

## FUZZY $n$ -FOLD INTEGRAL FILTERS IN $BL$ -ALGEBRAS

RAJAB ALI BORZOOEI

*Department of Mathematics*  
*Shahid Beheshti University*  
*Tehran, Iran*

**e-mail:** borzooei@sbu.ac.ir

AND

AKBAR PAAD

*Department of Mathematics*  
*Shahid Beheshti University Tehran, Iran*

**e-mail:** Akbar.Paad@gmail.com

### Abstract

In this paper, we introduce the notion of fuzzy  $n$ -fold integral filter in  $BL$ -algebras and we state and prove several properties of fuzzy  $n$ -fold integral filters. Using a level subset of a fuzzy set in a  $BL$ -algebra, we give a characterization of fuzzy  $n$ -fold integral filters. Also, we prove that the homomorphic image and preimage of fuzzy  $n$ -fold integral filters are also fuzzy  $n$ -fold integral filters. Finally, we study the relationship among fuzzy  $n$ -fold obstinate filters, fuzzy  $n$ -fold integral filters and fuzzy  $n$ -fold fantastic filters

**Keywords:**  $BL$ -algebra, fuzzy  $n$ -fold obstinate filter,  $n$ -fold obstinate  $BL$ -algebra,  $n$ -fold integral  $BL$ -algebra and fuzzy  $n$ -fold integral filter.

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### REFERENCES

- [1] R.A. Borzooei and A. Paad, *Integral filters and Integral  $BL$ -algebras*, Italian J. Pure and Appl. Math., to appear.
- [2] R.A. Borzooei and A. Paad,  *$n$ -fold integral and  $n$ -fold obstinate  $BL$ -algebras*, submitted.
- [3] C.C. Chang, *Algebraic analysis of many valued logics*, Trans. Amer. Math. Soc. **88** (1958) 467–490. doi:10.1090/S0002-9947-1958-0094302-9

- [4] A. Di Nola, G. Georgescu and A. Iorgulescu, *Pseudo BL-algebra*. Part I, Int. J. Mult. Val. Logic **8** (5–6) (2002) 673–714.
- [5] A. Di Nola and L. Leustean, *Compact representations of BL-algebras*, Department of Computer Science, University Aarhus, BRICS Report series (2002).
- [6] M. Haveski, A. Borumand Saeid and E. Eslami, *Some types of filters in BL-algebras*, Soft. Comput. **10** (2006) 657–664. doi:10.1007/s00500-005-0534-4
- [7] M. Haveski and E. Eslami, *n-Fold filters in BL-algebras*, Math. Log. Quart **54** (2) (2008) 176–186. doi:10.1002/malq.200710029
- [8] S. Motamed and A. Borumand Saeid, *n-fold obstinate filters in BL-algebras*, Neural Comput. and Applic. **20** (2011) 461–472. doi:10.1007/s00521-011-0548-z
- [9] C. Lele, *Folding theory of positive implicative/fuzzy positive implicative in BL-algebras*, Journal of Fuzzy Mathematics **17** (3) (2009), Los Angeles.
- [10] C. Lele, *Fuzzy n-fold obstinate filters in BL-algebras*, Afrika Matematika (2011) (On line).
- [11] C. Lele and M. Hyland, *Folding theory for fantastic filters in BL-algebra*, International Journal of Artificial Life Research **2** (4) (2011) 32–42. doi:10.4018/IJALR.2011100104
- [12] L. Liu and K. Li, *Fuzzy filters of BL-algebras*, Information Sciences **173** (2005) 141–154. doi:10.1016/j.ins.2004.07.009
- [13] L. Lianzhen and L. Kaitai, *Fuzzy Boolean and positive implicative filters of BL-algebras*, Fuzzy Sets and Systems **152** (2005) 333–348. doi:10.1016/j.fss.2004.10.005
- [14] P. Hájek, *Metamathematics of fuzzy logic*, Trends in Logic, vol. 4, Kluwer Academic Publishers, (1998), ISBN:9781402003707. doi:10.1007/978-94-011-5300-3
- [15] E. Turunen, *BL-algebras of basic fuzzy logic*, Mathware Soft. Comput. **6** (1999) 49–61.
- [16] E. Turunen, *Mathematics Behind Fuzzy Logic* (Physica Verlag, 1999).

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