

## ON ISOMORPHISMS OF INTUITIONISTIC FUZZY SETS

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**ABSTRACT.** We introduce the concepts of isomorphism between two Intuitionistic Fuzzy Subsets (IFS) in a non-empty finite universal set  $X$  and Intuitionistic Level Representation (ILR) of an IFS. We also obtain two characterisations of IFS isomorphisms. We prove that two IFSs are isomorphic if, and only if, they have identical ILRs. Our findings are reinforced using some illustrative examples. Eventhough many attempts have been made to define isomorphism between IFSs, each of them has either used the extension principle or the already existing concepts of isomorphism on the underlying universal sets. The novelty in our approach is that, we define isomorphism without using the structure of the underlying universal set and the extension principle. Furthermore, our definition of isomorphism between IFSs gives prior concern to the membership and non-membership degrees, so that the hierarchy of the membership and non-membership degrees of elements of the underlying set are preserved under this isomorphism.

## REFERENCES

- [1] K.T. Atanassov: *Intuitionistic fuzzy sets*, Fuzzy Sets and Systems, **20**(1986), No. 1, 87-96.
- [2] K.T. Atanassov: *More on intuitionistic fuzzy sets*, Fuzzy Sets and Systems, **33**(1989), No. 1, 37-45.
- [3] C.L. Chang: *Fuzzy topological spaces*, J. Math. Anal. Appl., **24**(1968), No. 1, 182-190.
- [4] P.S. Das: *Fuzzy groups and level subgroups*, J. Math. Anal. Appl., **84**(1981), 264-269.
- [5] X.P. Li and G.J. Wang:  *$(\lambda, \alpha)$ -Homomorphisms of intuitionistic fuzzy groups*, Hacet. J. Math. Stat., **40**(2011), No. 5, 663-672.
- [6] B.V. Rao and K. Lakshmi: *Correspondence and isomorphism theorems for intuitionistic fuzzy subgroups*, Invention J. Res. Technology Engng. Management, **1**(2017), No. 12, 09-17.
- [7] A. Rosenfeld: *Fuzzy groups*, J. Math. Anal. Appl., **35**(1971), No. 3, 512-517.
- [8] A. Rosenfeld: *Fuzzy graphs*, in *Fuzzy Sets and their Applications to Cognitive and Decision Processes* (L.A. Zadeh, K.S. Fu and M. Shimura (Eds)), Academic Press, New York, 1975, pp. 77-95.
- [9] Divya Mary Daise S and Deepthi Mary Tresa S: *On level subgroups of intuitionistic fuzzy groups*, J. Comput. Math. Sci., **7**(2016), No. 11, 606-612.
- [10] P.K. Sharma: *Homomorphism of intuitionistic fuzzy groups*, Int. Math. Forum, **6**(2011), No. 64, 3169-3178.
- [11] P.K. Sharma: *Intuitionistic fuzzy groups*, IFRSA Int. J. Data Warehousing Mining, **1**(2011), No. 1, 86-94.
- [12] P.K. Sharma: *Intuitionistic fuzzy representations of intuitionistic fuzzy groups*, Asian J. Fuzzy Appl. Math., **3**(2015), No. 3, 81-94.
- [13] B. Xi-Guang and L. Feng: *Intuitionistic fuzzy group based on bi-factor operation*, Fuzzy Systems and Mathematics, **20**(2006), No. 4, 16-21.
- [14] B. Xi-Guang and L. Feng: *The sub-intuitionistic fuzzy group and normal sub-intuitionistic of intuitionistic fuzzy group*, Fuzzy Systems and Mathematics, **20**(2006), No. 4, 43-46.

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- [15] C.Y. Xu: *Homomorphism of intuitionistic fuzzy groups*, in: Proc. Sixth International Conference on Machine Learning and Cybernetics, IEEE, Hong Kong, (2007), 1178-1183.
- [16] F.J. Xuan: *Fuzzy homomorphism and fuzzy isomorphism*, Fuzzy Sets and Systems, **63**(1994), No. 2, 237-242.
- [17] L.A. Zadeh: *Fuzzy sets*, Information Control, **8**(1965), 338-353.
- [18] L.A. Zadeh: *The concept of linguistic variable and its application to approximate reasoning*, Inform. Sci., **8**(1975), No. 3, 199-249.
- [19] C. Zhang and Q. Zheng: *The isomorphism and homomorphism of fuzzy sets*, in: Fourth International Conference on Fuzzy Systems and Knowledge Discovery, IEEE, Haikou, (2007), 711-716.

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