Abstracts of the presentations

Theoretical machines and the relevant structures that they brought into being in the hypercompositional Algebra

by Christos G. Massouros and Gerasimos Massouros

This presentation is in the frontiers of the above two topics that both appeared in the 20th century and seem to be extensively overlapping.

Hypergroups and lattices

by Violeta Fotea

Connections between hypergroups and lattices have been considered and analyzed by Nakano, Varlet, then by Mittas and Konstantinidou, Comer and later by Kehagias, Kehagias and Konstantinidou, Konstantinidou and Serafimidis, Calugareanu and Leoreanu, Leoreanu and Radu, Tofan and Volf. In this talk, we consider and investigate two types of hyperoperations determined by lattices. First, we show that we obtain a family of join spaces if the corresponding lattice is distributive. A second type of hypergroups associated with a lattice is analyzed in the next paragraph. Such hypergroups are join spaces if the corresponding lattice is modular. Then, we analyze here a lattice-determined hypergroupoid/join space, as a generalization of a hypergroupoids associated with a fuzzy set and we give another proof to the Varlet characterization of distributive lattices.

Some aspects of the reducibility in hypercompositional structures

by Milica Kankaraš

The reducibility concept was introduced by James Jantosciak in 1991, observing that the elements in a hypergroup can play interchangeable roles with respect to the hyperoperation. In order to cluster elements with the same behavior, Jantosciak introduced three equivalence relations and using them, he defined the reduced hypergroup. Cristea has later studied the reducibility concept for certain hypergroups, especially for hypergroups associated with binary and n-ary relations. This concept has been later extended to the fuzzy case by Cristea and Kankaraš. They defined new fundamental relations relying on Jantosciak's original definitions. Using these new definitions, they studied the reducibility in crisp hypergroups endowed with a fuzzy set. The fuzzy reducibility is considered for the specific types of hypergroups, as complete hypergroups, i.p.s. hypergroups and non-complete 1-hypergroups, with respect to the grade fuzzy set, defined by Corsini and used for studying the fuzzy grades of hypergroups.

Thereafter, Kankaraš obtained new results related to reducibility and fuzzy reducibility of Corsini hypergroups and some productional hypergroups containing Corsini hypergroups. In their last joint article, Cristea and Kankaraš extended the reducibility concept to hyperrings, by introducing the definition of a reduced hyperring. The authors studied reducibility for the general hyperrings, determining relationships between equivalence relations in some specific types of hyperrings. They investigated the reducibility in Corsini hyperrings, hyperrings of formal power series, (H,R)-hyperrings, and some other types of hyperrings.

Regular parameter elements and regular hyperrings

by Hashem Bordbar

Regular parameters elements come up from the nice and deep relation existing between the dimension of a local hyperring R with maximal hyperideal M and the set of the generators of its M-primary hyperideals. More precisely, since in a local hyperring R with maximal hyperideal M, the dimension of the hyperring R is equal to the height of the hyperideal M, i.e., $\dim R = ht_R M$, we can say that the regular parameter elements are a consequence of the investigation of the height of M and the set of the generators for M-primary hyperideals in R. Moreover, the investigation of the relation between the dimension of the hyperring R (equivalently, the height $ht_R M$ of the maximal hyperideal M) and the dimension of the vectorial hyperspace M/M^2 conducts us to the definition of the regular local hyperrings. They are exactly local Noetherian hyperrings with the property that the maximal hyperideal M can be generated by d elements, where d is the dimension of the hyperring.

Connections between commutativity degree and hypergroup theory

by Andromeda Sonea

The aim of this presentation is to introduce the commutativity degree in complete hypergroup theory. In group theory it is known there exists a relation between class equation and commutativity degree. So, we prove that in complete hypergroup theory exists a similar relation, but under certain conditions. Also, we give many examples to explain this relationship.

Real hyperfields

by Hanna Stojalowska

The history of the algebraic theory of ordered fields dates back to 1927, when Artin and Schreier introduced the foundations of this theory. This let Artin solve the 17th Hilbert's problem. Since hyperfields are a generalization of fields, it is natural to ask which aspects of Artin-Schreier theory can be developed in the hyperfield case. It is known that every real hyperfield has characteristic 0. During the talk we will introduce the notion of C-characteristic, which comes from the work of Viro and seems to be a good tool to classify real hyperfields. We will also present recent results on the compatibility between orderings and valuations in hyperfields. In the theory of ordered fields we say that a valuation v is compatible with an ordering P if its valuation ring is convex with respect to P. We will generalize this notion to the hyperfield case; however, we will observe that the generalization is not straightforward. Moreover, we will state a version of the Baer-Krull theorem for hyperfields.

