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Hommage à la mémoire de l'académicien Tiberiu Popoviciu au centenaire de sa naissance 1906-1975-2006

Elena Popoviciu
(Cluj-Napoca)

Le 16 févriere 2006 il y a en 100 ans depuis la naissance de l'académicien Tiberiu Popoviciu. Les disciples et les collaborateurs vont rendre hommage à la mmoire de leur grand maître entre le 25 et le 29 octobre 2006, en organisant une Session Scientifique.

Je vais évoquer dans les lignes á suivre quelques moments de la vie du savant, une vie remplie parfois de grandes satisfactions et réussites dans la suite de certains objectifs á atteindre.

Pourtant les défaites et les déceptions n'ont pas fait défaut. On peut dire que dés le debut de son activité de mathématicien, du temps qu'il était encore élève, Tiberiu Popoviciu, a été un combattant, il a suivi avec pérséverence ses objectifs et il n'a jamais arrêté de croire à ses idéaux. (Je propose à tous ceux qui vont lire ce texte de se pencher un moment

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The Application of Two-Dimensional Torus in the Transmission of Information

Mariana Bujac
(Chişinău)

Abstract. In the previous papers [2], [3] we used the notion of complex of multi-ary relations to define the notion of abstract multidimensional and without borders manifolds, which can be oriented or nonoriented. Also it was introduced some important proprieties: the classification of manifolds by their genus, the generalization of multidimensional directed Euler tour/Euler tour of manifolds, the notion of abstract multidimensional cube, abstract cubic manifold, cartesian product of elements of binary relations. All this notions and proprieties mentioned above help us to generalize in this paper the classical Posthumus' problem [1]. We do this generalization for the compact representation of information for one or more circular channels of binary sequences.

Key Words: Posthumus' problem, abstract torus, abstract cube, directed Euler tour, torus with channels

MSC 2000: 18F15, 32Q60, 32C10

1 Posthumus' problem (1946) and Directed Euler tour of a graph.

Let's consider a rotating drum. The position of a drum is to be recognized by means of binary signals produced at a number of electrical

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An Algorithm for Determination of the Median Independent on the Metric of the Space

Sergiu Cataranciuc
(Chişinău)

Abstract. It is defined the 1-dimensional skeleton of an abstract cubic complex. It is examined abstract cubic complexes which 1-dimensional skeleton is a special class of metric graphs. For this class of the graphs it is elaborated an efficient algorithm for determination the median independent on the metric. At the same time, it is indicated a new method of realization of the graphs from this class on the multidimensional cube.

Key Words: Abstract cubic complex, graph, median, metric space.
MSC 2000: 18F15, 32Q60, 32C10

The following results represent a sequence of syllogisms with the origin in the G – complex of multi-ary relations K^n [1], [2], which is defined on the finite set of distinct elements $X = \{x_1, x_2, \ldots, x_n\}$ as the following.

Let $X^1 = X$, X^2, …, X^{n+1} be a sequence of cartesian products of the set X and $R^1 \subset X^1$, $R^2 \subset X^2$, …, $R^{n+1} \subset X^{n+1}$ – nonempty subsets of the set mentioned above which determine a G – complex of multi-ary relations. The elements of the subset $R^m \subset X^m$, $1 \leq m \leq \leq n+1$, are some sequence in given order relation, which consist of elements from the set X.

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A Sufficient Condition for Saddle Points

Dorel I. Duca (Cluj-Napoca)
Liana Lupşa (Cluj-Napoca)

Abstract. A sufficient condition for a point to be a weak saddle point of a vector valued function (i.e., to be a solution of the vector saddle point problem) is given.

Key Words: Convex function, vector-valued function, weak saddle point, vector saddle point problem, vector variational inequality.

MSC 2000: Primary 90C29. Secondary 52A41, 52A07, 52A30.

1 Introduction

Studies on saddle points of scalar functions have been extended to studies of saddle points, with respect to a cone, of vector valued functions; see, for example, [1], [8], [10], [11], [12], [13]. Necessary and sufficient conditions for cone saddle points have been given in more papers; see, for example, [8], [11], [12]. Existence results for cone saddle points are based on some fixed points theorems or scalar minimax theorems; see, for example [13]. Recently, these problems are solved by a different approach; they are reduced to vector variational inequality problems. In [9], the reduction of the vector saddle point problem to a vector variational inequality problem is treated in a finite dimensional vector space.

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Averages of Convex Functions

Ioan Gavrea
(Cluj-Napoca)

Abstract. Using a result of Tiberiu Popoviciu we generalize a result obtained by G. Bennett and G. Jameson in [1].

