation etc. The list of potential target is getting every day bigger and bigger, while M&A activity is directed more and more towards the target firms operating at the markets in transition. The potential target firm identification becomes the area of great research interest, both to business and academia.

Taking into account the characteristics of the undeveloped capital markets, it is often very difficult to predict and choose suitable target firms, i.e. to create appropriate prediction models for corporate M&A. The problem to predict target firm can be analysed as the problem of classification. Some of the techniques applied to these classification problem involve the use of either discriminant analysis or logistic regression.

Discriminant analysis is a statistical technique used to classify entities with unknown group membership, using some classification rule based on the attribute value of the entity. From the original list of variables, discriminant analysis attempts to derive a combination of these characteristics which 'best' discriminates between groups. Logistic regression analysis is based on a cumulative probability function, which requires neither a normality assumption nor equal covariance matrices, and is generally solved using the maximum likelihood method. The logistic model relates one or more predictor variable to a dependent variable, and it yields regression coefficients, predicted values, and residuals.

The relationship between the predictor and the predicted values is assumed to be non-linear. A possible improvement could arise via the use of Artificial Neural Networks (ANN), which, since their first applications to financial analysis, have produced some promising results.

This study focuses on the recent developments of neural networks with regards to the identification of potential takeover targets. ANN are compared with the traditional statistical techniques of discriminant analysis and logistic regression.

The aim is to identify takeover targets, in which case the sample will consist of firms which were taken over (assigned the value of 1) and a further matched set of firms which were not (assigned a value of 0). This limited dependent variable is modelled using discriminant analysis, logistic regression analysis and artificial neural networks. The problems associated to ANN application in target prediction at the undeveloped capital markets are numerous. There is an accurate data deficiency with respect to financial and business operations related to M&A. National Securities Commissions

possess only limited data bases. They could be both unreliable and insufficient for the construction of appropriate time series.

This paper analyses explanatory and predictive capabilities of the ANN and discuss various limitations and problems attached to ANN application in target prediction at the undeveloped capital markets.

System Dynamics in Management Problems Solving

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Abstract.

As a special, functionalist systems approach to management, System Dynamics (SD) is aimed to assist managers improve goal seeking through increasing the efficiency and efficacy of organizational processes and structures. Grounded in the control theory as well as in the theory of non-linear dynamics, SD is a systems methodology for better understanding and creatively modeling and simulation of complex systems.

The main ideas of the SD-theory are: The *variables* in a complex system are causally related in *feedback loops*; the interactions between feedback loops constitute the *structure* of the system; the system structure is the prime determinant of the system *behaviour*. In order to get an appropriate understanding of the system structure it is necessary to establish: the boundary of the system, the network of feedback loops, the 'rate' and 'level' variables and the 'leverage' points. Due to the complexity of the system structure and its *counterintuitive* behaviour, the system is represented in a *computer model* using one of the programming languages custom-built for SD. Through *simulation*, managers can experiment to estimate the impact of possible interventions.

The SD-methodology is derived from the theory of the approach: The *problem* is clarified; the *variables* of the problem are identified; a *feedback loop model*, that uncovers the relationships between variables, is constructed; this model has to be turned into a *mathematical model* that, through equations of rates and levels, captures the basic interactions in the system, and using custom-built software can be transformed into a *computer simulation*.

The model is validated by comparing its behaviour with real-world activity, and *experiments* are conducted on the model to see how alternative structures (strategies) can improve the system performance. *Recommendations* are made on how the situation might be changed in order to make it better.

SD has widely applied in *prediction* of trends and testing out *control* policies in all kinds of organizations.

SD can be criticized from different viewpoints: Its attempts to tackle problems of greater complexity have left SD open to the charge of having imperfect *scientific rigour*. On the other hand, SD fails to fully embrace *subjectivity* as a necessary part of any analysis of social systems.

Keywords: system structure, system behaviour, feedback loop model, equations of rates and levels, prediction and control.

The Aggregate Measures of State Agricultural Protection Policy

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Abstract.

International economic integration have strongly influenced the development of the world market and the economic increase in the world, connecting the world into an economic whole and strengthening political, cultural and other links among countries.

