#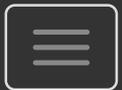 Hybrid tabu search hopfield recurrent ann fuzzy technique to the production planning problems: a case study of crude oil in refinery industry.

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Hybrid Tabu Search Hopfield Recurrent ANN Fuzzy

Technique to the Production Planning Problems: A Case Study of Crude Oil in Refinery Industry

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Abstract

The fuzzy technology reveals that everything is a matter of degree. At the moment, many industrial production problems are solved by operational research optimization techniques, under the considerations of some real assumptions. In this paper, the authors have several applications of fuzzy linear, non-linear, non-continues and other mathematical programming applications. The prime objective of this paper is to investigate a new application to the literature and to solve the crude oil refinery production problem by using the hybrid optimization techniques of Tabu Search (TS), Hopfield Recurrent Artificial Neural Network (HRANN) and fuzzy approaches. In application, the real world problem of refinery model has been developed and thorough comparative studies have been carried on varies optimization techniques. The final results and findings reveal that, the hybrid optimization technique provides better, robust, efficient, flexible and stable solutions.

Article Preview

Introduction

The first and meaningful momentum towards the mathematical formalization of fuzziness pioneered by

Zadeh (1965) is in its progress now (Orlovsky, 1980) when numerous attempts are being made to explore the ability of the fuzzy set theory to become a useful tool for adequate mathematical analysts of real-world situations.

From 1965 to 1977, fuzzy theory was developed and often referred to as the academic phase. The outcome was rather a small number of publications of a predominantly theoretical nature by a few contributors, mainly from the academic people. At this time, not much work in the area of fuzzy decision making was reported.

From 1978 to 1988, this period was called as the transformation phase where by significant advances in fuzzy set theory was developed and some successful practical real life problems were solved. In this period, some important principles in fuzzy set theory and its applications were established. But, work on fuzzy decision was still very small in number and not much publication was found in the area of engineering applications. Some of earlier works on fuzzy decision making can be found in Kickert (1978) and Zimmermann (1987).

The period from 1989 onwards was considered as the fuzzy boom period. In this period, tremendous application problems in industrial and business were tackled successfully. In early 1990s, fuzzy technique was used as ingredient to some soft computing problems. The aim of soft computing is to exploit, whenever possible, the tolerance for imprecision and uncertainty in order to achieve computational tractability, robustness, and low cost, by methods that produce acceptable approximation solutions to complex problems which are often not precisely solved.

Currently fuzzy technique is very much applied in the field of decision making. Fuzzy methods have been developed in virtually all branches of decision making, including multi-objective, multi-person, and multi-stage decision making (Tamiz, 1996). Apart from these, other research work connected to fuzzy decision making are applications of fuzzy theory in management, business and operational research (Zimmermann, 1991). Some of publications in Fuzzy Linear Programming (FLP) area in decision making can be found in Ross (1995), Klir and Yuan (1995), Yager, Ovchinnikov, Tong, and Nguyen (1987), Zimmermann (1985), and Dubois and Prade (1980).

In this research paper, application of fuzzy linear programming in decision making is considered. A hybrid optimization technique of Tabu search Hopfield Recurrent Artificial Neural Network is used to solve the fuzzy decision making problems in crude oil refinery industry. A modified logistic function (Watada, 1997) has been used to describe vagueness factor in the crude oil decision variables. This function is used in FLP problems to encourage an interaction among the decision maker, the analyst and the implementer. Considerable attention has been given earlier to solve FLP problem in various other approaches. Membership function such as exponential (Carlsson & Korhonen, 1986; Watada, 1997), Hyperbolic (Zimmermann, 1978) and trapezoidal (Luhandjula, 1986) have been employed in solving FLP problems in the area of engineering, science, management, economics and finance.

In the above mentioned applications, it is often difficult to determine with precision various coefficients in a problem because they are either specified subjectively by the decision maker or they are given through procedures requiring subjective answers to questions posed by analysts. Therefore, to deal with imprecise data, a fuzzy interval can be used. Some attempts in this direction on defining fuzzy intervals may be found where coefficients of the criteria are given by intervals (Bitran, 1980; Jiuping, 2000; Sengupta, Pal, & Chakroborthy, 2001).

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