Key Words: Convex functions, monotonic averages, divided differences.

MSC 2000: 41A60

1 Introduction

Let S be a subspace of $C(I)$, where I is an interval of the real axis. In what follows we suppose that the elements of S are sufficiently smooth such that the functionals which appear to be well defined.

Let A be a linear functional of the following form:

$$A(f) = \sum_{i=1}^{p} \sum_{j=0}^{k_i-1} a_{i,j} f^{(j)}(z_i), \tag{1.1}$$

where $p, k_1, k_2, \ldots, k_p$ are given natural numbers, z_i, $i = 1, 2, \ldots, p$ are p distinct points from the interval I.

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Some Properties of the Generalized Divided Differences

Mircea Ivan
(Cluj-Napoca)

Abstract. We present some properties of generalized interpolation operators and associated generalized divided differences.

Key Words: Divided difference, generalized interpolation operator.
MSC 2000: 41A05.

1 Generalized Divided Differences

Let n be an integer, $n > 1$. We use the notations: $e_i(x) := x^i$, $i = 0, \ldots, n$; $\mathbb{K} = \mathbb{R}$ or $\mathbb{K} = \mathbb{C}$, depending of the contest; I, a non-void interval of the real axis; $\{f_0, \ldots, f_n\} \subset \mathbb{K}^I$, a set of functions; $\{x_0, \ldots, x_n\} \subset I$, a set of distinct points. Define:

$$V\begin{pmatrix} f_0 & \ldots & f_n \\ x_0 & \ldots & x_n \end{pmatrix} := \begin{vmatrix} f_0(x_0) & \ldots & f_n(x_0) \\ \vdots & \ddots & \vdots \\ f_0(x_n) & \ldots & f_n(x_n) \end{vmatrix}. \tag{1.1}$$

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Testing the Goodness - of - Fit of a Bivariate Copula

Edith Kovács
(Budapest)

Abstract. In financial applications empirical evidence has proved the inadequacy of the multinormal distribution. The Copulas are flexible instruments used to build efficient algorithms for a better simulation of the joint distribution [2] and are able to make a good description of the dependence between the random variables [3].

The aim of this paper is describing a statistical procedure which tests the goodness of fitting of a copula to the empirical data. The procedure described here is based on the connection of a bivariate copula with a bivariate joint distribution and the testing of such a distribution by the χ^2 test.

Key Words: Bivariate joint distribution, marginal distribution function, copula function, χ^2 test.

MSC 2000: 62H15.

1. The bivariate copula

We denote $I = [0, 1]$.

Definition 1.1. The bivariate copula is a function $C : I^2 \to I$, with the following properties:

a) $\forall\ u, v \in I, \quad C(u, 0) = C(0, v) = 0$

b) $\forall\ u, v \in I, \quad C(u, 1) = u, \quad C(1, v) = v$

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Patterns in Information Extraction: A Comparison of Two Approaches

Dana Avram Lupşa
(Cluj-Napoca)

Abstract. Many of the automatic lexical acquisition systems benefit from the semantic relatedness among words in enumerations. This paper presents a study on the differences between approaches.

1 Introduction

The growth of available digital resources determined a growth in corpus-based methods used to extract lexical information. Some methods use patterns to identify semantic relations among words. Other methods are based on word co-occurrences and evaluate semantic similarity score.

In order to extract lexical information, Hearst [5] introduced some lexico-syntactic enumeration patterns for acquisition of hyponymic relations. The most known of them is:

NP_1 , NP_2 , . . . , NP_{n-1} ***or/and other*** NP_n

where NP stands for *Noun Phrase*. It has the semantics: NP_i (i = 1 , . . . , n-1) is a kind of NP_n (NP_n is a hypernym of NP_i). Following the work

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On Morphological Operators and Applications

Radu-Lucian Lupşa
(Cluj-Napoca)

Abstract. Morphological transforms are an important tool in image processing. They are somewhat complementary to the liniary transforms: gaussian filter and Fourier or wavelets transforms.

In this paper we will show that the representation of a function by its levelsets and the possibility to apply morphological operations on the levelsets reproduce, to some extent, the above constructions linked to wavelets.

1 Introduction

Morphological transforms are an important tool in image processing. They are somewhat complementary to the liniary transforms: gaussian filter and Fourier or wavelets transforms.

Wavelet transforms earned an important place in image processing due to two important features: they can decompose an image into simpler elements, so that we can construct operators that act independently on each such element, and they can be used for producing a series of simpler, "coarser" images, useful for a top-down analysis of the image.

