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Petr Emanovský, Jan Kühn

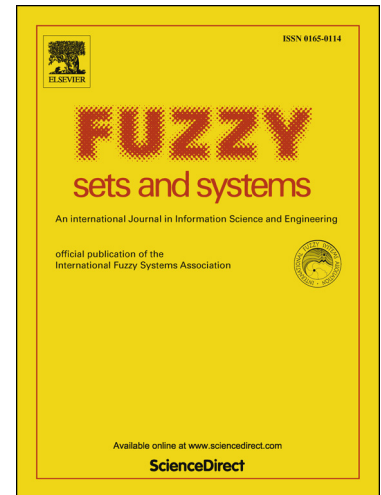
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Some properties of pseudo-BCK- and pseudo-BCI-algebras

Petr Emanovský*

Jan Kühr†

Department of Algebra and Geometry, Faculty of Science, Palacký University in Olomouc
17. listopadu 12, 77146 Olomouc, Czech Republic

Abstract

Pseudo-BCI-algebras generalize both BCI-algebras and pseudo-BCK-algebras, which are a non-commutative generalization of BCK-algebras. In this paper, following [41], we show that pseudo-BCI-algebras are the residuation subreducts of semi-integral residuated po-monoids and characterize those pseudo-BCI-algebras which are direct products of pseudo-BCK-algebras and groups (regarded as pseudo-BCI-algebras). We also show that the quasivariety of pseudo-BCI-algebras is relatively congruence modular; in fact, we prove that this holds true for all relatively point regular quasivarieties which are relatively ideal determined, in the sense that the kernels of relative congruences can be described by means of ideal terms.

Keywords: Pseudo-BCK-algebra; pseudo-BCI-algebra; filter; prefilter; ideal term; relative congruence modularity.

1 Introduction

BCK- and BCI-algebras were introduced by Iséki [27] as algebras induced by Meredith's implicational logics BCK and BCI. As a matter of fact, BCK-algebras are the equivalent algebraic semantics for the logic BCK, but BCI is not algebraizable in the sense of [1]. Nevertheless, both BCK- and BCI-algebras are closely related to residuated commutative po-monoids because, as is well-known, BCK-algebras are the $\{\rightarrow, 1\}$ -subreducts of integral residuated commutative po-monoids (see [17, 38, 39]), and BCI-algebras are the $\{\rightarrow, 1\}$ -subreducts of semi-integral ones, where “semi-integral” means that the monoid identity 1 is a maximal element of the underlying poset (see [41]).

Also some other algebras of logic, such as MV-algebras, BL-algebras or hoops, are (equivalent to) certain integral residuated commutative po-monoids. Although non-commutative residuated po-monoids were known since the 1930s (for historical overview see [18]), non-commutative versions of the aforementioned algebras were introduced only about 15 years ago in a series of papers by Georgescu, Iorgulescu and coauthors in which they defined pseudo-MV-algebras¹ [20], pseudo-BL-algebras [8], pseudo-hoops [21], and

*Corresponding author. E-mail: petr.emanovsky@upol.cz

†E-mail: jan.kuhr@upol.cz

¹Rachůneck [40] independently introduced another non-commutative generalization of MV-algebras, called GMV-algebras. In fact, pseudo-MV-algebras and these GMV-algebras are equivalent. In [18], the name “GMV-algebra” has a different, more general meaning.

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