

## On the Solvability of Certain Nonlinear Systems of Fuzzy Relation Equations

Stefan Stanimirović

*University of Niš, Faculty of Sciences and Mathematics, Višegradska 33, 18000 Niš, Serbia*  
*e-mail: stefan.stanimirovic@pmf.edu.rs*

Ivana Micić

*University of Niš, Faculty of Sciences and Mathematics, Višegradska 33, 18000 Niš, Serbia*  
*e-mail: ivana.micic@pmf.edu.rs*

Miroslav Ćirić

*University of Niš, Faculty of Sciences and Mathematics, Višegradska 33, 18000 Niš, Serbia*  
*e-mail: miroslav.ciric@pmf.edu.rs*

Zorana Jančić

*University of Niš, Faculty of Sciences and Mathematics, Višegradska 33, 18000 Niš, Serbia*  
*e-mail: zorana.jancic@pmf.edu.rs*

Ivan Stanković

*University of Niš, Faculty of Sciences and Mathematics, Višegradska 33, 18000 Niš, Serbia*  
*e-mail: ivan.stankovic@pmf.edu.rs*

**Abstract.** Since the pioneering works of Sanchez [2, 3], the systems of fuzzy relation equations have steadily taken a fundamental role in fuzzy literature, not only because they possess numerous interesting mathematical properties, but also because of their application potential. The most studied ones are the *linear systems*, in which an unknown fuzzy relation is on the one side of the equal sign [1]. The situation is quite different with the *weakly linear systems*. Although they can occur in many forms, roughly speaking they consist of one or more unknown fuzzy relations on both sides of the equal sign. This talk aims to cover the mathematical foundations of the described problem (cf. [4–6]), and deals with the solvability issues of weakly linear systems over complete residuated lattices. We provide a characterization of the set of all solutions to weakly linear systems to a desired degree. Ultimately, we demonstrate the application aspects in aggregating fuzzy relation structures.

**Keywords:** Fuzzy relation equations; Fuzzy relation inequalities; Fuzzy preorders; Fuzzy equivalences; Fuzzy relation systems.

**Acknowledgement.** The authors acknowledge the support of the Science Fund of the Republic of Serbia, Grant No. 7750185, Quantitative Automata Models: Fundamental Problems and Applications – QUAM.

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