

### A new predictor-corrector algorithm for SDP with polynomial convergence

Feixiang Chen, Yuming Feng

We establish the polynomiality of primal-dual interior-point algorithms for SDP based on the direction of the M-Z family of search directions. We show that the polynomial iteration-complexity bounds of the well known algorithms for linear programming, namely, the predictor-corrector algorithm, carry over to the context of SDP. (pp. 7-14)

### Pseudo-D-lattices and topologies generated by measures

Anna Avallone, Paolo Vitolo

We prove that every modular measure on a pseudo-D-lattice  $L$  generates on  $L$  a lattice uniformity which makes uniformly continuous the pseudo-D-lattice operations. As an application, we obtain a uniqueness theorem for modular measures on pseudo D-lattices. (pp. 25-42)

### On injectivity of projection and separated projection algebras

M.M. Ebrahimi, M. Mahmoudi

Projection spaces (algebras) were first introduced by Ehrig et. al. as an algebraic version of ultrametric spaces, and then studied by Giuli, Ebrahimi, Mahmoudi. Computer scientists use projection algebras for algebraic specification of process algebras. A kind of *injectivity* of separated projection algebras have been studied by Giuli. In this paper, we extend this notion to all projection algebras, and introduce some other kind of injectivity, so called  $m$  and  $p$ -injectivity, and show, among other things, that injectivity,  $s$ -injectivity, and  $m$ -injectivity coincide, and so we get some more Baer criteria for injectivity. (pp. 43-54)

### Quasi-permutation representations of some minimal non-abelian $q$ -groups

Mohammad Hassan Abbaspour, Houshang Behravesht

In [1],  $c(G)$ ,  $q(G)$  and  $p(G)$  are defined for a finite group  $G$ . In this paper, we will calculate  $c(G)$ ,  $q(G)$  and  $p(G)$  for the following minimal non abelian  $p$ -groups:

$$G = \langle a, b \mid a^{p^m} = b^p = c^p = 1, [a, b] = c, [a, c] = [b, c] = 1 \rangle,$$

and will show that

$$c(G) = q(G) = p(G) = pc(Z(G)) = p^m + p^2.$$

(pp. 55-62)

## An analytical solution of fluid flow through narrowing systems

A.D. Patel, I.A. Salehbhai, J. Banerjee, V.K. Katiyar, A.K. Shukla

Narrowing of pipeline network is an important aspect in drinking water distribution systems, sewage system and in oil-well techniques. In the proposed problem, a flow equation in simple pipeline network has been studied to solve the velocity flow. The deposition causing narrowing has been replaced by using sinusoidal model with axial velocity. In this paper, we used MAPLE 11.02 for plotting the graphs. (pp. 63-70)

## On generalized Hilbert algebras

R.A. Borzooei, J. Shohani

In this paper by considering the notion of generalized Hilbert algebra which is named g-Hilbert algebra, we obtain some properties of it. Moreover, we show that for all  $n \geq 3$  there exist at least one proper g-Hilbert algebra of order  $n$ . Because g-Hilbert algebra is not a Boolean algebra we define the concept of branch in g-Hilbert algebras and we prove that any branch in commutative g-Hilbert algebras is a Boolean algebra. (pp. 71-86)

## $m^{\text{th}}$ Power symmetric $n$ -sigraphs

R. Rangarajan, P. Siva Kota Reddy, N.D. Soner

An  $n$ -tuple  $(a_1, a_2, \dots, a_n)$  is *symmetric*, if  $a_k = a_{n-k+1}$ ,  $1 \leq k \leq n$ . A *symmetric  $n$ -sigraph* (*symmetric  $n$ -marked graph*) is an ordered pair  $S_n = (G, \sigma)$  ( $S_n = (G, \mu)$ ), where  $G = (V, E)$  is a graph called the *underlying graph* of  $S_n$  and  $\sigma : E \rightarrow H_n$  ( $\mu : V \rightarrow H_n$ ) is a function. The  $m^{\text{th}}$  *power graph* of a graph  $G = (V, E)$  is a graph  $G^m = (V, E')$ , with same vertex set as  $G$ , and has two vertices  $u$  and  $v$  are adjacent if their distance in  $G$  is  $m$  or less. Analogously, one can define the  $m^{\text{th}}$  *power symmetric  $n$ -sigraph*  $S_n^m$  of a symmetric  $n$ -sigraph  $S_n = (G, \sigma)$  as a symmetric  $n$ -sigraph,  $S_n^m = (G^m, \sigma')$ , where  $G^m$  is the underlying graph of  $S_n^m$ , and for any edge  $e = uv$  in  $S_n^m$ ,  $\sigma'(e) = \mu(u)\mu(v)$ , where for any  $v \in V$ ,  $\mu(v) = \prod_{u \in N(v)} \sigma(uv)$ . It is shown that for any symmetric  $n$ -sigraph  $S_n$ ,