Krasner hyperfields and the model theory of valued fields

by Alessandro Linzi

When Krasner axiomatized his hyperfields in 1957, he had in mind a specific structure which is associated to any valued field. The model theory of valued fields has been extensively studied after 1965, when the work of Ax-Kochen and Ershov found remarkable applications in number theory.

In particular, the research on (relative) quantifier elimination (for henselian valued fields of characteristic 0) culminated in 2011 with the introduction of Flenner's RV-structures, which then have found a variety of other fruitful applications.

We argue that these structures are nothing but the hyperfields that Krasner had in mind when the hyperoperation + is encoded via the ternary relation $z \in x + y$. The fact that valuation theorists did not notice this until now, shows that Krasner hyperfields have not yet received the attention they deserve in this area of investigation. One of our aims is to start filling this gap, learning more about hypercompositional algebra.

Hypercompositional structures and ordering: Ends lemma (EL)

by Michal Novak

In the contribution I introduce the idea of EL-hyperstructures (where EL stands for the "Ends lemma"). First of all, I discuss several approaches to linking hyperoperations (hypercompositions) and quasi- or partial ordering. These include: quasi-order hypergroups (where only ordered sets are involved), several constructions combining single-valued operations and ordering (which is e.g. the case of EL-hyperstructures) and partially ordered hypergroups (where the relation is defined on already existing hypercompositional structure). After giving the context, several examples of EL-hyperstructures are given. These include both simple and straightforward ones as well as examples used by other authors using the same construction yet not its name. Moreover, I provide a brief introduction to the issue of hypercompositional generalization of automata, in which the EL construction can be used. I also include a short motivational section for the construction and give its historical background. In the end of the contribution, I discuss the importance of clarifying the terminology one is going to use.

Celular Automaton Created as an m-ary Product of Algebraic Quasi-multiautomata

by Štepan Krehlik

In the present contribution, combine of the multi-automata is described. Internal links are defined between their states, for two specific combinations, i.e., homegenous and heterogeneous product of multiautomata. This concept is studied from the view of cellular automata.

On the reverse transposition axiom

by Vasileios Migkos and Christos G. Massouros

This is the kick off presentation of the research on reverse transposition hypergroup which is defined by the following axiom:

$$ad \cap bc \neq \varnothing \Rightarrow \begin{cases} b \setminus a \cap c / d \neq \varnothing \\ \\ a \setminus b \cap d / c \neq \varnothing \end{cases} \quad \text{for all} \quad a,b,c,d \in H$$

It still remains an open problem whether there exist hypergroups which satisfy only one of the two relations of the second part of this implication. If there do exist, then, the ones that satisfy both relations will be named strong reverse transposition hypergroups.

An overview of the theory of hypernear-rings

by Sanja Jančić-Rašović

In this note the main properties of three classes of hypernear-rings are summarized. The first part of this paper contains the main results about the hypernear-rings with a defect of distributivity. The second part is devoted to the class of division hyernear-rings. The third part contains our results about the general hypernear-rings associated with a hypergroup.

Closed and Open Transformations in Complex and Real Spacetime and applications on Relativity Theory

by Spyridon Vossos, Elias Vossos and Christos G. Massouros

This presentation, (i) proves that the Transitive Attribute of Parallelism (which is equivalent to the 5th Euclidean Postulate) CAN BE VALID in Spacetime (ST), with complex Cartesian Coordinates (CCs), (ii) reveals the Unification of Newtonian Physics (NPs) and Einsteinian Relativity Theory (ERT), by using Generalized Isotropic Metrics, and (iii) proves that the Gravitational phenomena can be explained, by using not only General Relativity (GR) (in curved spacetime), but also with the usage of Special Relativity (SR) and Newtonian Physics (NPs) (in flat spacetime).

Dependence relations-a hypercompositional approach

by Irina Cristea

Combining elements from hypercompositional algebra, graph theory and fuzzy sets help us to describe the interdependencies between sets of elements that appear in numerous practical models. The key element of this innovative method is given by the dependence relations. We aim here to connect the notions of degree of influence or impact with the one of fuzzy grade.