In this paper we will show that the representation of a function by its levelsets and the possibility to apply morphological operations on the

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Strong Roughly $\rho - d$-convex Functions

Daniela Marian
(Cluj-Napoca)

Abstract. In this paper we define and study strong roughly d-convex functions.

1 Preliminary notions and results

We consider a normed linear space $(X, \|\cdot\|)$. This become a metric space with the metric

$$d(\cdot,\cdot) : X \times X \to R, d(x,y) = \|x - y\| \tag{1.1}$$

We consider the points $x, y \in X$. We denote

$$[x,y] = \{z \in X \mid z = \alpha x + (1-\alpha)\, y, \alpha \in [0,1]\}, \tag{1.2}$$

and

$$\langle x,y\rangle = \{z \in X \mid d\,(x,z) + d\,(z,y) = d\,(x,y)\}. \tag{1.3}$$

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Fractal Operators for Mixed Iterated Function System

Ghiocel Moţ (Arad) Adrian Petruşel (Cluj-Napoca)

Abstract. Let (X,d) be a metric space, $P_{cp}(X)$ be the space of all nonempty compact subsets of X and $f_i : X \to X$ for $i \in \{1,2,...,m\}$ be continuous operators. Then the fractal operator generated by the iterated function system $f = (f_1, f_2, ..., f_m)$ is defined by $T_f : P_{cp}(X) \to P_{cp}(X)$, $T_f(Y) := \bigcup_{i=1}^{m} f_i(Y)$. Similarly, if $F_i : X \to P_{cp}(X)$ are upper semicontinuous multivalued operators, for $i \in \{1,2,...,m\}$, then the multi-fractal operator generated by the iterated multifunction syastem $F = (F_1, F_2, ..., F_m)$ is denoted by $T_F : P_{cp}(X) \to P_{cp}(X)$ and defined by $T_F(Y) := \bigcup_{i=1}^{m} F_i(Y)$.

The purpose of this paper is to present some fixed point results for the (multi-)fractal operator.

Key Words: Multivalued operator, fixed point, self-similar set.

MSC 2000: 47H10, 54H25.

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Almost Explicitly Quasiconvex Bicriteria Optimization

Nicolae Popovici
(Cluj-Napoca)

Abstract. The aim of this paper is to study the contractibility of the efficient outcome set for bicriteria minimization problems having almost explicitly quasiconvex objective functions, which are continuous on a nonempty compact convex feasible set.

Key Words: generalized convexity, bicriteria optimization

MSC 2000: 26B25, 90C29

1 Preliminaries

Throughout this paper X will be a topological linear space over the field $\mathbb{R}$ of real numbers. Recall that a real-valued function $f : D \to \mathbb{R}$ defined on a nonempty convex subset D of X is called *quasiconvex* if

$$f((1-t)x^1 + tx^2) \leq \max\{f(x^1), f(x^2)\}$$

for all $x^1, x^2 \in D$ and $t \in]0,1[$, which means that for every $y \in \mathbb{R}$, the *lower level set* $\{x \in D : f(x) \leq y\}$ is convex. A function $f : D \to \mathbb{R}$ is

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The Nonlinear Heat Equation via Fixed Point Principles

Radu Precup
(Cluj-Napoca)

Abstract. Starting with the existence and uniqueness result of J.L. Lions for the non-homogenous heat equation with the source term in $H^{-1}(\Omega)$, we present existence results for the nonlinear perturbed heat equation via Banach, Schauder and Leray-Schauder principles.

Key Words: Parabolic equation, Nonlinear operator, Sobolev space.
MSC 2000: 35K60, 47J35

1 Introduction. The non-homogenous heat equation in $H^{-1}(\Omega)$

We start with an existence and uniqueness result of J.L. Lions (see [4] and [3]) for the non-homogenous heat equation with the source term in $H^{-1}(\Omega)$. We include a proof adapted from Temam [9] for completeness.

Theorem 1.1 ([4]) *If $f \in L^2\left(0,T;H^{-1}(\Omega)\right)$ and $g_0 \in L^2(\Omega)$, then there exists a unique function u such that*
(1.1)
$$u \in L^2\left(0,T;H_0^1(\Omega)\right) \cap C\left([0,T];L^2(\Omega)\right), \quad u' \in L^2\left(0,T;H^{-1}(\Omega)\right)$$

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Some Inequalities Deduced from Convexity

Ioan Rasa
(Cluj-Napoca)

Abstract. We use inequalities satisfied by functions with $f^{(3)} \geq 0$, respectively $f^{(2)} \leq 0$ in order to deduce some inequalities for means in two arguments.

