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Some results on complementable semihypergroups

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Abstract

In this paper we first introduce the notion of complementable semihypergroup, proving that the classes of simplifiable semigroups, groups, simplifiable semihypergroups and complete hypergroups are examples of complementable semihypergroups. Then we define when two semihypergroups are disjoint and find examples of such semihypergroups.

Keywords: (semi)hypergroup, complementable semihypergroup, disjoint semihypergroups.
Mathematics Subject Classification [2010]: 20N20

1 Introduction

In this paper we introduce a new type of semihypergroups, called complementable semihypergroups, as semihypergroups having the complement (so the hypergroupoid endowed with the complement hyperoperation) a semihypergroup too. Our first aim is to find several classes of complementable semihypergroups and we prove that the simplifiable semigroups, groups, simplifiable semihypergroups and complete hypergroups have this property.

We recall here some basic notions of hypergroup theory and we fix the notations used in this note. We referee the readers to the following fundamental books Corsini [1], Corsini and Leoreanu [2], Vougiouklis [3].

Let H be a non-empty set and $\mathcal{P}^*(H)$ denote the set of all non-empty subsets of H. Let $\circ$ be a *hyperoperation* (or *join operation*) on H, that is, a function from the chartezian product $H \times H$ into $\mathcal{P}^*(H)$. The image of the pair $(a, b) \in H \times H$ under the hyperoperation $\circ$ in $\mathcal{P}^*(H)$ is denoted by $a \circ b$. The join operation can be extended in a natural way to subsets of H as follows: for non-empty subsets A, B of H, define $A \circ B = \cup\{a \circ b \mid a \in A, b \in B\}$. The notation $a \circ A$ is used for $\{a\} \circ A$ and $A \circ a$ for $A \circ \{a\}$. Generally, the singleton $\{a\}$ is identified with its element a. The hyperstructure $(H, \circ)$ is called a *semihypergroup* if $a \circ (b \circ c) = (a \circ b) \circ c$ for all $a, b, c \in H$, which means that

$$\bigcup_{u \in x \circ y} u \circ z = \bigcup_{v \in y \circ z} x \circ v.$$

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