

References

- [1] Anderson, C. A. (1984). "General intensional logic," in Gabbay, D. and F. Guenthner (eds.), *Handbook of Philosophical Logic, Vol. II*, D. Reidel: Dordrecht, 355–385.
- [2] Appelbaum, L. and Ruspini E. H. (1985). "ARIES an approximate reasoning inference engine," in: Gupta M. M. et al. (eds.), *Approximate Reasoning in Expert Systems*, Amsterdam: North Holland, 745–765.
- [3] Barr, M. and Wells, C. (1984). *Toposes, Triples and Theories*. Berlin: Springer Verlag.
- [4] Bellman, R. E. and Zadeh L. A. (1975). "Local and fuzzy logics." In: Dunn, J. M. and Epstein, G. eds. *Modern Uses of Multiple-Valued Logic*. Boston: D. Reidel, 105–165.
- [5] Bělohlávek, R. and V. Novák: Learning Rule Base of the Linguistic Expert Systems. Int. J. of Soft Computing (submitted).
- [6] Biacino, L. and Gerla, G. (1986). "Weak Decidability and Weak Recursive Enumerability for L-subsets," Preprint No. 45, Università Degli Studi di Napoli, Napoli.
- [7] Biacino, L. and Gerla, G. (1988). "Recursively Enumerable L-sets," Zeit. Math. Logic. Grundl. Math.
- [8] Barwise, J. (ed.) (1977). *Handbook of Mathematical Logic*, Amsterdam: North-Holland.
- [9] Birkhoff, G. (1967) *Lattice Theory*. Amer. Math. Soc. Providence: R. I.
- [10] Black , M. (1937). "Vagueness: An Exercise in Logical Analysis," Philosophy of Science 4, 427–455. Reprinted in Int. J. of General Systems 17(1990), 107–128.
- [11] Butnariu, D. and Klement, E. P. (1993). *Triangular Norm-based Measures and Games with Fuzzy Coalitions*. Dordrecht: Kluwer.

- [12] Chang, C. C. (1958). "Algebraic analysis of many valued logics," Trans. AMS, **93**, 74–80.
- [13] Chang, C. C. (1959). "A new proof of the completeness of the Łukasiewicz axioms," Trans. AMS, **88**, 467–490.
- [14] Chang, C. C. and Keisler, H. J. (1966). *Continuous Model Theory*, Princeton: Princeton University Press.
- [15] Chang, C. C. and Keisler, H. J. (1973). *Model Theory*, Amsterdam: North-Holland.
- [16] Cohen, P. M. (1965), *Universal algebra*, New York: Harper & Row.
- [17] van Dalen, D. (1994). *Logic and Structure*, Berlin: Springer.
- [18] Dilworth, R. P. (1938). "Abstract residuation over lattices," Trans. Amer. Math. Soc. **44**, 262–268.
- [19] Dilworth, R. P. and Ward, M. (1939) "Residuated lattices," Trans. Amer. Math. Soc. **45**, 335–354.
- [20] diNola, A. (1993). "MV-Algebras in the Treatment of Uncertainty." In: P. Löwen, M. Roubens, eds. *Proc. of the Int. IFSA Congress*. Dordrecht: Kluwer, 123–131.
- [21] di Nola, A. and Gerla, G. (1986). "Fuzzy models of first order languages." Zeitschr. f. math. Logik und Grundlagen d. Math. **32**, 331–340.
- [22] Dubois D. and Prade, H. (1980). *Fuzzy Sets and Systems: Theory and Applications*. New York: Academic Press.
- [23] Dubois, D. and Prade, H. (1990). "Fuzzy sets in approximate reasoning — Part 1: Inference with possibility distributions," Fuzzy Sets and Systems **40**, 143–202.
- [24] Dubois, D., Lang, J. and Prade, H. (1991). "Fuzzy sets in approximate reasoning — Part 2: Logical approaches," Fuzzy Sets and Systems **40**, 203–244.
- [25] Esteva, F., Godo, L., Hájek, P. and Navara, M. (1999). "Residuated fuzzy logics with an involutive negation," Archive for Mathematical Logic. (to appear).
- [26] Eytan, M. (1981). "Fuzzy sets: a topos-logical point of view," Fuzzy Sets and Systems **5**, 47–67.
- [27] Gallin, D. (1975). *Intensional and Higher-order Modal Logic*. Amsterdam: North Holland.
- [28] Gerla, G. (1994). "Comparing fuzzy and crisp deduction systems," Fuzzy Sets and Systems **67**, 317–328.

