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Short Note on Research Findings and Results: An Innovative Fuzzy Computing for Industrial Production Planning

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Introduction

The Findings of research

In general, this research work has achieved its objectives in formulating a new form of membership function and in investigating its applications in industrial production planning. This new form is a modified version of the S-curve membership function that is logistic within non linear membership functions [1]. The research findings are discussed below:

Formulation of modified S-Curve membership function

In the first part of this work a logistic membership function, within the non linear membership functions, has been formulated for solving IFLP (Interactive Fuzzy Linear Programming) problem as applied to industrial production system. This membership function is a modified form of the general set of S-curve membership functions. The flexibility of this membership function in applying to real world problem has been proved through an analysis [2,3].

Application of the modified S-Curve membership function

The S-curve membership function was used in generating certain fuzzy parameters towards solving an industrial production problem. This parameters are defined in terms of the fuzzy linear programming problem and named as the fuzzy coefficients of the objective function, fuzzy technical coefficients and fuzzy resource variables. Membership values for this fuzzy parameters are created by using the S-curve membership function. This formulation is found to be suitable in applying the Simplex Method in Linear programming (LP) approach. The fuzzy parameters are handled by this approach and the application of S-curve membership function has been demonstrated through an illustration example. This methodology of solving such a fuzzy based linear programming is named as Fuzzy Linear Programming approach (FLP). The developed methodology of FLP has provided a confidence in applying to real life industrial production planning problem. This approach of solving industrial production planning problem can have feed back within the decision maker, the implementer and the analyst. In such case this approach can be called as IFLP (Interactive Fuzzy Linear Programming) [4].

MATLAB platform and its Simplex Method of Linear Programming Tool Box has been found to be very suitable in solving FLP problem; hence this software has been extensively used throughout this research work.

Fuzzy product mix selection problem

An industrial application of IFLP through the S-curve membership function has been investigated using a set of real life data collected from a Chocolate Manufacturing Company. The problem of fuzzy product mix selection has been defined. Eight possible cases were identified depending upon sets of fuzzy and non fuzzy parameters. Necessary equations in each case have been formulated. Profits and satisfactory level have been computed using FLP approach. Since there are several decisions that were to be taken, a performance measure has been defined to identify the solution with higher level of profit and with a higher degree of satisfaction. It is to be noted that higher profit need not lead to higher degree of satisfaction [5].

Future Research Works

The following research topics can be considered for future research in this area of industrial production planning.

- There are three groups of parameters in the industrial production planning problem. They are objective coefficient, technical coefficient and resource variable. We only considered a group to be fuzzy or non fuzzy. However, in real life problem some variables within the group can be fuzzy while others are non fuzzy. This problem of dealing with such mixed fuzzy and non fuzzy coefficients may be considered for future research in using IFLP.
- The newly developed S-curve membership function has been found to be flexible in applying to the product mix selection problem. The use of the membership function can be investigated in applying IFLP of other industrial engineering related problems, such as job assignment and portfolio selection. Earlier work in these areas have been proposed by using linear or exponential membership functions [6-8].
- In this research work, only single objective (profit) function was considered. However, there are many real life situations in which more than one objective function have to be considered simultaneously. The approach of IFLP can be applied to these multi objective function problem. There are only few works reported in the literature in the area of applying multi objective function. Peidro and vasant [3] has proposed a solution for multi objective function problem using fuzzy method.
- The successfully implemented innovative fuzzy computing methodology in production planning can possibly applied in manufacturing systems, supply chain management, network analysis, vehicle routing problems, thermal optimization, economic dispatch and hybrid electrical vehicle problems [9-12].
- The industrial production problem that undertaken in this research work can be possibly solve my other meta-heuristics methods such as Evolutionary Algorithms, Artificial Neural

Network, Particle Swarm Optimization, Simulated Annealing, Bat Algorithms, Ant Colony Optimization, Cuckoo Search Algorithms, Gravitational Search Algorithms and Hybrid optimization algorithms [5-7].

The readers are strongly encouraged to refer to the following references in order to have more enlighten ideas on the above research topic and the detail of the discussion, results and findings.

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