A necessary precondition for creation of the European Union is its common agrarian policy. In the Union today the highest degree of integration has been achieved in agriculture. This was achieved gradually, through constant efforts to overcome existing contradictions between member countries in that field. Forming of a uniform agrarian policy met with many difficulties. Not all countries are equally interested in the development and stimulation of agricultural production. The interest for a quicker development is larger in countries where agriculture employs a large number of inhabitants and is a remarkable source of foreign hard currency income. Different interest

arise from the differences in the level of agricultural work productivity, production costs level, prices of agricultural product, specific characteristics of socioeconomic processes and applied protective measures. The Union policy of prices, production and turnover is defined as agrarioan protectionism. Within the frame of integration, agricultural protection has from the start been used for realization of economic and political goals. Economic science has developed different methods for protection measuring. Due to above said, this paper attempts to present on the short way the most important implications of agricultural protection in European Union. Also, this paper offers a short review of several aggregate measures of state protection policy.

***The Algorithms for Constructing Efficient
Experimental Designs in Conjoint Analysis***

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Abstract.

Conjoint analysis is a technique for measuring consumer preferences for products or services and intentions for buying them. It is also a method for simulating consumers' possible reactions to changes in current products or newly introduced products into an existing competitive market.

One of the fundamental problems in performing Conjoint analysis is how to generate experimental designs. The purpose of an experimental design is to give a rough overall idea as to the shape of the experimental response surface, while only requiring a relatively small number of runs. These designs are expected to be orthogonal and balanced in an ideal case. In practice, though, it is hard to construct optimal plans and thus constructing of quite optimal and efficient designs is carried out.

There are several ways to quantify the relative efficiency of experimental

designs. The choice of measure will determine which types of experimental designs are favored as well as the algorithms for choosing efficient designs.

The purpose of this paper is to explain the term “experimental designs” as used in Conjoint analysis. The paper will present the basic criteria of the design efficiency and some algorithms which can be used for its construction. Special attention will be paid to the algorithm we developed and implemented in Visual Basic application as the procedure in MCON software. Results of comparing the algorithm performance with the performance of those implemented in SPSS will be also presented.

Keywords: Conjoint analysis, experimental design, orthogonality, criteria of efficiency, algorithms, MCON Software.

The Effects of Biodiversity Concerns on Economic Profits of Timber in Forest Management

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Abstract.

The changing demands of today require a widened scope of forest management. Society is asking for sustainable forestry emphasizing biodiversity. Maintaining, improving and also integrating biodiversity into forest management plans have been a challenging task over the last decade. Biodiversity can be decomposed into measurable characteristics of individual stands by diversity indicators. Some examples of the indicators are; mean volume of deciduous trees, mean volume of deadwood and proportion of Old Growth Forests (OGF). OGF, play an especially important role in maintaining biodiversity having large living and dead trees. Also high variability of tree sizes is an important diversity feature.

In forest ecosystems, there are tradeoffs between timber production and habitat for old growth dependent species. The purpose of this study is to estimate economic effects of ecological concerns on Net Present Values (NPV) of timber harvest in the Mustafa Kemal Pasha Planning Unit. To achieve this aim, distribution of age classes and the amount of the area of OGF is considered. A Linear Programming (LP) model were built maxi-

mizing the Net Present Value (NPV) of timber production and solved by a commercial LP solver.

The model built for a 100 year planning horizon generating equal age classes. Then OGF were increased % 5, 10 and 15 respectively and the effects of these differences on NPV were analyzed. The results show that, if the forests are managed for maintaining biodiversity, the NPV of the profits of timber production is considerably reduced. In this way it would be possible to measure the opportunity cost of biodiversity in terms of financial returns.

Keywords: Forest Planning, Biodiversity, Old Growth Forests, Net Present Value.

The Impact of Concession Projects on the Partnering Process of the Construction Industry in Greece

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Abstract.