- [29] Girard J. Y. (1987). “Linear logic,” *Theor. Comp. Sci.*, **50**, 1–102.
- [30] Glushankof, D. (1992). “Prime deductive systems and injective objects in the algebras of Lukasiewicz infinite-valued calculi,” *Algebra Universalis* **29**, 354–377.
- [31] Goguen, J. A. (1967). “L-fuzzy sets,” *J. of Math. Anal. Applic.* **18**, 145–174.
- [32] Goguen, J. A. (1968-69). “The logic of inexact concepts,” *Synthese* **19**, 325–373.
- [33] Goldblatt, R. (1979). *TOPOI, The categorical analysis of logic*. Amsterdam: North-Holland.
- [34] Gottwald, S. (1989). *Mehrwertige Logik*. Berlin: Akademie-Verlag.
- [35] Gottwald, S. (1993). *Fuzzy Sets and Fuzzy Logic*. Wiesbaden: Vieweg.
- [36] Gottwald, S. and Novák, V. (1997). “On the Consistency of Fuzzy Theories,” *Proc. of VIIth IFSA World Congress, Prague*. Prague: Academia, 168–171.
- [37] Grätzer, G. (1978). *General Lattice Theory*. Berlin: Akademie-Verlag.
- [38] Hájek P. (1995). “Fuzzy logic and arithmetical hierarchy,” *Fuzzy Sets and Systems* **73**, 359–363.
- [39] Hájek, P. (1996). “Fuzzy logic as logic.” In: G. Coletti et al., ed.: *Mathematical Models of Handling Partial Knowledge in Artificial Intelligence*. Oxford: Pergamon Press.
- [40] Hájek P. (1997). “Fuzzy logic and arithmetical hierarchy II,” *Studia Logica* **58**, 129–141.
- [41] Hájek, P. (1998). *Metamathematics of fuzzy logic*. Dordrecht: Kluwer.
- [42] Hájek P., Esteva, F. and Godo, L/ (1995). “Fuzzy logic and probability,” in P. Besnard and S. Hanks, eds., *Proc. 11th Conf. on Uncertainty and Artificial Intelligence Montreal*, 237–244.
- [43] Hájek, P, Paris, J. and Shepherdson, J. (1998). The liar paradox and fuzzy logic. (to appear)
- [44] Higgs, D. (1973). *A category approach to Boolean/valued set theory*. Manuscript: University of Waterloo.
- [45] Höhle, U. (1991). “Monoidal closed categories, weak topoi and generalized logics,” *Fuzzy Sets and Systems* **42**, 15–35.
- [46] Höhle, U. (1992). “M-Valued Sets and Sheaves over Integral Commutative CL-Monoids,” in Rodabaugh, S. E, Klement, E. P., Höhle, U., eds., *Applications of Category to Fuzzy Subsets*. Dordrecht: Kluwer, 33–72.

