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Analysis of Mean, Standard Deviation and Global Minimum using Animal Migration Optimization

Ashish Anjana[1], Mr. Sachin Upadhyay[2]

Student, Computer Science and Engineering, Alpine Institute of Technology , Ujjain, India[1]

Asst Professor, Computer Science and Engineering, Alpine Institute of Technology, Ujjain, India[2]

Abstract: The animal migration is constant and straightenedout movement affected by the animal's own locomotory exertions carrying them to new habitats. It depends on some impermanent inhibition of station keeping responses but promotes their ultimate disinhibition and recurrence. Animal migration is the relatively long-distance movement of individuals, usually on a seasonal basis. It is a ubiquitous incident that can be found in all major animal groups, such as birds, mammals, fish, reptiles, amphibians, insects and crustaceans. The trigger for the migration may be local climate, local availability of food, and the season of the year, and so on. We perform Mean, Standard deviation and Global Minimum on the four techniques such as Sum, Ackley, Beale and Rosenbrock.

Keywords: Data mining, PSO, FA, CS, ABC, BA, Animal Migration Optimization.

I. INTRODUCTION

Data mining is a process to extract interesting, implicit, previously unknown and potentially useful knowledge or patterns from data in large databases [1]. It is one of those latest technology with potential to support or help organizations on the very vital processed data in their respective warehouse of data. Each and every Data mining technique is output of exhaustive research and development work.

Animal Migration Optimization (AMO) Algorithm is a novel heuristic optimization algorithm proposed by us recently. This algorithm is inspired by the animal migration behavior, a ubiquitous phenomenon that can be found in all major animal groups, such as birds, mammals, fish, reptiles, amphibians, insects, and crustaceans. There are mainly two process involved in this algorithm:
(1) In the first process, the algorithm simulates how the groups of animals move from the current position to the new position. During this process, each individual should obey three main rules.
(2) In the latter process, the algorithm simulates how some animals leave the group and some other join the group during the migration.

In present years, many optimizing technique have been established on the basis of animal behavior phenomena. For example firefly algorithm (FA) [22], cuckoo search (CS) [23], bat algorithm (BA) [25], artificial bee colony (ABC) [18], and particle swarm optimization (PSO) [17].

1. PSO : Partical swarm intelligence

Particle swarm optimization (PSO) is a population based stochastic optimization technique developed by Dr. Eberhart and Dr. Kennedy in 1995, inspired by social behavior of bird flocking or fish schooling. PSO shares many similarities with evolutionary computation techniques such as Genetic Algorithms (GA). The system is initialized with a population of random solutions and searches for optima by updating generations. However, unlike GA, PSO has no evolution operators such as crossover and mutation. In PSO, the potential solutions, called particles, fly through the problem space by following the current optimum particles.

2. FA : Firefly Algorithm

For simplicity in describing our new Fireflire Algorithm (FA), we now use the following three idealized rules: 1) all fireflies are unisex so that one firefly will be attracted to other fireflies regardless of their sex; 2) Attractiveness is proportional to their brightness, thus for any two flashing fireflies, the less brighter one will move towards the brighter one. The attractiveness is proportional to the brightness and they both decrease as their distance increases. If there is no brighter one than a particular firefly, it will move randomly; 3) The brightness of a firefly is affected or determined by the landscape of the objective function. For a maximization problem, the brightness can simply be proportional to the

value of the objective function. Other forms of brightness can be defined in a similar way to the fitness function in genetic algorithms[22].

3. CS : Cuckoo search

Cuckoo search is a meta-heuristic algorithm inspired by the bird cuckoo, these are the „Brood parasites" birds. It never builds its own nest and lays their eggs in the nest of another host bird nest. Cuckoo is a best-known brood parasite. Some host birds can engage directly with the intruding cuckoo. If the host bird identifies the eggs that are not their egg then it will either throw that eggs away from its nest or simply rid its nest and build a new nest. In a nest, each egg represents a solution and cuckoo egg represents a new and good solution. The obtained solution is a new solution based on the existing one and the modification of some characteristics. In the simplest form each nest has one egg of cuckoo in which each nest will have multiple eggs represents a set of solutions. CS [23] is successfully used to solve scheduling problems and used to solve design optimization problems in structural engineering. In many applications like speech reorganization, job scheduling, global optimization.

