Jiří Velebil*
Czech Technical University in Prague

Abstract characterisation of varieties and quasivarieties of ordered algebras

Classes of algebras whose carrier is a poset and whose operations are monotone functions and which are definable by inequalities (or, by implications using inequalities) were characterised in Birkhoff's HSP-style (or, in SP-style) by Stephen Bloom [1]. The H, S and P closure operators are related to a factorisation system of monotone surjections and order-reflecting embeddings in the category Pos of posets and monotone maps.

We show that the above factorisation system makes the category Pos *exact in 2-dimensional sense* and, as a consequence, one can characterise varieties and quasivarieties of ordered algebras as abstract categories in a similar way as for the classical case.

Namely, we prove the following ([2]):

1. A category is equivalent to a variety of ordered algebras iff it is exact in the 2-dimensional sense, has coinserters, and possesses a "nice" generator.

2. A category is equivalent to a quasivariety of ordered algebras iff it is regular in the 2-dimensional sense, has coinserters, and possesses a "nice" generator.

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References:

[1] S. L. Bloom, Varieties of ordered algebras, *J. Comput. System Sci.* 13.2 (1976), 200–212.

[2] A. Kurz and J. Velebil, Quasivarieties and varieties of ordered algebras: Regularity and exactness, accepted for publication in *Math. Structures Comput. Sci.*

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