its  $m^{\text{th}}$  power symmetric  $n$ -sigraph  $S_n^m$  is  $i$ -balanced. We then give structural characterization of  $m^{\text{th}}$  power symmetric  $n$ -sigraphs. Further, we obtain some switching equivalence relationship between  $m^{\text{th}}$  power symmetric  $n$ -sigraph and line symmetric  $n$ -sigraph. (pp. 87-92)

## Common fixed point theorems for finite number of mappings without continuity and compatibility on uniformly convex Banach space

Sushil Sharma, Alok Pande, Chetna Kothari

The purpose of this paper is to prove some common fixed point theorems for finite number of discontinuous, noncompatible mappings on noncomplete uniformly convex Banach space. Our results extend, generalize several known results of fixed point theory in different spaces. We give an example and also give formulas for total number of commutativity conditions for finite number of mappings. (pp.93-108)

## **Error locating codes dealing with repeated burst errors**

Bal Kishan Dass, Ritu Arora

This paper obtains bound for linear codes which are capable to detect and locate errors which occur during the process of transmission. The kind of errors considered are known as repeated burst errors of length  $b$ (fixed) introduced by Dass and Garg [10] which has its seeds in the work carried out by Srinivas et al. [15] in connection with models of stroke-induced epilepsy which is an area of mathematical biology. An illustration for such kind of codes has also been provided. (pp. 109-118)

## **$\mathcal{M}$ -injectivity in the category Act-S**

Leila Shahbaz

Injectivity is one of the central notions in many branches of mathematics. Different kinds of injectivity with respect to the class of all monomorphisms and with respect to some special subclasses of monomorphisms in the category **Act-S** of acts over a semigroup  $S$  have been studied before. In this paper, we take the category **Act-S** of acts over a semigroup  $S$ , and  $\mathcal{M}$  as an arbitrary subclass of monomorphisms, and study some kinds of injectivity with respect to  $\mathcal{M}$ . Also, the behaviour of these notions of injectivity with respect to products, coproducts, and direct sums is studied. As a result we give some characterizations of semigroups. (pp. 119-134)

## **On Köthe-Toeplitz duals of some new and generalized difference sequence spaces**

A.A. Ansari, V.K. Chaudhry

In this paper we define the sequence spaces  $\Delta_{v,r}^m(l_\infty)$ ,  $\Delta_{v,r}^m(c)$  and  $\Delta_{v,r}^m(c_0)$ , ( $m \in N$ ,  $r \in R$ ), and have studied some of their topological properties and have computed their Köthe-Toeplitz duals. (pp. 135-148)

## **Fuzzy hypervector spaces (redefined)**

R. Ameri, M. Motameni

In this paper, we introduce and analyze a new type of fuzzy hypervector spaces, as a generalization of fuzzy vector spaces. In this regards, we investigate the basic properties of fuzzy hyper vector spaces and obtain some related results. (pp. 149-162)

## **Sur les algèbres de lie d'un système de champs de vecteurs permutables**

H.S.G. Ravelonirina, P. Randriambololondrantomalala, M. Anona

Let be  $M$  a  $C^\infty$ -differentiable manifold and  $S$  a system of  $q$   $C^\infty$ -vector fields which commute mutually. This system defines a generalized foliation  $\mathcal{F}$  on  $M$ . The Lie algebra  $A_S$  of vector fields in  $M$  which commute with  $S$  is both a module over the ring of  $C^\infty$ -functions that are constant on the leaves of  $\mathcal{F}$  and a sub-Lie algebra of the foliation preserving vector fields. We determine all derivations of the Lie algebra  $A_S$ . (pp. 163-174)

