Optimization Theory And Their Related Technology

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Abstract—Optimization is a technique of finding out the best solution from a group of solution. Optimization of a system searches the best value from a solution of data base, which not only enhances the accuracy but also enhances the efficiency of finding a solution. Due to vast amount of data in the data base sys- tem the data clustering has dragged the focus many researchers for finding out the optimization based solution. Among the different available techniques the swarm optimizations find itself most suitable, particularly the particle based swarm optimization technique. This technique was developed from the inspiration of ant and honey bees. These creatures are always tries to extract more information about their destination with high speed and accuracy. This concept leads to finding out a solution from a set of solution which is not only suitable for the group but also suitable for the individual as a single. This paper describes about the details of swarm optimization techniques and their related application to the search method. In the second part of the paper some hierarchical model are considered for finding out the better solutions.

Index Terms—Algorithm, Clustering, PSO, Data mining.

I. INTRODUCTION

With the increase in the data in the data base, it becomes very difficult to extract the data. When the data increases beyond the limit of a system it becomes very tedious to extract the data. Although the increased no of data give more flexibility to the system for finding out the best solution but at the same time it decreases the speed of extraction of the data. Sometimes for finding out a particular solution , data are extracted from the different sources like primary source, secondary source and other related sources . These data upon extraction from their sources are integrated in a system are stored in some other place. With some transformation techniques they are transformed into suitable data mining system. Pattern recognition is then applied to find the best value from the mining. Knowledge based technique that may be personal or group can be applied to find the best performed solution. Data mining of the system basically extracts the data pattern, their coding techniques, and their sequence of organization, pattern and the probable model prediction from the different sources of system data. The data may be available in a structured format or in a non-structured format and again it may include a text document, a picture, and an audio clip or may be a video clip. So the extraction of these data depends upon the extractor efficiency and their expertise in the subject.

Data clustering is the process of combining the un structured data which are extracted from a group of data, are arranged in a group of data depending upon the similarity

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present in between them. The grouping of these data may be in the form of supervisory or un-supervisory control manner. The clustering generally includes combing the data depending on the similarity, grouping the data, assessing the performance of the output. Among the different available algorithms Hier- archy based model and Partition based model are best suited. Partition based model divides the system into small small sub group depending on the similarity between them. The similarity measures in the form of distance, speed, and time of the system. Distance based system find the best solution by comparing the system solution with the desired value or the centre value of the system. The centre represents the object of the function which again changes its position depending upon the iteration value or number. Every time the centre position and the new iteration value are updated till convergence does not appear. To maintain a constant centre value during the

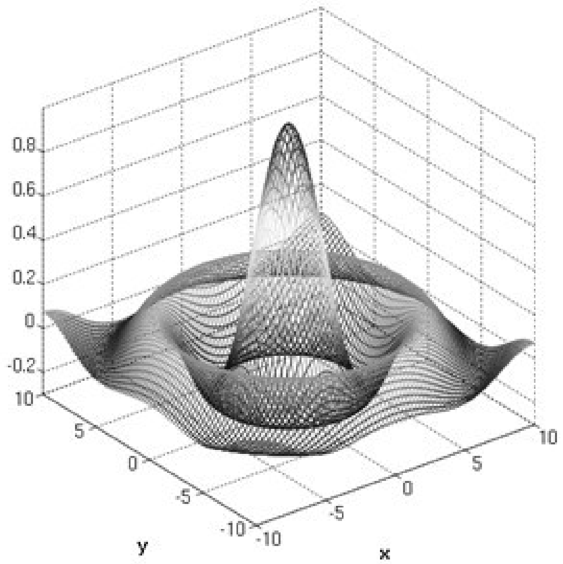

Fig. 1. optimization around the centre position

iteration procedure K map clustering technique may be used. It finds its centre position by dividing the distance measure with that of the data sheet. To handle the sensitivity problem K harmonic clustering can be used. The K method is very efficient method but its solution depends upon the initial domain value.

The Bees Algorithm is derived from the ecological behavior of honey bees. Nectar collected from different parts of the environment are generally stored in their hib. The collection generally depends on the group decision and not the individual decision. Bee Colony Optimization (BCO), Bee System (BS),Artificial Bee Colony (ABC) are some of the examples of optimization techniques i.e. being used worldwide.

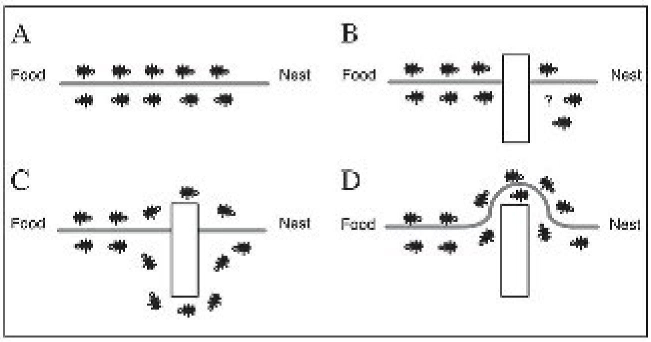

Fig. 2. Ant colony optimization scheme

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II. PARTICLE SWARM INTELIGENCE

Particle swarm intelligence was derived from the biological behavior concept of birds, animals and creatures. The concept was derived from the birds when they are searching for their food not for individual benefit but for the group as a whole. One of the most important things in the Swarm is their behavior in a decentralized manner, self discipline in the group, co-operation among the individual and performance oriented work. The algorithm which represents the above behavior finds itself a best technique in optimization of the data. Different types of swarm optimization techniques are available for optimizing the solution however the particle swarm optimization and ant colony optimization are two efficient solution techniques. These techniques are generally suitable for solving the continuous and discrete function with constrained and un-constrained parameter. The behavior of the particle in the swarm is being affected by the environment to which they belongs and the individual past experience. The individual experience is known as the particle best or pBest which basically determines the best performance given by an individual where as gBest determines the best performance given by the group as a whole. In particle swarm optimization the performance are basically evaluated in terms of velocity, position i.e. both initial and final and cognitive components of the particles.