4. ABC : Artificial Bee Colony

Artificial bee colony (ABC) algorithm is a recently proposed optimization technique which simulates the intelligent foraging behavior of honey bees. A set of honey bees is called swarm which can successfully accomplish tasks through social cooperation. In the ABC algorithm, there are three types of bees: employed bees, onlooker bees, and scout bees. The employed bees search food around the food source in their memory; meanwhile they share the information of these food sources to the onlooker bees. The onlooker bees tend to select good food sources from those found by the employed bees. The food source that has higher quality (fitness) will have a large chance to be selected by the onlooker bees than the one of lower quality. The scout bees are translated from a few employed bees, which abandon their food sources and search new ones. In the ABC algorithm, the first half of the swarm consists of employed bees, and the second half constitutes the onlooker bees. The number of employed bees or the onlooker bees is equal to the number of solutions in the swarm [18].

5. BA : Bat Alogithm

It is again very effective optimization technique which is based on a meta heuristic search method which is innovated by Xin She Yang in 2010 [25]. The echolocation microbatbehaviour is responsible for this algorithm. This is with changeable pulse emission with loudness. We can be summarized idolization of echolocation as below: Where we can consider that virtual bat flies randomly (velocity veli), which is at position xi (which we can consider as solution). This is always consider along varying frequency Ai at any ith step of process .

II. ANIMAL MIGRATION PROCESS

In animal behavior ecology, migration could be a widespread development within the Animalia has been studied intensively. The migration is persistent and straightenedout movement stricken by the animal's own locomotory exertions carrying them to new habitats. It depends on some temporary inhibition of station keeping responses however promotes their ultimate disinhibition and return.

Animal migration is that the comparatively long-distance movement of people, sometimes on a seasonal basis. it's a present development which will be found altogether major animal teams, like birds, mammals, fish, reptiles, amphibians, insects, and crustaceans. The trigger for the migration could also be native climate, native accessibility of food, and therefore the season of the year, and so on. The standard image of migration is of northern landbirds, like swallows and birds of prey, creating long flights to the tropics [22].

Within the migration method, the best mathematical models of animal aggregations usually instruct the individual to follow 3 rules: (1) move within the same direction as your neighbors; (2) stay near your neighbors; and (3) avoid collisions along with your neighbors. Recent studies of oscine flocks have shown that every bird modifies its position associated with the six or seven animals directly around it, regardless of however shut or however isolated those animals square measure [23, 24]. Interactions between flocking starlings square measure so supported a topological rule instead of a metric rule.

In this paper, supported these rules, we have a tendency to projected a replacement swarm intelligent formula, referred to as as animal migration improvement, in line with these rules. The key plan is enforced by means that of concentric ''zones'' around every animal. within the zone of repulsion, the focal animal can obtain to distance itself from its neighbors to avoid collision. Slightly additional away, the focal animal can obtain to align its direction of motion with its neighbors within the zone of alignment. within the outmost zone of attraction, the focal animal can obtain to maneuver toward a neighbor.

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The algorithm of animal migration divided into two parts.
1) Animal migration process
2) Animal updating process.

In the migration process, the algorithm shows the movement of groups of animal move from one position to another position. During this time increase of animal population calculate by algorithm how animals are updated by probabilistic method.

1) Animal Migration Process.
During the animal migration process, an animal should follow three rules:
(1) Avoid collisions through your neighbors;
(2) Move in a similar direction as your neighbors; and
(3) Remain close to the your neighbors.

The idea of local neighborhood of an individual is described through the topological ring use. For effortlessness, we set the neighborhood length to be five for each entity dimension. In this algorithm the neighborhood topology is static and is described on the set of indices of vectors.

If the animal index is j, then its neighborhood consists of the animal having indices j − 2, j − 1, j, j + 1, j + 2, if the animal index is 1, the neighborhood consists of animal having indices $NP - 1$, NP, 1, 2, 3, and so forth. Once the topology of neighborhood has been constructed, we select one neighbor randomly and also position update of the individual according to this neighbor, as can be seen in the following formula:

$$X_{i,G+1} = X_{j,G} + \delta.(X_{neiborhood\ ,G} - X_{j,G})$$

Where$X_{neiborhood\ ,G}$ is the neighborhood present position, δ is produced by using a random number generator controlled through a Gaussian distribution, $X_{j,G}$ is the current position of the ith individual, and$X_{j,G+1}$ is the novel position of ith individual.