## **C-essentialness and well-behavedness of C-injectivity in Act-S**

Leila Shahbaz

An important notion related to injectivity with respect to monomorphisms or any other class  $\mathcal{M}$  of morphisms in a category  $\mathcal{A}$  is essentialness. In this paper, taking  $\mathcal{A}$  to be the category of right acts over a semigroup  $S$ ,  $C$  to be an arbitrary closure operator in the category **Act-S**, and  $\mathcal{M}_d$  to be the class of  $C$ -dense monomorphisms resulting from a closure operator  $C$ , we study the properties of  $\mathcal{M}_d$ -essential monomorphisms and we show the existence of a maximal  $\mathcal{M}_d$ -essential extension for any given act. Finally, the behavior of  $\mathcal{M}_d$ -injectivity in the sense that the three so called Well-behavedness propositions hold is studied. We show that the idempotency and weak hereditariness of a closure operator  $C$  are sufficient, but not necessary, conditions for the well-behavedness of  $\mathcal{M}_d$ -injectivity. The class of sequentially dense monomorphisms resulting from a special closure operator (sequential closure operator) and injectivity with respect to this class of monomorphisms have been studied by Giuli, Ebrahimi, Mahmoudi, Moghaddasi, and the author. Some of these results generalize some of the results about the class of sequentially dense monomorphisms. (pp. 175-186)

## **Numbers in the $n$ dimensional space**

Nicola D'Alfonso

This paper introduces the numbers in the  $n$  dimensional space. Namely, if in the first dimension we have the real numbers and in the second the complex numbers, in the next dimensions we have the complete numbers introduced here.

(pp. 187-300)

## **A radical property of hyperrings**

A. Asokkumar, M. Velrajan

In this paper we prove that Von Neumann regularity is a radical property on hyperrings.

(pp. 301-308)

## **Multi-objective decision making based on fuzzy events and their coherent (fuzzy) measures**

Antonio Maturo

We propose a reformulation of the problem of making a decision with multiple objectives in terms of fuzzy scores and their consistent defuzzification, with respect to the logical point of view taken into account. The objectives are seen as subsets (or events) of a universal set  $U$  and the degree to which an alternative  $A_i$  satisfies the objective  $O_j$  is a conditional fuzzy event  $A_i|O_j$ , represented by a fuzzy set  $\varphi_{ij}$  defined on a partition  $\pi_{ij}$  of  $O_j$ . The elements of  $\pi_{ij}$  are the particular aspects of the objective  $O_j$  considered by  $A_i$ ; the value assumed by an element  $x \in \pi_{ij}$  is the extent to which  $A_i$  satisfies that particular aspect. Using an appropriate procedure of defuzzification fuzzy scores of alternatives with respect to the objectives are transformed into numerical scores belonging to the interval  $[0, 1]$ . We study the conditions of consistency of defuzzified scores taking into account the logical relations among the objectives and the alternatives. Finally, we develop criteria for the aggregation of scores of each alternative. (pp. 309-324)

### **The category of hyper $S$ -acts**

Leila Shahbaz

The actions of a semigroup or a monoid  $S$  on sets have been studied and applied in many branches of mathematics. In this paper, we generalize this notion, and introduce the category of hyper  $S$ -acts with the homomorphisms between them. Then, using the usual notion of congruences defined for hyper  $S$ -acts, quotients are defined and isomorphism theorems are proved. Finally, limits and colimits in the category of hyper  $S$ -acts are studied. (pp. 325-332)

### **Maximal partial line spreads of $PG(3, q)$ , $q$ even**

Maria Scafati Tallini

Applying the representation of  $PG(3, q)$  over  $AG(2, q)$ , [3], we construct a maximal partial line spread of  $PG(3, q)$ ,  $q = 2^{2n}$ ,  $n$  an integer,  $n \geq 1$ , of size  $q^2 = q + 2$ . This size is the greatest known till now, except a sporadic case, found by O. Heden [2], for  $q = 7$ . (pp. 333-340)

### **$H_v$ -Structures and the bar in questionnaires**

Pipina Nikolaidou, Thomas Vougiouklis

The class of hyperstructures called  $H_v$ -structures has been studied from several aspects as well as in connection with many other topics of mathematics. Here we present applications obtained from social sciences mainly the ones used questionnaires. Moreover we improve the procedure of the filling the questionnaires, using the bar instead of Likert scale, on computers where we write down automatically the results so they are ready for research. (pp. 341-350)