- [47] Höhle, U. (1995). "Monoidal logic." In: Kruse, R., ed. *Foundations in Fuzzy Systems*. Wiesbaden: Vieweg.
- [48] Höhle, U. (1995). "Commutative residuated l-monoids," in [51], 53–106.
- [49] Höhle, U. (1995). "Presheaves over GL-monoids," in [51], 127–157.
- [50] Höhle, U. (1999). "Classification of Subsheaves over GL-algebras," Proc. of Logic Colloquium 98 Prague. Berlin: Springer Verlag.
- [51] Höhle, U. and Klement,E. P. (eds.) (1995), *Non-Classical Logics and Their Applications to Fuzzy Subsets. A Handbook of the Mathematical Foundations of Fuzzy Set Theory*. Dordrecht: Kluwer.
- [52] Johnstone, P.T. (1977). *Topos Theory*. London: Academic Press.
- [53] Kelley, J. L. (1957). *General Topology*. Princeton, New Jersey: Van Nostrand.
- [54] Klawonn, F. and Kruse, R. (1993), "Equality Relations as a Basis for Fuzzy Control," *Fuzzy Sets and Systems* **54**, 147–156.
- [55] Klawonn, F. and Novák, V. (1996). "The Relation between Inference and Interpolation in the Framework of Fuzzy Systems," *Fuzzy Sets and Systems* **81**, 331–354.
- [56] Klement, E. P., Mesiar, R. and Pap, E. *Triangular Norms*. Monograph in preparation.
- [57] Klir, G.J. and Yuan, B. (1995). *Fuzzy Sets and Fuzzy Logic: Theory and Applications*. New York: Prentice-Hall.
- [58] Kruse, R., Gebhardt, J. and Klawonn, F. (1994). *Foundations of Fuzzy Systems*, Chichester: Wiley.
- [59] Kulka, J. and Novák, V. (1984). "Have fuzzy operations a psychological correspondence?" *Studia psychologica* **26**, 131–141.
- [60] Kuz'min, V. B. (1985). "About semantical structure of linguistic hedges:an experimental hypothesis," *BUSEFAL* **24**, 118 - 125, Université Paul Sabatier, Toulouse.
- [61] Lakoff, G. (1973). "Hedges: A study in meaning criteria and logic of fuzzy concepts," *J. Philos. Logic* **2**, 458–508.
- [62] Lawvere, F.W., ed. (1971). *Toposes, Algebraic Geometry and Logic*. Berlin: Springer Verlag.
- [63] Lee R. C. T. (1972). "Fuzzy logic and the resolution principle," *J. Assoc. Comput. Mach.*, **19**, 109–119.
- [64] Lehmke, S. (1995). *On Resolution-Based Theorem Proving in Propositional Fuzzy Logic with 'Bold' Connectives*. Diploma thesis. University of Dortmund.

- [65] Łukasiewicz J. (1920). “O logice trójwartościowej (On three-valued logic),” *Ruch Filozoficzny*, **5**, 170–171.
- [66] Łukasiewicz, J. (1970). *Selected works* (col. by L. Borkowski). Amsterdam.
- [67] Mac Lane, S. and Moerdijk, I. (1992). *Sheaves in Geometry and Logic, A First Introduction to Topos Theory*. Berlin: Springer Verlag.
- [68] Makkai, M. and Reyes, E.G. (1977). *First Order Categorical Logic*. Berlin: Springer Verlag.
- [69] Mamdani, E.H. (1974). “Applications of fuzzy algorithms for simple dynamic plant,” *Proc. IEE* **121**, 1585–1588.
- [70] Mamdani E.H. and Assilian, S. (1975). “An experiment in linguistic synthesis with a fuzzy logic controller,” *Int. J. of Man-Machine Studies*, **7**, 1–13.
- [71] Marks-II, R. J. (1994). *Fuzzy logic technology and applications*. IEEE Technological Activities Board.
- [72] Mareš, M. (1994). *Computation over fuzzy quantities*. Boca Raton: CRC Press.
- [73] McLarty, C. (1995). *Elementary Categories, Elementary Toposes*. Oxford: Oxford Science Publications, Clarendon Press.
- [74] McColl H. (1897). “Symbolic reasoning. II,” *Mind*, N.S., **6**, 493–510.
- [75] McNaughton, R. (1951). “A theorem about infinite-valued sentential logic,” *J. Symb. Log.*, **16**, 1–13.
- [76] Mendelson, E. (1979). *Introduction to Mathematical Logic*. New York: D. Van Nostrand.
- [77] Menger, K. (1942). “Statistical Metrics”, *Proc. Nat. Acad. Sci.* **28**, 535–537.
- [78] Mesiar, R. and V. Novák (1977). “On Fitting Operations,” *Proc. of VIIth IFSA World Congress*, Prague: Academia, 286–290.
- [79] Mesiar R. and and H. Thiele (1999). “On T-quantifiers and S-quantifiers,” in: Novák V. and I. Perfilieva (eds.), *Discovering the World with Fuzzy Logic*. Heidelberg: Springer (to appear).
- [80] Mundici, D. (1986). “Interpretation of AF C^* -Algebras in Łukasiewicz Sentential Calculus,” *J. of Functional Analysis* **65**, 15–63.
- [81] Mundici, D. (1993). “Ulam games, Łukasiewicz logic, and AF C^* -algebras.” *Fund. Inf.* **18**, 151–161.

