Abstract

The theory of sequence spaces of real or complex numbers has occupied an important position in various branches of pure mathematics. Due to its enumerable applications in summability theory, duality theory, matrix theory and the theory of functions, several mathematicians such as Simons (1965), Kizmaz (1981), Maddox (1988), Malkowsky and Savas (2004), Polat et al. (2011) have contributed to this theory by introducing and studying new spaces of scalar sequences from the existing one either in the conventional way or using different approach. Also to relax our known classical convergence criterion, the concept of statistical convergence is introduced where the idea of "Almost all" is replaced by "Majority" of the elements. Fast (1951) and Schoenberg (1959) introduced the notion of statistical convergence which is further extended by various authors such as Fridy (1985), Connor (1990), Colak and Bektas (2011), Et and Sengul (2014), Aktuglu (2014) and many others.

The "Fuzzy set" concept was first proposed by L. Zadeh, in 1965, as a means of handling the uncertainty of our environment. After introducing the level sets of fuzzy numbers, the basic arithmetic operations and metric on the set of all fuzzy numbers, mathematicians have received a serious consideration over the analytical approach of fuzzy numbers. Several authors such as Matloka (1986), Nanda (1989), Nuray (1998), Savas (2000a), Talo and Basar (2008) and many others have studied the sequences of fuzzy numbers in an analogous way as others did for scalar sequence spaces. Since the set of all fuzzy numbers is partially ordered and does not carry a group structure, so the results for the sequences of real numbers may not be valid in fuzzy setting. So the fuzzy set theory is not mere an extension of what has been known in real case.

The present work of the thesis is aimed to study some new quasilinear sequence spaces of fuzzy numbers using generalized weighted mean and also to introduce the concept of generalized weighted statistical convergence and summability of fuzzy functions.

To generalize the known summability methods such as Cesaro summability, weighted summability, etc., a new class $\lambda^F[u, v, f, r]$ of sequences of fuzzy numbers is introduced for $\lambda = c, c_0, l_1, l_\infty$ with the help of the generalized mean matrix $G(u, v)$. Topological properties and algebraic inclusion relations are established for this class. Using the difference operator Δ, the class of bounded variation is defined over $\lambda^F(u, v)$. Its relations with few earlier known classes are obtained. Some discussions are made based on the concepts of symmetric fuzzy numbers, equivalent fuzzy numbers etc.

The idea of weighted $\beta\gamma$ - statistical convergence for sequences of fuzzy functions is also introduced. The convergence is classified into pointwise, uniform and equi-statistical sense. The inter-relation among them are examined. Also, it is shown that the basic

properties such as limit, continuity, boundedness, etc., are preserved in equi-statistical sense of convergence if the weight sequence is bounded.

To include the classes of λ - summability, lacunary summability, etc., the notion of absolutely weighted $\beta\gamma$ - summability in case of fuzzy functions is defined. Its relations with the corresponding weighted $\beta\gamma$ - statistical convergence are investigated. Also to extend the Cesaro non-absolute summability, Riesz summability, the concept of ordinary weighted $\beta\gamma$ - summability of fuzzy functions is introduced. Finally a generalized version of Tauberian theorem is proved.

These two methods, namely, the classes of generalized weighted mean and the weighted $\beta\gamma$ - summability, are incomparable. In fact, the first one relaxes the weight condition, while the other one extends the interval condition.

Keywords: Fuzzy number; Modulus function; Generalized mean; Convergence free; Solid; Symmetric; Difference operator; Natural density; Statistical convergence; λ - statistical convergence; Lacunary sequence; Weighted convergence; Weighted summability.