# An Analysis of Particle Swarm Optimization

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## ABSTRACT

Data mining is a very powerful technology. It aims at the extraction of predictive information enabling discovery of knowledge from very large datasets. The process of knowledge discovery from databases requires fast and automated clustering of huge datasets with several attributes of different types. This poses as a severe challenge for the traditional clustering techniques. Various bio-inspired algorithms, well-known as Swarm Intelligence(SI) that meets these requirements have successfully been applied to a number of real world clustering problems. Particle Swarm Optimization(PSO) is one such algorithm that is used in applications such as integer programming, scheduling and routing. This paper focuses on the improvement of the limitations of the PSO algorithm and expanding the scope of its applications to real world problems.

## INTRODUCTION

Particle Swarm Optimization(PSO) is a population based search algorithm based on the simulation of the social behavior of flock of birds, swarm of bees or a school of fishes. PSO graphically simulates the unpredictable movements of flock of birds. Each individual within the swarm is represented by a vector in multidimensional search space. This vector has also one assigned vector which determines the next movement of the particle and is called the velocity vector[8]. The PSO also determines the updation mechanism for the velocity of a particle. Each particle updates its velocity based on current velocity and the best position it has explored so far; and also based on the global best position explored by swarm[3]. The advantages of PSO are very few parameters to deal with and large number of processing elements, so called dimensions. These advantages enables to fly around the solution space effectively[5]. The PSO is an efficient global optimization solution for continuous variable problems. By virtue of its nature, the concept of PSO has been extended to many areas such as antennas, biomedical applications, communication networks, clustering and classification, combinatorial optimization[4]. The disadvantages of particle swarm optimization (PSO) algorithm are that it is easy to fall into local optimum in high-dimensional space and has a low convergence rate in the iterative process.

## LITERATURE REVIEW

Particle swarm optimization is a very simple concept and its paradigms can be implemented in a few lines of computer code. It requires only primitive mathematical operators, and is computationally inexpensive in terms of both memory requirements and speed. It has roots in two main component methodologies. Perhaps more obvious are its ties to artificial life (A-life) in general, and to bird flocking, fish schooling, and swarming theory in particular[1]. It is also related, however, to evolutionary computation, and has ties to both genetic algorithms[5] and evolutionary programming[1]. Significant research has been carried out recently to find the optimal path in network routing[5]. Around 24 papers (3.5%) in the database deal with combinatorial optimization problems. These include applications on floor-planning, travelling-salesman problems, packing and knapsack, minimum spanning trees, satisfiability, path optimization, knights cover problem, n-queens problem, layout optimization, vehicle routing, urban planning[7].

## METHODOLOGY

One difficulty seen was with simple functions with single highest value(unimodal), where regrouping is unnecessary since particles quickly move towards a suboptimal solution which affects the accuracy of the final result. So, performance can be improved in association with an improved local minimizer without regrouping with the aid of extreme programming techniques and supervised learning of particle-grouping. We will study diversity in PSO systematically by combining PSO with other clustering algorithms as there are still gaps in understanding of the effects of diversity in PSO algorithm.

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