

## On Some Contributions to Quantum Structures by Fuzzy Sets

Beloslav Riečan

*Abstract:* It is well known that the fuzzy sets theory can be successfully used in quantum models ([5, 26]). In this paper we give first a review of recent development in the probability theory on tribes and their generalizations – multivalued (MV)-algebras. Secondly we show some applications of the described method to develop probability theory on IF-events.

*Keywords:* probability; fuzzy sets; MV-algebra; IF events;

*AMS Subject Classification:* 06D35; 03B50; 03G12;

## References

- [1] K. Atanassov: Intuitionistic Fuzzy Sets: Theory and Applications. Physica-Verlag, New York 1999.
- [2] L. O. Cignoli, M. L. D’Ottaviano, and D. Mundici: Algebraic Foundations of Many-valued Reasoning. Kluwer, Dordrecht 2000.
- [3] A. Di Nola, A. Dvurečenskij, M. Hyčko, and C. Manara: Entropy of effect algebras with the Riesz decomposition property I: Basic properties. Kybernetika 41 (2005), 143–160.
- [4] A. Di Nola, A. Dvurečenskij, M. Hyčko, and C. Manara: Entropy of effect algebras with the Riesz decomposition property II: MV-algebras. Kybernetika 41 (2005), 161–176.
- [5] A. Dvurečenskij and S. Pulmannová: New Trends in Quantum Structures. Kluwer, Dordrecht 2000.
- [6] T. Gerstenkorn and J. Manko: Probabilities of intuitionistic fuzzy events. In: Issues in Intelligent Systems: Paradigms (O. Hryniwicz et al., eds.). EXIT, Warszawa, pp. 63–58.
- [7] P. Grzegorzewski and E. Mrowka: Probability of intuitionistic fuzzy events. In: Soft Methods in Probability, Statistics and Data Analysis (P. Grzegorzewski et al., eds.). Physica-Verlag, New York 2002, pp. 105–115.
- [8] P. R. Halmos: Measure Theory. Van Nostrand, New York 1950.

- [9] A. N. Kolmogorov: Foundations of the Theory of Probability. Chelsea Press, New York 1950 (German original appeared in 1933).
- [10] K. Lendelová: Measure Theory on Multivalued Logics and its Applications. Ph.D. Thesis. M. Bel University, Banská Bystrica 2005.
- [11] K. Lendelová: Probability on L-posets. In: Proc. Fourth Conference of the European Society for Fuzzy Logic and Technology and 11 Rencontres Francophones sur la Logique Floue et ses Applications (EUSFLAT-LFA 2005 Joint Conference), Technical University of Catalonia, Barcelona, pp. 320–324.
- [12] K. Lendelová: A note on invariant observables. *Internat. J. Theoret. Physics* 45 (2006), 915–923.
- [13] K. Lendelová: Central Limit Theorem for L-posets. *J. Electr. Engrg.* 12/S (2005), 56, 7–9.
- [14] F. Montagna: An algebraic approach to propositional fuzzy logic. *J. Logic. Lang. Inf.* 9 (2000), 91–124.
- [15] J. von Neumann: Grundlagen der Quantenmechanik. Berlin 1932.
- [16] B. Riečan: A new approach to some notions of statistical quantum mechanics. *BUSEFAL* 36 (1988), 4–6.
- [17] B. Riečan: On the product MV-algebras. *Tatra Mt. Math. Publ.* 16 (1999), 143–149.
- [18] B. Riečan: Representation of probabilities on IFS events. In: Advances in Soft Computing, Soft Methodology and Random Information Systems (M. Lopez–Díaz et al., eds.) Springer–Verlag, Berlin 2004, pp. 243–246.
- [19] B. Riečan: Free products of probability MV-algebras. *Atti Sem. Mat. Fis. Univ. Modena* 50 (2002), 173–186.
- [20] B. Riečan: The conjugacy of probability MV- $\sigma$ -algebras with the unit interval. *Atti Sem. Mat. Fis. Univ. Modena* 52 (2004), 241–248.
- [21] B. Riečan: Kolmogorov–Sinaj entropy on MV-algebras. *Internat. J. Theoret. Physics* 44 (2005), 1041–1052.
- [22] B. Riečan: On the probability on IF-sets and MV-algebras. *Notes on IFS* 11 (2005), 6, 21–25.
- [23] B. Riečan: On the probability and random variables on IF events. In: Applied Artificial Intelligence (Proc. 7th FLINS Conf. Genova, Da Ruan et al., eds.), World Scientific 2006, pp. 138–145.
- [24] B. Riečan and M. Jurečková: On invariant observables and the individual ergodic theorem. *Internat. J. Theoret. Physics* 44 (2005), 1587–1597.
- [25] B. Riečan and D. Mundici: Probability on MV-algebras. In: Handbook on Measure Theory (E. Pap, ed.), Elsevier, Amsterdam 2002.

- [26] B. Riečan and T. Neubrunn: Integral, Measure, and Ordering. Kluwer, Dordrecht 1997.
- [27] E. Schmidt and J. Kacprzyk: Probability of intuitionistic fuzzy events and their applications in decision making. In: Proc. EUSFLAT'99, Palma de Mallorca 1999, pp. 457–460.