- [82] Mundici, D. (1993). "An Elementary Proof of Chang's Completeness Theorem for the Infinite-valued Calculus of Łukasiewicz." *Studia Logica* **58**, 79–97.
- [83] Mundici, D. (1994). "A constructive proof of McNaughton's theorem in infinite-valued logic." *J. of Symbolic Logic* **59**, 596–602.
- [84] Mundici, D., Cignoli, R. and D'Ottaviano, I.M.L. (1995). *Algebras of Lukasiewicz Logics*, (in Portuguese), Collection CLE, vol. 12, UNICAMP, Campinas, San Paulo, Brazil, (1994) 256 pages. Second edition, 1995. Expanded Edition in English, entitled "Algebraic Foundations of many-valued Reasoning", in preparation.
- [85] Negoita C. V. and Ralescu, D. A. (1975). *Application of Fuzzy Sets to System Analysis*. Stuttgart: Birkhauser.
- [86] Novák, V. (1989). "Sorites-like First-order Fuzzy Theories," Proc. of IIIrd IFSA Congress, Seattle.
- [87] Novák, V. (1989). *Fuzzy Sets and Their Applications*. Bristol: Adam Hilger.
- [88] Novák, V. (1990). "On the syntactico-semantical completeness of first-order fuzzy logic. Part I, II." *Kybernetika* **26**, 47–66; 134–154.
- [89] Novák, V. (1992). *The Alternative Mathematical Model of Linguistic Semantics and Pragmatics*. New York: Plenum.
- [90] Novák, V. (1992). "Fuzzy Logic As a Basis of Approximate Reasoning," in: Zadeh, L. A., Kacprzyk, J. (eds.), *Fuzzy Logic for the Management of Uncertainty*. New York: J. Wiley & Sons.
- [91] Novák, V. (1992). "On the Logical Basis of Approximate Reasoning," in: Novák, V., Ramík, J., Mareš, M., Černý, M., Nekola, J. (eds.), *Fuzzy Approach to Reasoning and Decision-Making*. Dordrecht: Kluwer; Praha: Academia, 17–27.
- [92] Novák, V. (1994). "Fuzzy Control from the Point of View of Fuzzy Logic," *Fuzzy Sets and Systems* **66**, 159–173.
- [93] Novák, V. (1995). "A New Proof of Completeness of Fuzzy Logic and Some Conclusions for Approximate Reasoning," Proc. Int. Conference FUZZ-IEEE/IFES'95, Yokohama, 1461–1468.
- [94] Novák, V. (1995), "Ultraproduct Theorem and Recursive properties of Fuzzy Logic," in [51], 341–370.
- [95] Novák, V. (1995). "Linguistically Oriented Fuzzy Logic Controller and Its Design," *Int. J. of Approximate Reasoning* 1995, **12**, 263–277.
- [96] Novák, V. (1995). "Towards Formalized Integrated Theory of Fuzzy Logic," in: Bien, Z, and K. Min (eds.), *Fuzzy Logic and Its Applications to*

Engineering, Information Sciences, and Intelligent Systems, Dordrecht: Kluwer, 353–363.