2) Population Updating Process.
During the population updating process, the algorithm simulates how some animals leave the group and some join in the new population. Individuals will be replaced by some new animals with a probability Pa. The probability is used according to the value of the fitness. We sort fitness in descending order, so the probability of the individual with best fitness is $1/NP$ and the individual with worst fitness, by contrast, is 1, and the procedure can be shown in Algorithm 1.
In Algorithm 1, $r1$, $r2 \in [1, \ldots,]$ are randomly chosen integers, $r1 \neq r2 \neq i$. After producing the new solution $X_{i,G+1}$, it will be evaluated and compared with the $X_{i,G}$, and we choose the individual with a better objective fitness:

$$X_i = \begin{cases} X_{i,} & if\ \ f(X_{i,}) is\ better\ \ tHan\ f(X_{i,G+1}), \\ X_{i,G+1} & otherwise \end{cases}$$

III. LITERATURE SURVEY

DominikFisch [30] in 2014 author initiate novel fusing classifiers approach at the amount of categorization rules parameters the 2 completely different new methodology to fuse probabilistic generative classifiers (CMM) into one. Multinomial distributions for categorical input and variable traditional distributions ar the most foundation of this system. the fundamental advantage of this fusion is to hyper distributions everywhere the fusion method used parts employed in on-line coaching.

JianlinXu, [31] in 2013 to enhance the safety standing of mobile app author counsel a way for mobile apps supported data processing and cloud computing to separate out malware apps from mobile app markets and additionally gift model system is mobsafe. Mobsafe combined the static and dynamic analysis strategies ar SAAF and ASEF to guess the overall time required to calculate all the apps hold on in one mobile app market.

NeelamadhabPadhy, [34] in 2012 the author justify concerning the 2 data processing applications i.e. generic applications and domain specific applications. It's determined that no generic application is absolutely generic. There ar limitations of generic applications of information mining. Domain and knowledge, context parameters and aim of information mining attempt to influence the info mining choices. Domain specific applications produce extra correct outcomes that ar over ninetieth and these ar additional specific for data processing. it's troublesome to style such mining system that works for any domain dynamically.

Shouyi Wang [27] in 2011 author defines that some reasonably errors ar detectable in advance; data processing strategies are often used for early detection of those numerical writing errors. Author used multichannel graphical record (EEG) recordings for measurement of police work errors together with 2 basic data processing techniques i.e. LDA and SVM. while not process info concerning eightieth error are often detected. Mistreatment data processing strategies it's doable to proactively predict keystrokes with errors supported EEG recordings. the sole disadvantage is that study relies on restricted knowledge pool, it perhaps not manufacture lead to generalized kind.

Mahdi Esmaeili [28] within the 2010 author gettable there's a large range of variables and objectives concerned in part engineering optimisation that can not be neglected, therefore solely multi-objective optimisation will manage it with efficiency and planned technique to use data processing approaches for part engineering optimisation procedure. The advantage of mistreatment these techniques is that less variables decrease the effective value of optimisation. Here straightforward variable reduction tool and a few data processing techniques ar applied for obtaining desired results. Even in worse case fifty fifth variables ar reduced and BFTree and J48 rules need fewer variables whereas LAD Tree algorithm utilizes a minimum of seven variables to classify knowledge set.

Sérgio Ramos, Zita depression [29] in 2008 author gift associate degree electricity medium voltage (MV) customers characteristics and categoryifications and additionally compare the 3 completely different bunch algorithms for taking varied clusters and it additionally presents the novel tariff structures to mistreatment for all client class.

Bartley D. Richardson [32] in 2008 author defines the strategies used through fellow's feedback and reactions from the scholars through integrates data processing and code engineering. STEP project relies on the engineering principles and relevant to student's lives. To extend the arrogance and learning skills of scholars applying STEM subject's mega miming outlet is calculated to grasp correlations in an exceedingly acquainted setting and additionally tabular array.

