

# Filter theory of bounded residuated lattice ordered monoids

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Bounded residuated lattice ordered monoids ( $R\ell$ -monoids) are a common generalization of pseudo- $BL$ -algebras, pseudo- $MV$ -algebras and Heyting algebras, i.e. algebras of the non-commutative basic fuzzy logic (and consequently of the basic fuzzy logic), the non-commutative Łukasiewicz logic (and consequently of the Łukasiewicz logic) and the intuitionistic logic, respectively. Various classes of filters of  $BL$ -algebras were studied by Turunen (2001), Haveski, Saeid and Eslami (2006) and Kondo and Dudek (2008). Zhang and Li (2006) generalized some of the results also for pseudo- $BL$ -algebras. Boolean filters of bounded commutative  $R\ell$ -monoids were investigated by Rachůnek and Šalounová (2005).

We develop the theory of filters of general bounded  $R\ell$ -monoids and we describe the classes of filters such that the quotient  $R\ell$ -monoids corresponding to normal filters of them are Heyting algebras, Boolean algebras and pseudo- $MV$ -algebras, respectively.