III. WORKING METHODOLOGY

In recent year the development of differential evolution has provided a new plat form for finding out the solution for non linear and non differentiable fun over the continuous space[22]. Differential evolution utilizes only a few parameter and is a straight forward method for finding out a solution. From efficiency and accuracy point of view it is most suitable and flexible method as compared to others.

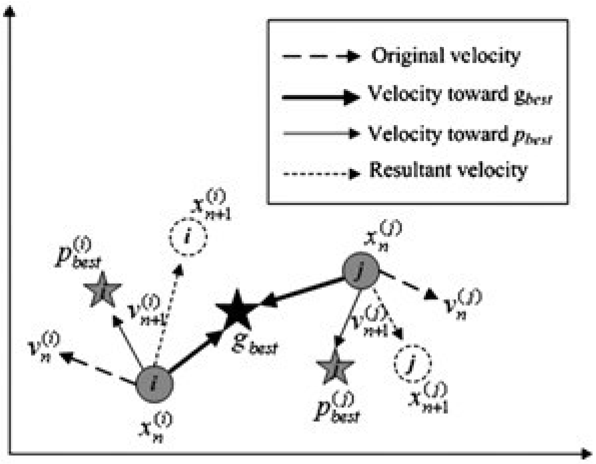

Fig. 3. Effect of pBest and gBest on the particle

Particle swarm optimization generally starts with the initial random declaration and initialization. Each particle in the swarm is considered as a solution. The initial random consideration about the particle must converge itself into a best solution at the end of the solution. Generally 25 to 40 numbers of particles are initially considered for finding out a solution but however there is no restriction on its consideration. One can choose more number of swarm. The increased number of swarm generally decreases the search methodology. Each particle in the swarm starts moving in a direction so as to find a best position. The movement of the particle is generally affected by the cognitive and social components. The cognitive component effect on the particle can be defined as [11]

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pBestn(n+1)= $\{pBest(n) \quad if\ (xn(n+1)\ is\ greater$
$\{$Xn(n) $\quad if\ (xn(n+1)\ is\ less$

Here pBest is the best particle position where as the Xn(n+1) denotes the new position of the particle. After every iteration the position of the particle is changed to the position. Similarly gBest defines the best global position of the particle. The resultant motion of the particle in the swarm generally affected by the influence of the both pBest and gBest. The velocity of the particle in the system is bounded by the Vmin and Vmax, where V represents the velocity of the particle. Figure 2 shows that X(n) is the initial position and Xn(n+1) is the final position after the completion of the iteration.

IV. INTEGRITY OF PSO

Due to its flexibility and target oriented performance it finds its maximum application in the field of search engine. However now a days it is not limited to only search engine but extended to sensor algorithm, image processing, robotic arm movement algorithm and OPF. The demand for energy is increasing day by day and the cost of producing and maintance cost is also increasing. To limit this some controlling strategies must be taken into consideration. This controlling strategies can be found out with the help of PSO. The OPF is basically a non linear function which has to be optimized against some constraint and un constraint parameter. Due to the following merits of the PSO it find a lot of applications such as, Local minima can be avoided. The movement of the system is affected by the performance of both global and local variables. Non differentiable equation can be eliminated Due to its coincidence property it can handle lots of data from different base at a time. Convergence of the system is not affected by the initial gauss of the particle in the swarm.

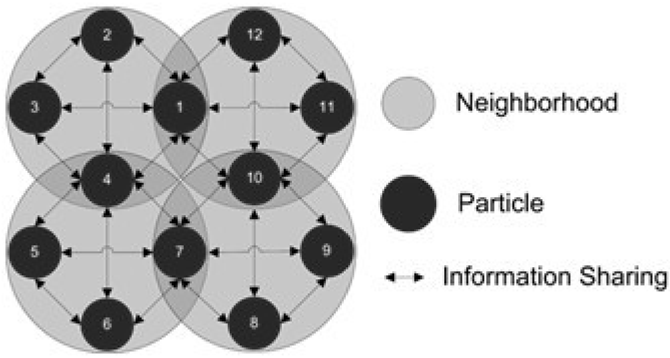

Fig. 4. Particle information sharing System

V. CONCLUSION

Particle swarm optimization has dragged the focus of many researchers because of its simplicity and versatility. It reduces the latency time by reducing the search area. Its divide and game rule give more flexibility to the user for finding out the best solution. However the application of PSO requires a sound and through knowledge of coding and parameter of PSO. This acts as a drawback to the evolutionary concept of PSO. It is required to develop a global platform where anyone can acess the PSO without prior knowledge about the coding. Almost all the research on PSO describes the applications and algorithm. For checking the validation of these algorithm some testing tools must be designed inn the future so as to enhance the research work. This paper describes some of the emerging areas of the applications of PSO.

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