

Some functional equations of aggregation operations with absorbing element ¹

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There are a huge number of aggregation functions which are grouped into different families such as means, triangular norms and conorms, copulas, Choquet and Sugeno integrals, and many others. This raises the questions: how to choose the most useful aggregation function to a specific problem? Is just one aggregation function or at different steps of solving the problem is advisable to apply different functions? Whether the selected function should be symmetrical, should have a neutral element, an absorbing element, or should be idempotent? The answer to these kinds of questions deliver the mathematical properties, on the basis of which can be chosen the appropriate class of aggregation functions. Therefore, from the point of view of certain applications, it seems necessary the detailed analysis of the structure of aggregation functions with various additional assumptions and interaction in satisfying by them different laws, including functional equations.

In this paper the functional equations of distributivity and modularity in a special class of aggregation operators with an absorbing element is investigated.

We focus first on the distributivity between binary operators from the family of 2-uninorms ($\mathbf{U}_{k(e,f)}$), which generalize nullnorms by extending their certain conditions. In particular, all possible solutions of the distributivity equation for the three defined subclasses of these operators depending on the position of its absorbing and neutral elements are characterized. Further on we examined the modularity equation for these operators. Depending on the position of its neutral elements and having the same absorbing element, we obtained both positive and negative results. They are analogous to the results in general case for operators with different absorbing elements.

¹**Acknowledgement** This work was partially supported by the Centre for Innovation and Transfer of Natural Sciences and Engineering Knowledge No RPPK.01.03.00 – 18 – 001/10.