- [97] Novák, V. (1996). “On the Hilbert-Ackermann Theorem in Fuzzy Logic,” *Acta Mathematica et Informatica Universitatis Ostraviensis* **4**, 57–74.
- [98] Novák, V.: *Open Theories, Consistency and Related Results in Fuzzy Logic*. *Int. J. of Approximate Reasoning* **18**, 191–200.
- [99] Novák, V. and Perfilieva, I. (1997). “On Logical and Algebraic Foundations of Approximate Reasoning,” Proc. FUZZ-IEEE’97, Barcelona, 693–698.
- [100] Novák, V. and Perfilieva, I. (1997). “On Model Theory in Fuzzy Logic in Broader Sense,” Proc. Int. Conference EUFIT’97, Verlag Mainz, Aachen, 143–147.
- [101] Novák, V. and Perfilieva, I. (1999). “Evaluating Linguistic Expressions and Functional Fuzzy Theories in Fuzzy Logic,” in: Zadeh, L. A., Kacprzyk, J. (eds.), *Computing with Words in Systems Analysis*. Heidelberg: Springer Verlag (to appear).
- [102] Parikh, R. (1971). “Existence and Feasibility in Arithmetics,” *J. of Symb. Logic.*, **36**, 494–508.
- [103] Pavelka, J. (1979). “On fuzzy logic I, II, III,” *Zeit. Math. Logic. Grundl. Math.* **25**, 45–52; 119–134; 447–464.
- [104] Perfilieva I. and Tonis, A. (1995). “Functional System in Fuzzy Logic Formal Theory,” *BUSEFAL*, **64**, 42–50.
- [105] Pitts, A.M. (1982) “Fuzzy sets do not form a topos,” *Fuzzy Sets and Systems* **8**, 101–104.
- [106] Ponasse, D. (1988). “Categorical studies of fuzzy sets,” *Fuzzy Sets and Systems* **28**, 235–244.
- [107] Post E. L. (1921). “Introduction to a general theory of elementary propositions,” *American J. of Math.*, **43**, 163–185.
- [108] Powell, M. J. D. (1980). *Approximation theory and methods*. Cambridge: Cambridge university press.
- [109] Pultr,A. (1976). “Fuzzy mappings and fuzzy sets,” *Comment. Mat. Univ. Carolin.*, **17**(3),
- [110] Pultr, A. (1976). “Closed categories of L-fuzzy sets,” *Vorträge zur Automaten und Algorithmentheorie*, TU Dresden.
- [111] Pultr, A. (1984). “Fuzziness and Fuzzy Equality,” in: Skala, H.J., Termini, S. and Trillas, E. (eds.) *Aspects of Vagueness*. Dordrecht:D.Reidel.

