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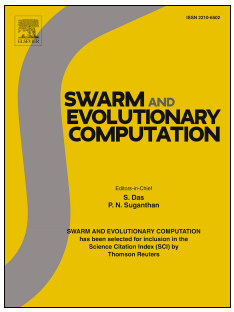

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ACCEPTED MANUSCRIPT

A Generic Fuzzy Approach for Multi-objective Optimization under Uncertainty

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Abstract

Multi-objective optimization under uncertainty has gained considerable attention in recent years due to its practical applications in real-life. Many studies have been conducted on this topic, but almost all of them transformed the problem into a mono-objective one or just neglected the effects of uncertainty on the outcomes. This paper addresses specific uncertain multi-objective problems in which uncertainty is expressed by means of triangular fuzzy numbers. To handle these problems, we introduced a new approach able to solve them without any transformation by considering fuzziness propagation to the objective functions. The proposed approach is composed of two main contributions: First, a fuzzy Pareto dominance is defined for ranking the generated fuzzy solutions. Second, a generic fuzzy extension of well-known evolutionary algorithms is suggested as resolution methods. An experimental study on multi-objective Vehicle Routing Problems (VRP) with uncertain demands is finally carried to evaluate our approach.

Keywords: Multi-objective optimization, Fuzzy sets, Triangular fuzzy numbers, Pareto dominance, Evolutionary algorithms, Vehicle routing problem

1. Introduction

Multi-objective optimization is an important and complex field in decision making in which many scientific and industrials must cope. Indeed, in many

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