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**Adaptive Tuning of All Parameters in a Multi-Swarm Particle Swarm Optimization Algorithm.
An Application to the Probabilistic Traveling Salesman Problem**

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Abstract

One of the main issues in the application of a Particle Swarm Optimization (PSO) algorithm and of every evolutionary optimization algorithm is the finding of suitable parameters for the algorithm. In this paper, we use a parameter free version of a Multi-Swarm PSO algorithm where random values are assigned during the initialization of all parameters (including the number of swarms) of the algorithm and, then, during the iterations the parameters are optimized together and simultaneously with the optimization of the objective function of the problem. This idea is used for the solution of the Probabilistic Traveling Salesman Problem (PTSP). The PTSP is a variation of the classic Traveling Salesman Problem (TSP) and one of the most significant stochastic routing problems. In the PTSP, only a subset of potential customers needs to be visited on any given instance of the problem. The number of customers to be visited each time is a random variable. The proposed algorithm is tested on numerous benchmark problems from TSPLIB with very satisfactory results. It is compared with other algorithms from the literature, and, mainly with a Multi-Swarm Particle Swarm Optimization with parameters calculated with a classic trial - and - error procedure and they are the same for all instances.