- [112] Rasiowa, H. and Sikorski, R. (1963). *The Mathematics of Metamathematics*. Warszawa: PWN.
- [113] Rescher N. (1969). *Many-Valued Logic*. New York: McGraw Hill.
- [114] Rose, A. and Rosser, J. B. (1958). "Fragments of many-valued statement calculi," *Trans. A. M. S.* **87**, 1–53.
- [115] Rosser, J. B. and Turquette, A. R. (1952). *Many-Valued Logics*. Amsterdam 1952.
- [116] Rosenfeld, A. (1971). "Fuzzy groups," *J. Math. Anal. Applic.* **35**, 512–517.
- [117] Russel, B. (1923). "Vagueness," *Australian J. Phi.* **1**, 84–92.
- [118] Scarpellini, B. (1962). "Die Nichaxiomatisierbarkeit des unendlichwertigen Prädikatenkalküls von Łukasiewicz," *J. of Symbolic Logic* **27**, 159–170.
- [119] Sgall, P., Hajičová, E. and Panevová, J. (1986). *The Meaning of the Sentence in Its Syntactic and Pragmatic Aspects*. D. Reidel: Dordrecht.
- [120] Shen Z. L., L. Ding and Mukaidono M. (1988). Fuzzy resolution principle. *Proc. 8th Int. Symp. on Multiple-valued Logic*, Palma de Mallorca, Spain, 210–214.
- [121] Shoenfield, J. R. (1967). *Mathematical Logic*. New York: Addison–Wesley.
- [122] B. Schweizer and Sklar, A. (1983). *Probabilistic metric spaces*. New York: North Holland.
- [123] Stout, L.N. (1991). "A survey of fuzzy set and topos theory," *Fuzzy Sets and Systems* **42**, 3–14.
- [124] A. Tarski (1956). *Logic, semantics, metamathematics*. Oxford: Oxford University Press.
- [125] Takeuti, G. and Titani, S. (1992). "Fuzzy logic and fuzzy set theory," *Arch. Math. Logic*, **32**, 1–32.
- [126] Trillas, E. and Valverde, L. (1985). "On the Implication of Indistinguishability in the Setting of Fuzzy Logic," in: Kacprzyk, J. and Yager, R. R., eds., *Management Decision Support Systems Using Fuzzy Sets and Possibility Theory*, Köln: Verlag TÜV Rheinland, 198–212.
- [127] Turunen, E. (1992). "Algebraic Structures in Fuzzy Logic," *Fuzzy Sets and Systems* **52**, 181–188.
- [128] Turunen, E. (1995). "Well-defined Fuzzy Logic. Fuzzy Sentential Logic," *Math. Logic Quarterly* **41**, 236–248.

- [129] Vopěnka, P. (1979). *Mathematics In the Alternative Set Theory*. Leipzig: Teubner.
- [130] Vopěnka P. (1990). *Fundamentals of the Mathematics In the Alternative Set Theory*. Bratislava: Alfa (in Slovak).
- [131] Wajsberg M. (1931). “Aksjomatyzacja trójwartosciowego rachunku zdań (Axiomatization of three-valued calculus),” Société des Sciences et Lettres Varsovie, cl. III, **24**, 126–148.
- [132] Wyler, O. (1995). “Fuzzy logic and categories of fuzzy sets,” [51], 235–268.
- [133] Ying, M. (1991), “Deduction theorem for many-valued inference,” Z. Math. Logic Grundlagen Math. **37**, 533–537.
- [134] Ying, M. (1992), “The fundamental theorem of ultraproduct in Pavelka’s logic,” Z. Math. Logic Grundlagen Math. **38**, 197–201.
- [135] Ying, M. (1992), “Compactness, the Loöwenheim-Skolem property and the direct product of lattices of truth values,” Z. Math. Logic Grundlagen Math. **38**, 521–524.
- [136] Zadeh, L. A. (1965). “Fuzzy Sets,” Inf. Control. **8**, 338–353.
- [137] Zadeh, L.A. (1971). “Similarity relations and fuzzy orederings,” Inf. Sci. **3**, 177–200.
- [138] Zadeh, L.A. (1973). “Quantitative Fuzzy Semantics,” Inf.Sci. **3**, 159–176.
- [139] Zadeh, L.A. (1973). “Outline of a New Approach to the Analysis of Complex Systems and Decision Processes,” IEEE Trans. Syst. Man and Cybern, **1**, 28–44.
- [140] Zadeh, L.A. (1975). “Fuzzy logic and approximate reasoning,” Synthese **30**, 407–428.
- [141] Zadeh, L.A. (1975). “The concept of a linguistic variable and its application to approximate reasoning I, II, III,” Inf. Sci., **8**, 199–257, 301–357; **9**, 43–80.
- [142] Zadeh, L.A. (1978). “Fuzzy Sets as a Basis for a Theory of Possibility,” Fuzzy Sets And Systems,” **1**, 3–28.
- [143] Zadeh, L.A. (1983) “A computational approach to fuzzy quantifiers in natural languages,” Comp. Math. with Applic. **9**, 149-184.