Key Words: Convex function, inequalities, means.

MSC 2000: 26D15

1 Introduction

Let p_i be positive real numbers, $i = 0, 1, \ldots, n$. Let $x_i, y_i \in [a, b]$, $y_i = x_i + t,\ i = 0, 1, \ldots, n;\ t \geq 0$.

The following result is well-known.

Theorem 1.1 *a) If $f \in C^2[a, b]$ and $f^{(2)} \leq 0$, then*

$$\frac{\sum_{i=0}^{n} p_i f(x_i)}{\sum_{i=0}^{n} p_i} - f\left(\frac{\sum_{i=0}^{n} p_i x_i}{\sum_{i=0}^{n} p_i}\right) \leq 0. \tag{1.1}$$

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The Robust Fractional Spanning Tree Problem with Interval Data

Stefan Tigan (Cluj-Napoca) Eugenia Iacob (Enschede) I. M. Stancu-Minasian (Bucuresti)

Abstract. The purpose of this paper is to investigate the minimum fractional spanning tree problem where edges costs are interval numbers. We propose a parametrical algorithm in order to find an absolute robust fractional spanning tree.

Key Words: Uncertainty, absolute robust spanning tree, fractional optimization, interval data.

1 Introduction

The spanning tree problem is a combinatorial problem and has been investigated by many authors (e.g. [1], [2], [5], [6], [7], [8], [9], [13], [22], [24]).

Recently, Katagiri et all.. [7] considered a bottleneck spanning tree problem with fuzzy random edge costs and formulated the problem as a chance constrained programming using the concepts of possibility and necessity measures. Aron and Van Hentenryek [2] prove that the special case of the robust spanning tree problem with interval data (RSTID)

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De l'Académie des Sciences de Roumanie à l'Académie Roumaine

Elvira Botez
(Cluj-Napoca)

Pour mieux évoquer la mémoire du mathématicien **Tiberiu Popoviciu** à l'occasion de 100 ans depuis sa naissance, nous apportons ici une modeste contribution à sa biographie, liée à ces deux institutions qui figurent en titre de notre exposé. Nous y ferons d'ailleurs référence moins à l'Académie Roumaine - institution bien connue, qui a fêté cette année 140 ans depuis sa création - qu'à l'Académie des Sciences de Roumanie, institution éphémère, avec une existence qui a à peine dépassé une décennie et qui reste ignorée par la littérature de spécialité. Nous nous y arrêterons sur la naissance de cette dernière institution, sur son organisation et les activités qui s'organisaient dans ses cadres.

Le dernier quart du XIX-ème siècle, le commencement d'une époque de recherche scientifique dans notre pays s'est produit dans le cadre des activités de l'enseignement supérieur. Son développement après 1900, et surtout après la réalisation de l'unité nationale, a donné un aspect nouveau à la culture supérieure en Roumanie. La création scientifique s'est intensifiée dans tous les domaines. Ce fait est rendu évident par le grand nombre des sociétés scientifiques (33) et des participants (~ 500) au Congrès de l'**Association Roumaine pour l'Avancement des**

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Protein Folding Problem: Empirical Potential Energy Functions

Stefan Hobai
(Tg. Mureş)

Victor Balogh-Sămărghiţan
(Tg. Mureş)

Zita Fazakas
(Tg. Mureş)

1 Introduction

There are approximately 100,000 different types of proteins in the human body engaged in promoting or controlling of cell life. Recently we have become familiar with forms that these molecules adopt to attain their 3D functional states. We have begun to learn the manner in which these structure are attained through the complex process of protein folding. It is also becoming evident that biological systems have evolved procedures to ensure that proteins fold correctly in order to prevent non-native folded proteins. These events are supervised by other proteins, so called chaperons [Avram-Nitchi2005]. Despite this control, a range of human diseases is associated with protein misfolding events that result in the malfunctioning of the cells.

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On mathematical modelling of protein folding

Stefan Hobai
(Tg. Mureş)

The *protein folding problem* can be definite as the task of understanding and predicting how the sequence of a protein determines the 3-dimensional structure of it. This problem is one of the most important questions in current biochemistry, a source of interesting problems in mathematical modeling and numerical analysis.