### **Related fixed point theorem for six mappings on three modified intuitionistic fuzzy metric spaces**

Sushil Sharma, Prashant Tilwankar

The class of hyperstructures called  $H_v$ -structures has been studied from several aspects as well as in connection with many other topics of mathematics. Here we present applications obtained from social sciences mainly the ones used questionnaires. Moreover we improve the procedure of the filling the questionnaires, using the bar instead of Likert scale, on computers where we write down automatically the results so they are ready for research. (pp. 351-364)

### **Geometric equivalence between the Veblen and Desargues theorems and between the Pappus–Pascal and the "Three stars theorems"**

Maria Scafati Tallini

Let  $P(r, k)$  and  $A(2, k)$  be the projective  $r$ -dimensional space over the field  $k$  and the projective plane over the same field  $k$ , respectively. Let  $PG(3, q)$  be the three-dimensional projective space over the Galois field  $GF(q)$  and  $AG(2, q)$  be the affine plane over  $GF(q)$ . Referring to the representation of  $P(r, k)$  over  $A(2, k)$

called also "Crashing" (see [1]), we prove the equivalence, from the geometric point of view, between the Veblen axiom in  $PG(3, q)$  and the Desargues theorem in  $AG(2, q)$ . Moreover, we get a representation in  $PG(3, q)$  of the Pappus-Pascal theorem in  $AG(2, q)$ , consisting of a suitable configuration of planes, called the "Three stars theorem", which turns out to be a geometric equivalence between those two theorems. For the notations and theorems about the representation of  $P(r, k)$  over  $A(2, k)$  (and therefore in particular of  $PG(3, q)$  over  $AG(2, q)$ ), we refer to the paper [1], cited in the bibliography, which the reader must know before reading this text. (pp. 365-370)

### Three representations of a hyperbolic quadric of $PG(3, q)$ in $AG(2, q)$

Maria Scafati Tallini

We construct three different representations of a hyperbolic quadric of a projective Galois space  $PG(3, q)$  in the affine Galois plane  $AG(2, q)$ . To do this, we use the representation  $R$ , or  $R(U_1, U_2, \pi, 3)$  of the projective space  $P(r, k)$ , over the field  $k$ , in the affine plane  $A(2, k)$ , over the same field  $k$ , called also "Crashing", cited in the bibliography [1]. Further applications of this representation are the construction of maximal partial line spreads in  $PG, q$  even, a geometric proof of the equivalence between the Desargues and the Veblen theorems and a geometric proof of the equivalence between the Pappus-Pascal theorem and the "Three stars theorem". Those results will soon appear. (pp. 371-386)

### Recognition of $A_{10}$ and $L_4(4)$ by two special conjugacy class sizes

Yanheng Chen, Guiyun Chen

It is well-known that  $A_{10}$  is the smallest (by order) nonabelian simple group with connected prime graph and  $L_4(4)$  is the smallest nonabelian simple group of Lie type with connected prime graph. In 2009, A.V. Vasil'ev first dealt with the groups with connected prime graph and proved that Thompson's conjecture holds for  $A_{10}$  and  $L_4(4)$  (see [1]). In this work, the authors characterize finite simple groups  $A_{10}$  and  $L_4(4)$  by their orders and largest and smallest conjugacy class sizes greater than 1, and partially generalize A.V. Vasil'ev's work. (pp. 387-394)

### The groups of two classes of certain cyclically presented groups are essentially 3-generated

Devon Roy Stoddart

Two classes of cyclically presented groups were introduced in [3] and proven infinite for  $n \geq 3$  in [2]. I show that the groups of these classes of certain cyclically presented groups are essentially 3-generated. The groups  $G_n$  and  $H_n$  for  $n = 3$  and 4 were shown to be 2-generated in [9] and [1], while the abelianized groups  $G_n^{ab}$  of  $G_n$  were dealt with in [8]. Naturally, the groups  $G_n$  and  $H_n$  for  $n = 1$  and 2 are trivial. Showing that the groups of these two classes are essentially 3-generated has been the most difficult to solve thus far. (pp. 395-402)

## ***n*-fold positive implicative hyper *K*-ideals**

P. Babari, M. Pirasghari, M.M. Zahedi

In this paper we introduce the definitions of *n*-fold positive implicative hyper *K*-ideals. These definitions are the generalizations of the definitions of positive implicative hyper *K*-ideals, which have been defined in [13]. Then we obtain some related results. In particular we determine the relationships between those *n*-fold positive implicative hyper *K*-ideals which satisfy the simple condition. (pp. 403-418)