Elovici, Y., Kandel [33] author planned knowledge primarily based methodology to look at terror connected context. this system use algorithms of information mining to the matter context of terror-related websites. User will read all activities done by terrorist.

De socialist and Timmis [35] in 2002 planned a stopping criterion for aiNet rule supported nominal Spanning Trees that's named Hierarchy of aiNets. It's doable to separate mechanically the clusters, and sub-clusters, found in coaching knowledge sets.

De socialist and Timmis [36] in 2002 planned opt-aiNet. during this model network cells move consequently with its affinity and thru a suppression method that consists of removing those cells that affinities ar but a fix threshold. Otherwise, cells continue biological research and mutation processes.

Alonso et al. [37] build a modification of aiNet to model associate degree agent that performs the Iterated Prisoner's quandary (IPD) that attempt to realize a technique (most stirred up B-cell) within the immune memory. The most modification created to aiNet is within the memory mechanism: if a B cells else to memory it'll never be removed. During this paper we have a tendency to think about immune network algorithms as a main branch of artificial systems for anomaly detection to simulate reconciling immune system of our planned methodology.

IV. PROPOSED WORK

Animal migration optimization is a heuristic optimization algorithm. In AMO we explain that the animal migrate from one place to another because of two reasons , first due to food and second due to climatic conditions. When the animal move from its current position to new position they have to satisfy three condition these three conditions are – they do not collide with their neighbor, they are close with their neighbor and move in same direction as their neighbor. In AMO

- Initialize population
- Apply genetic algorithm for the generation of the population
- Then form Mutation over the population
- For calculate the fitness value of each animal, AMO (animal migration optimization) is applied
- Calculate the value of fitness function $(Xi)^2$
- Two conditions are taken for the calculation of the fitness function which can be taken into the form of ten conditions like two conditions for climate and five conditions from food
- After selecting condition multiply the value of fitness function with "score"
- On the basis of fitness function animal will be migrate

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V. EXPERIMENTAL ANALYSIS

The formula is coded in MATLAB 2013a and therefore the experiments were performed on Dell digital computer with 3.0 GHz processor with 1 GB memory. The code is run on 32-bit software on windows ten.

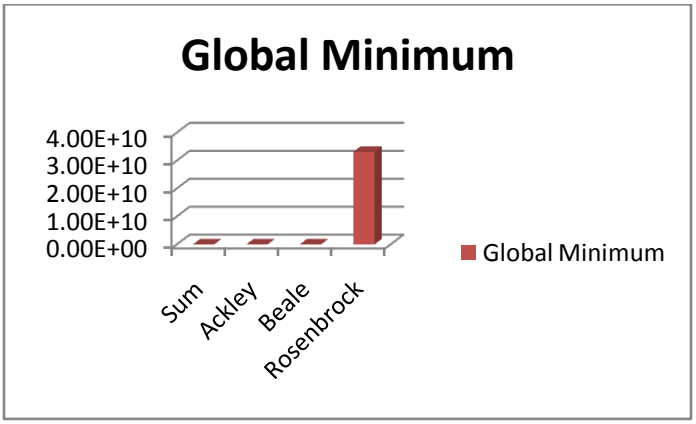
The results are calculated on few benchmark functions that show the animal migration formula performance and its operating. The factors that square measure calculated in AMO are- mean, variance and global minima. The benchmark functions taken are:

No.	Functions	Range	Formulation
1.	Sum	[-100,100]	$f(x) = \sum_{i=1}^{D} x_i^2$
2.	Ackley	[-35,35]	$f(x) = 20 * (1 - exp(-0.2 * \sqrt{(0.5 * (x1^2 + x2^2))}) - exp(0.5 * (cos(2\pi x_1) + cos(2\pi x_2))) + exp(1)$
3.	Beale	[-4.5,4.5]	$f(x) = (1.5 - x_1 + x_1 * x_2)^2 + (2.25 - x_1 + x_1 * x_2^2)^2 + (2.625 - x_1 + x_1 * x_2^3)^2$
4.	Rosenbrock	[-100,100]	$f(x) = \sum_{i=1}^{D} 100(x_2 - x_1^2)^2 + (1 - x_1)^2, 1)$