“Partnering” is regarded as a strategic arrangement whereby a contractor is engaged in a series of projects with the aim to lowering costs and improving efficiency, or can be a short term single project agreement. In all cases, each partner is jointly anchored to project success, while the “partnering” process is linked to the project procurement procedure. There has been evidence that PFI/PPP projects have had an impact on the partnering process in the construction industry, while the entire supply chain management process has been revisited. Value for Money Drivers and partnering mechanisms are interlinked principally due to the fact that concession contracts create the environment for longer relationships, while the output specification nature of the granted projects surfaces the need to manage and control the supply chain.

The paper presents the results of a questionnaire survey targeting Greek contractors’ opinion on partnering and supply chain collaboration and management in view of new concession schemes to be undertaken in Greece. The results are compared to their conception of Money for Value concern-

ing their participation in PFI/PPPs. The research findings reported add to other surveys carried out on the subject and should enable contractors to implement successful partnering and supply chain management and public sector clients to evaluate the possibility of successful tenderers vis-à-vis successful projects.

Keywords: PFI/PPP, partnering, supply chain management.

Toward Integration of Operations Management

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Abstract.

Modern operations systems are focused on achieving integration of their business applications and networks. Simultaneously, they decentralize their organizational structure.

This paper considers current trends in operations systems management. In the paper the advantages of integrated over traditional operations management system have been analysed. Most operations systems have a mix of new and old hardware and software. Generally, they use different management and business concepts. As the tool to provide data interoperability and data sharing between different platforms involved in integrated operations system, logistics system CALS ("Commerce At Light Speed") has been presented. CALS is a global strategy and an electronic environment to enterprise integration through streamlining the business process and applying the standards for the creation, exchange and use of business and technical information. In that sense CALS allows integration of enterprises on a worldwide basis facilitating electronic commerce. The paper helps to prepare the students to be more effective operations managers as well as more effective information technology users in a highly dynamic e-world. The design of product-service bundle and the role of Logistic Support Analysis in a concurrent engineering procedure have been analysed, too.

Keywords: Integrated Operations Management, product-service bundle, interoperability, Commerce At Light Speed.

***Two-stage Dea for Assesing Efficiency and
Effectiveness of Micro-loan Programme***

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Abstract.

In this paper we will show that DEA methods can be applied for measuring efficiency and effectiveness at the same time. According the new management approaches, outputs, as first and most immediate results of project can be stated using number, are clearly distinguished from outcomes, which flow from outputs and could bring the changes to organizations, families, etc. In that context, necessity for measuring effectiveness is arisen.

In this paper DEA is applied on evaluation of micro-loan programme realization in 18 municipalities. Micro-loan programme is established to help poor and on that way to help society in reducing poverty and unemployment. Micro-loan organization choose refugees and internally-displaced people, who have already been running or planning to start their own small business, as target group. Following mentioned objectives, we found that DEA methods could be very useful for assessing efficiency and effectiveness scores and municipalities ranking.

Efficiency assessment is based on exact number of clients, active clients, potential clients and the other data related with municipality under the evaluation. The efficiency assessment for the same municipality is based on data obtained by impact evaluation of micro-loan program and consists of client opinion if their life conditions are improved or not after using the loan. DEA could also be used in purpose to identify source of micro-loan programme realization inefficiency or ineffectiveness and the results of the analysis is very important for developing new loan products more suitable for target group of clients.

Keywords: efficiency, effectiveness, micro-loan, DEA

***Using Futures and Options in Equity Portfolio
Management***

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Abstract.

Futures and options can affect the risk and return distribution for a portfolio. Equity portfolio return profiles can be modified by use of futures and options. It is possible to trade futures contracts on major indexes, as well as acquire options on stock market indexes, on selected industry groups, and on individual stocks. These derivative securities can assist portfolio manager in shifting a portfolio's exposure to systematic and unsystematic risk.

The aim of this paper is to show how the futures can be used to hedge against portfolio cash inflows and outflows; to keep a passive portfolio fully invested and help minimize tracking error; and to change an actively managed portfolio's beta. Alternatively, options can be used to modify a portfolio's unsystematic risk. Finally, futures and options can be used in managing currency exposures in international equity portfolios.

Keywords: futures, options, portfolio, management.

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