1 Spatial Arrangement of Protein's Atoms

The disposition of the atoms of protein molecules can be treated mathematically by assigning to the ith atom a 3-dimensional *coordinate vector*

$$x_i = \begin{pmatrix} x_{i1} \\ x_{i2} \\ x_{i3} \end{pmatrix} \tag{1.1}$$

If two atoms (Figure 1) with assigned j and k are joined by a chemical bond, the corresponding *bond vector* is:

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Precocious Evolution of Acute Pancreatitis: Intra-abdominal Complications

Mihaela Leşe (Baia Mare) S. Nemes (Baia Mare) Stefan Tigan (Cluj-Napoca)

Abstract. Introduction. The precocious events in the acute pancreatitis are decisive for the prognostic and the evolution of the disease.

Material and method. A number of 33 patients suffering from severe acute pancreatitis (SAP) have been observed, for which the intra-abdominal complications appeared in the first 14 days of the evolution of the disease have been studied: pancreatic necrosis, areas of exudates, acute fluid collections and the pancreatic ascites, and the highest value of the intra-abdominal pressure has been recorded, as well as the presence of the organ insufficiencies. These changes have been compared with one another but also with other parameters: age, gender, etiology, Balthazar score, Simplified Acute Physiologic Score SAPS) II, the occurrence of pancreatic infection, the presence of the abdominal compartment syndrome (ACS), the number of hospitalization days and the decease rate.

Results. None of the precocious intra-abdominal modifications varies significantly with mortality, which, on the other hand is very well correlated with the organ insufficiencies (p=0,00001).

Conclusions. The occurrence of organ insufficiencies is an indication of surgical intervention only when it is associated with the increase of the intra-abdominal pressure.

Key Words: Severe acute pancreatitis, intra-abdominal complications, organ insufficiency.

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The Multi, Inter and Transdisciplinarity of the Collaborative Systems

Ştefan Ioan Niţchi
(Cluj-Napoca)

Rodica Avram-Niţchi
(Cluj-Napoca)

1 Multidisciplinary, Interdisciplinary and the Transdisciplinary Approaches

Many authors consider that the terms "*multidisciplinary*" and the "*interdisciplinary*" are similar the differences being imposed by the usage. In this respect it is considered [Wikipedia2006] "The use of the term 'multidisciplinary' has in recent years been overtaken by the term 'interdisciplinary' (a Google ratio of 86:214 in mid-August 2006) for what is essentially holistic working by another name. The former term tends to relate to practitioner led working while the later term tends to carry a more academic overtone".

Multidisciplinary or *Pluridisciplinary* means [Wikipedia2006] "Drawing appropriately from multiple disciplines (such as sociology, geography, planning, engineering, architecture and design, economics, public health, cybernetics, statistics, systems thinking etc.) to define and apply new ways of understanding complex situations".

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The Teaching and Educational System at the Beginning of the Third Millenium

Cornelia Rada (Bucharest)
Cristiana Glavce (Bucharest)

The *educability*, the human capability to pedagogical develops in a progressive, permanent and continuous manner as a result of interdependence between heredity (general, for the entire human species and special, for each human personality), environment and education, is the aspect, which marks the difference between the human kind and the other species. The social environment in our current society became a real "educational fortress"; this is why the quality of the provided environment became an essential element, especially taking into consideration the affirmation of Golu P., who said that "the environment extends itself into education and becomes one with it" (6,7).

Cristea S. and Constantinescu C. provide us two relevant definitions of these two concepts in order to avoid any current confusion between "education" and "teaching". *The educational system* is "the entirety of the social and economical, political and cultural organizations/institutions and also, of the human communities, included family, people, nation; professional and ethnic groups: villages, towns, districts and communities, which fulfill directly or indirectly, explicitly and implicitly pedagogical functions of action and influence on the human personality's process of formation and development. *The teaching system*,

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Delay Measuring in Survival Analysis

Nicolae Todor
(Cluj-Napoca)

Abstract. It is analyzed the impact by which the presence or absence of a prognostic factor delays the death or the recurrence of illness. We shift the observations of a group of data to left or right till we find the log rank test minimal value. The length of shift is the searched delay. Supplementary a confidence interval is suggested. The method was used in evaluation of treatment results for breast cancer registered at Oncological Institute "Ion Chiricuta", Romania in 1995-1996. A Mathematica program used in ellaboration of the examples is annexed.

Key Words: Survival analysis, logrank test, delay of death, breast cancer, Mathematica program.
MSC 2000: 62N02, 62N03.

1 Introduction

In most survival studies, to compare two set of patients means the use of logrank test [Butenko2003, Chambert2004, Graham&Jones1988] with p of significance and the report of survival at a predefinite time at a "round value" of 5 or 10 years. Rarely are reported the medians when the report of survival it is not relevant or as a result of short follow-up or a particular distribution of data.

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