Norwich, A. M.; **Turksen, I. B.**
A model for the measurement of membership and the consequences of its empirical implementation. (English) Zbl 0538.94026
Fuzzy Sets Syst. 12, 1-25 (1984).

This research regards a controversial problem in the fuzzy set theory: the measurement of fuzziness; here a measurement model is proposed when the domain of discourse is order-dense (has an associated physical continuum). The authors prove - by representation and uniqueness theorems - that, in the above conditions, the membership of a fuzzy set is on an interval scale; the inapplicability of extensive measurement to fuzziness and the lack of a natural origin for membership are the arguments in the support of the measurement model. The preliminary results of an empirical study for the verification of this model and the construction of membership functions are also presented. Discussing the meaningfulness of operations on membership, the authors propose a method which involves the replacement of the membership function by a function derived from it, but which is on an absolute scale.

Reviewer: L.Olaru

MSC:

94D05   Fuzzy sets and logic (in connection with information, communication, or circuits theory)
91E99   Mathematical psychology

Cited in **44** Documents

Keywords:

scale invariance; fuzzy set; measurement of fuzziness; interval scale; empirical study; membership functions; absolute scale

Full Text: DOI

References:

[1]   Coombs, C.H; Dawes, R.M; Tversky, A, Mathematical psychology, (1970), Prentice-Hall Englewood Cliffs, NJ · Zbl 0205.23701

[2]   Edwards, W, Behavioural decision theory, (), 473-498

[3]   Goguen, J.A, The logic of inexact concepts, Synthese, 19, 325-373, (1969) · Zbl 0184.00903

[4]   Guilford, J.P, ()

[5]   Krantz, D.H; Luce, R.D; Suppes, P; Tversky, A, ()

[6]   MacVicar-Whelan, P.J, Fuzzy logic: an alternative approach, (), 152-158, IEEE · Zbl 0342.68057

[7]   Norwich, A.M; Turksen, I.B, The membership function of fuzzy set theory: representation, uniqueness, and construction, () · Zbl 0538.94026

[8]   Norwich, A.M; Turksen, I.B, The fundamental measurement of fuzziness, () · Zbl 0538.94026

[9]   Norwich, A.M; Turksen, I.B, The construction of membership functions, () · Zbl 0538.94026

[10]   Norwich, A.M; Turksen, I.B, Meaningfulness in fuzzy set theory, ()

[11]   Norwich, A.M; Turksen, I.B, Stochastic fuzziness, ()

[12]   Nunnally, J.M, Psychometric theory, (1978), McGraw-Hill New York

[13]   Saaty, T.L, Measuring the fuzziness of sets, Journal of cybernetics, 4, 4, 43-61, (1974) · Zbl 0319.02060

[14]   Sticha, P.J; Weiss, J.J; Donnell, M.L, Evaluation and integration of imprecise information, Final technical report PR 79-21-90, (1979), (also available from JSAS through Order Department, American Psychological Association, 1200 17th Street N.W., Washinton, DC 20036)

[15]   Suppes, P; Zinnes, J.L, Basic measurement theory, (), 1-76

[16]   Thole, U; Zimmermann, H.-J; Zysno, P, On the suitability of minimum and product operators for the intersection of fuzzy sets, Fuzzy sets and systems, 2, 167-180, (1979) · Zbl 0408.94030

[17]   Torgerson, W.S, Theory and methods of scaling, (1958), John Wiley and Sons New York

[18]   Turksen, I.B; Norwich, A.M, Measurement of fuzziness, (), 745-754 · Zbl 0538.94026

[19]   Zadeh, L.A, Fuzzy sets, Information and control, 8, 338-353, (1965) · Zbl 0139.24606

[20]   Zadeh, L.A, The concept of a linguistic variable and its application to approximate reasoning — II, Information sciences, 8, 301-357, (1975) · Zbl 0404.68074