## Some new concepts in fuzzy arithmetic \*

Badal Saxena<sup>†</sup> Saibal K. Pal<sup>‡</sup> Scientific Analysis Group, DRDO Metcalfe House Delhi 110054, India

## Abstract

The theory of classical fuzzy sets has found applications in diverse areas such as fuzzy control, fuzzy inferencing, fuzzy pattern recognition etc. However in its present form there are a number of drawbacks leading to limited applications for handling many real world problems. In this paper, the concepts of fuzzy sets, fuzzy numbers and fuzzy arithmetic are critically examined and need for their improvement is explained. Based on Piegat's work, modifications in the existing schemes are suggested and computer implementation is carried out for their realization.

*Keywords and phrases :* Fuzzy sets, fuzzy numbers, fuzzy arithmetic, membership function,  $\alpha$ -cut, qualification probability.

## 1. Introduction

The concept of partial membership of elements in sets or fuzzy sets [1] was introduced by Zadeh in 1965 for representation/manipulation of data and information processing of non-statistical uncertainties. It was specifically designed to mathematically represent uncertainty and vagueness and to provide formalized tools for dealing with the imprecision intrinsic to many problems. In the last few decades, fuzzy sets have been defined by different authors in different ways.

**Zadeh's definition (1965) [1].** A fuzzy set *F* is equivalent to a given reference set  $\Omega$  and a mapping  $\mu_F$ , of  $\Omega$  into [0, 1], the unit interval.

*Journal of Discrete Mathematical Sciences & Cryptography* Vol. 13 (2010), No. 3, pp. 257–270 © Taru Publications

<sup>\*</sup>This paper was presented at 'Pre-ICM International Convention on Mathematical Sciences' held at Department of Mathematics, University of Delhi, 18-20 December, 2008.

<sup>&</sup>lt;sup>†</sup>*E-mail*: saxenabadal@yahoo.com

<sup>&</sup>lt;sup>‡</sup>E-mail: skptech@yahoo.com