The Human Optimization Method (PhD)

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This paper is dedicated to everyone who is interested in the Artificial Intelligence. In the past, researchers have explored behavior of chromosomes, birds, fishes, ants, bacteria, bees and so on to create excellent optimization methods for solving complex optimization problems. The author proposed the Human Optimization in this paper. Humans progressed like anything. They help each other. There are so many plus points in Humans. In fact all optimization algorithms based on other beings are created by Humans. There is so much to explore in behavior of Human for creating awesome optimization algorithms. Artificial Fishes, birds, ants, bees etc have solved optimization problems. Similarly, optimization method based on Humans is expected to solve complex problems. This paper sets the trend for all optimization algorithms that come in future based on Humans.

Introduction

Many optimization algorithms have been proposed in literature based on the behavior of several living beings like Birds, Ants, Fishes and so on. The proposed algorithms were applied for solving various complex optimization problems. In papers [1], [2], [3], [4] optimization algorithms have been applied for solving clustering problem. These new algorithms are just some of several algorithms proposed by a corresponding author who is approximately 25 years young. Recently in [5] a new paradigm titled Smile Computing has been proposed. Similarly, one can find excellence (kindness, intelligence etc) of Humans all across the globe. Humans have progressed from a point of very few new algorithms every year to so many publications comprising of several new algorithms every few months. Hence there is something powerful in the way Humans live, love, help each other, motivate each other and so on with knowing or without knowing, with selflessness or with selfishness and so on. Hence in this paper The Human Optimization is proposed based on excellent beings called as Humans. Besides good features, it is also possible to mimic the features of Human which are not good. If one gets -100 as the next location at one step of the algorithm then opt for $+100$ which is opposite of what we obtained by imitating bad features of Human. Hence it is possible to go in optimal direction even from the results of imitating behaviors of Human which are not good. In this way, there is scope to find optimal solution by combining strength of all the features of Humans. One can design an innovative optimization algorithm by combining bad and good behaviors of Human. It is sure that the day has come to mimic the behavior of Humans who have so many awesome features to create powerful optimization algorithms. This paper sets this trend.

Terminology

- This sub-section explains the terminology used in the proposed method.

- Humans: These are the entities which search for solution in the search space. These entities imitate Humans in the real world.

- Location of Human: It is the location of that particular Human in search space. Hence it is a particular point in the search space.

- Guidance Locations of a Human: Each Human has N guidance locations where N is the number of Humans in the search space. N-1 guidance locations are meant for remaining N-1 Humans (one for each). The remaining one guidance location is for the Human himself. Hence each Human gets N Guidance Locations which are used to update Location of Human.

- Fitness value of Human: This is the value of the fitness function at that particular location of the Human.

- Fitness value of Guidance Location of Human: This is the value of fitness function at the Guidance Location of Human.

- Step: This value is used while updating the locations of Humans in the search space.

- Love array: Love array contains Love values. The movement of Human towards the guidance locations set by other Humans and one guidance location set by Human himself is based on these Love values in the Love array. The more the Love value the faster the Human moves towards selected Guidance Location.

Materials and Methods

Projected Clustering Particle Swarm Optimization has been applied in the preprocessing step to classification in [6]. In [7], VINAYAKA was developed which comes under the category of Semi-supervised clustering methods. This method is based on Differential Evolution. Huge amount of effort has been made so far to develop optimization methods based on living beings like Ants, Bees, Birds and so on. These methods have been applied for solving complex optimization problems. But the concept of love, sacrifice, kindness of other Humans and various other things that Human experiences in his life are yet to be used for creating innovative optimization methods. This paper is an attempt in this direction. The proposed The Human Optimization method is given in next sub-section. The nickname of this algorithm is PhD.

The Human Optimization Method (PhD)

Initialize Locations of Humans;
Initialize Guidance Locations of Humans;
Initialize Love array;
Initialize step;
while *Termination condition not reached* **do**
    Update Locations of Humans();
    Update Guidance Locations of Humans();
    Update Love array();
    Update Step();
end

Analysis of the Proposed Method

In the beginning all variables are initialized. The initialization is achieved by the following statements in the pseudo code:

Initialization part of PhD:
Initialize Locations of Humans;
Initialize Guidance Locations of Humans;
Initialize Love array;
Initialize step;

In each iteration, the Locations of Humans are updated. Then Guidance Locations of Humans, Love array and Step are updated. The iteration process continues until a termination condition has been reached. The iteration part of the pseudo code is shown below:

Iteration part of PhD:
while *Termination condition not reached* **do**
    Update Locations of Humans();
    Update Guidance Locations of Humans();
    Update Love array();
    Update Step();
end

The function Update Locations of Humans can be implemented as explained below:

Calculate the fitness values of guidance locations of the Human. Calculate probability of particular guidance location of a Human by dividing fitness value of Guidance location with sum of fitness values of all guidance locations of that particular Human. Use Mixed Linear Congruential Random Number Generator [8] to generate uniformly distributed random numbers. Based on the probability of guidance location and random number generated, select a particular guidance location of Human. Say there are two guidance locations with probability 0.4 and

0.6. Use random number generator to generate numbers 1 to 100. If you get the random number between 1 to 40 then select first guidance location of Human else select other guidance location. The love array contains love value corresponding to the selected guidance location and the Human. The location of Human is updated as shown below:

Location= Location + (Love value)*(Step);

Connect location of Human and Selected Guidance Location with a straight line. The Human moves towards the selected guidance location and the distance moved on this line is equal to (Love value)*(Step). Hence each guidance location has certain probability to be selected by the Human based on its fitness value. Once guidance location is selected, the Human moves towards the guidance location. The more the Love value between Human and Guidance Location the faster The Human moves towards the guidance Location. The same procedure is used for updating Locations of all the Humans.

The simple strategy to update Guidance Locations of Humans is to update them randomly. One more strategy is to consider all Guidance Locations of Humans as vectors in Differential Evolution and update Guidance Locations using Differential Evolution. Randomly select some values in Love array and modify Love values to imitate the fact that Love between Humans and their Guidance Locations may change with time. The Step value can be changed in Update Step function.

If there are N Humans then there will be N locations one for each Human. The idea of Guidance Locations is that each Human plays some role (either directly or indirectly) in the movement of other Human. If Human A is responsible for Human B to move to the position (20, 30) on X-Y axis search space then this feature of Humans is imitated by using Guidance Locations. Then Human A sets Guidance Location for Human B as (20, 30). If Love value between Human and particular Guidance Location is 0 then Guidance Location has no impact on the position of Human. Each Human has N Guidance Locations. N-1 Guidance Locations are set by remaining N-1 Humans for this particular Human. The remaining Guidance Location is set by Human for himself.

The result of this paper is the design of optimization algorithm based on Humans. The strength of other optimization algorithms like Differential Evolution can be used to update Guidance Locations of Humans. Hence a unique algorithm has been designed. Giving effort in this direction might yield fruitful results.

Conclusions

In this paper, a new direction is opened for the creation of innovative optimization algorithms. The Human Optimization method (also known as PhD method) has been proposed. The concept of Love and how each Human plays role in the movement of other Humans is imitated in this method. Optimization algorithms based on other beings like birds, Ants and so on proved their strength. Hence optimization methods based on intelligent, excellent and kind Humans are expected to prove their strength like other optimization methods in literature. Implementation

of PhD method proposed in this paper and analysis of obtained results will be part of future work.

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