

## ON THE EXISTENCE OF A FUZZY INTEGRAL EQUATION OF URYSOHN-VOLTERRA TYPE

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### Abstract

We present an existence theorem for integral equations of Urysohn-Volterra type involving fuzzy set valued mappings. A fixed point theorem due to Schauder is the main tool in our analysis.

**Keywords and phrases:** fuzzy integral equation, Urysohn-Volterra, Hausdorff metric, Schauder fixed point theorem.

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### REFERENCES

- [1] A. Arara and M. Benchohra, *Fuzzy solutions for boundary value problems with integral boundary conditions*, Acta Math. Univ. Comenianae, **LXXV** (1) (2006), 119–126.
- [2] M. Benchohra and M.A. Darwish, *Existence and uniqueness theorem for fuzzy integral equation of fractional order*, Commun. Appl. Anal. **12** (1) (2008), 13–22.
- [3] M.A. Darwish, *On maximal and minimal solutions of fuzzy integral equation of Urysohn type*, Accepted for publication in Int. Journal of Math. Analysis, 2006.
- [4] D. Dubois and H. Parde, *Towards fuzzy differential calculus, Part 1. Integration of fuzzy mappings*, Fuzzy Sets and Systems **8** (1982), 1–17.

- [5] D. Dubois and H. Parde, *Towards fuzzy differential calculus, Part 2. Integration of fuzzy mappings*, Fuzzy Sets and Systems **8** (1982), 105–116.
- [6] J. Dugundji and A. Granas, *Fixed Point Theory*, Monografie Matematyczne, PWN, Warsaw, 1982.
- [7] M. Friedman, Ma Ming and A. Kandel, *Solutions to fuzzy integral equations with arbitrary kernels*, Internat. J. Approx. Reason. **20** (3) (1999), 249–262.
- [8] R. Goetschel and W. Voxman, *Elementary Calculus*, Fuzzy Sets and Systems **18** (1986), 31–43.
- [9] O. Kaleva, *Fuzzy differential equations*, Fuzzy Sets and Systems **24** (1987), 301–317.
- [10] J. Mordeson and W. Newman, *Fuzzy integral equations*, Information Sciences **87** (1995), 215–229.
- [11] S. Nanda, *On integration of fuzzy mappings*, Fuzzy Sets and Systems **32** (1989), 95–101.
- [12] J.Y. Park and J.U. Jeong, *A note on fuzzy integral equations*, Fuzzy Sets and Systems **108** (1999), 193–200.
- [13] M.L. Puri and D.A. Ralescu, *Fuzzy random variables*, J. Math. Anal. Appl. **114** (1986), 409–422.
- [14] P.V. Subrahmanyam and S.K. Sudarsanam, *A note on fuzzy Volterra integral equations*, Fuzzy Sets and Systems **81** (1996), 237–240.

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