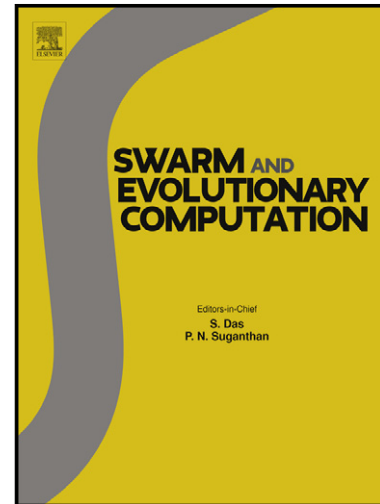


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# Stability of Pareto optimal Allocation of Land Reclamation by Multistage Decision-based Multipheromone Ant Colony Optimization

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## Abstract

The assignment of multiobjective human resources is a very important phase of the decision-making process, especially with respect to research and development projects where performance strongly depends on human resources capabilities. Unfortunately, the input data or related parameters are frequently imprecise / fuzzy owing to incomplete or unobtainable information, which can be represented as a fuzzy numbers. This paper presents a multiobjective multipheromone ant colony optimization approach (MM-ACO) with an application in fuzzy multiobjective human resource allocation problem. Our approach has two characteristic features. Firstly, a set of nondominated solutions is obtained by exploring the optimal Pareto frontier using different  $\alpha$  cut level and subsequently, based on the definition of Pareto stability, the Pareto frontier may be reduced to manageable sizes (i.e., Stable Pareto optimal solutions) where in a practical sense only Pareto optimal solutions that are stable are of interest, since there are always uncertainties associated with the efficiency data. Furthermore, we provided an example of optimum utilization of human resources in reclamation of derelict land in Toshka-Egypt.

## Keywords

Multiobjective Resource allocation problem, Fuzzy numbers, Ant colony optimization

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