Results for benchmark functions in animal migration optimization are shown below:

S.No.	Functions	Algorithm	AMO
1.	Sum	Glob_min	4.6795e+04
		std	53.6247
		mean	3.7712
2.	Ackley	Glob_min	554.5001
		std	62.2806
		mean	-4.1179
3.	Beale	Glob_min	426.0937
		std	59.4734
		mean	7.3854
4.	Rosenbrock	Glob_min	3.3055e+10
		std	71.4819
		mean	-5.0798

These results show the results on varied benchmark functions that square measure thought of as common place functions so as to indicate the results on multiple factors and functions. The outcomes show the mean, variance and global minimum. The results square measure described in type of graphs and a comparison has been shown for the values:



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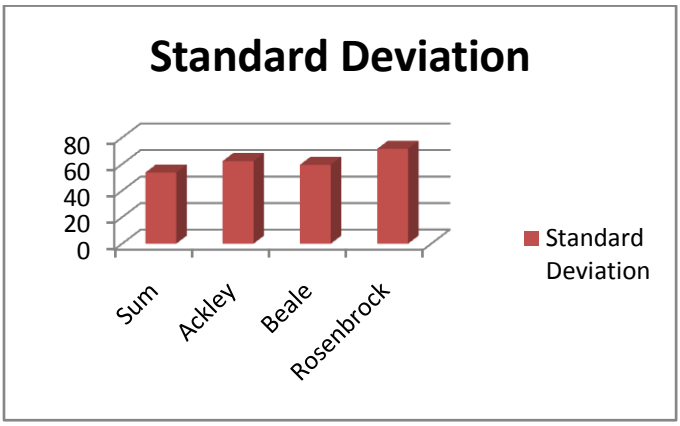

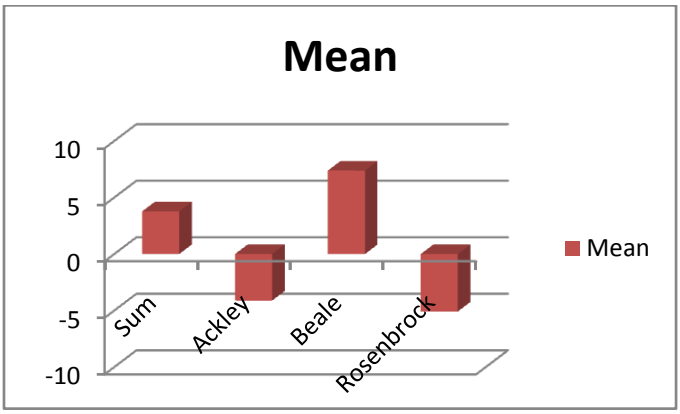

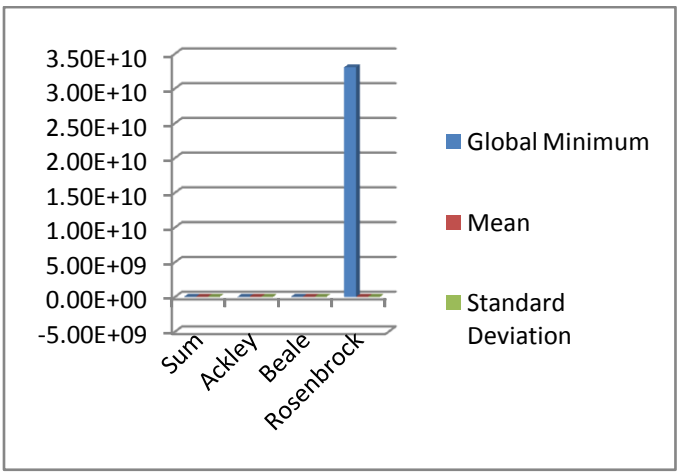

VI. CONCLUSION

Animal migration optimization is the method which is based on the behavior of animal migrartion. This is a new heuristic optimization algorithm which is a ubiquitous phenomenon that can be found in all major animal groups, such as birds, mammals, fish, reptiles, amphibians, insects, and crustaceans. It depends on some temporary inhibition of station keeping responses but promotes their eventual disinhibition and recurrence. Animal migration is the relatively long-distance movement of individuals, usually on a seasonal basis.

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