A survey on Grey wolf optimization Algorithms

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Abstract

Grey wolf optimizer (GWO) is arising from grey wolves. The grey wolf algorithmic rule imitate the hunting mechanism of grey wolf. This algorithmic rule is very successful in engineering field. GWO algorithmic rule is very popular in research and analyses in terms of anatomy and manipulation. In (GWO) algorithmic rule author saw that half of the iterations are dedicated to anatomy and half is dedicated to manipulation. There is a right balance b/w anatomy and manipulation which shows approximation of global optimum. To overcome this effect a new modified algorithm (MGWO) is introduced. MGWO focus on proper stability between anatomy and that shows manipulation optimal performance of the algorithmic rule .The Modified algorithmic rule is benefits from high anatomy as compared to original GWO. MGWO has an ability to solve real world optimization problem.

Keywords: *GWO, MGWO, RWOP*

Introduction

GWO is a meta-heuristic algorithm rule which is very successful method for solving real world problem. It is arising in nature. GWO is recently developed which is arising by the hunting mechanism of grey wolves. Numbers of applications are suggest to make better the presentation of basic GWO. In this paper a new algorithm rule is proposed MGWO for proper balance between the exploration and exploitation [3]. Different functions are used in GWO for varying the exploration and exploitation combination over the course of iteration. In the hierarchy grey wolves are of four types which is alpha, beta gamma and delta. Grey wolves are at the peak of food series. Alpha wolves are in the first rank and follow the other wolves. Alpha wolves are the most dominating member. Second ranking is beta wolves. The beta wolves are the advisor of alpha that can help alpha to take decision. And the next ranking is gamma wolves is the lowest ranking wolves [5, 10]. Gamma wolves have to give way to all other dominant wolves. It may seem that it is not an important part in the pack. At the end the delta wolves. Delta wolves have to submit to the alpha and beta but they control the gamma.

Hunting Of Grey Wolves Consist of Following:

- FINDING FOR QUAARY
- CIRCLE QUARRY
- STRIKE QUARRY

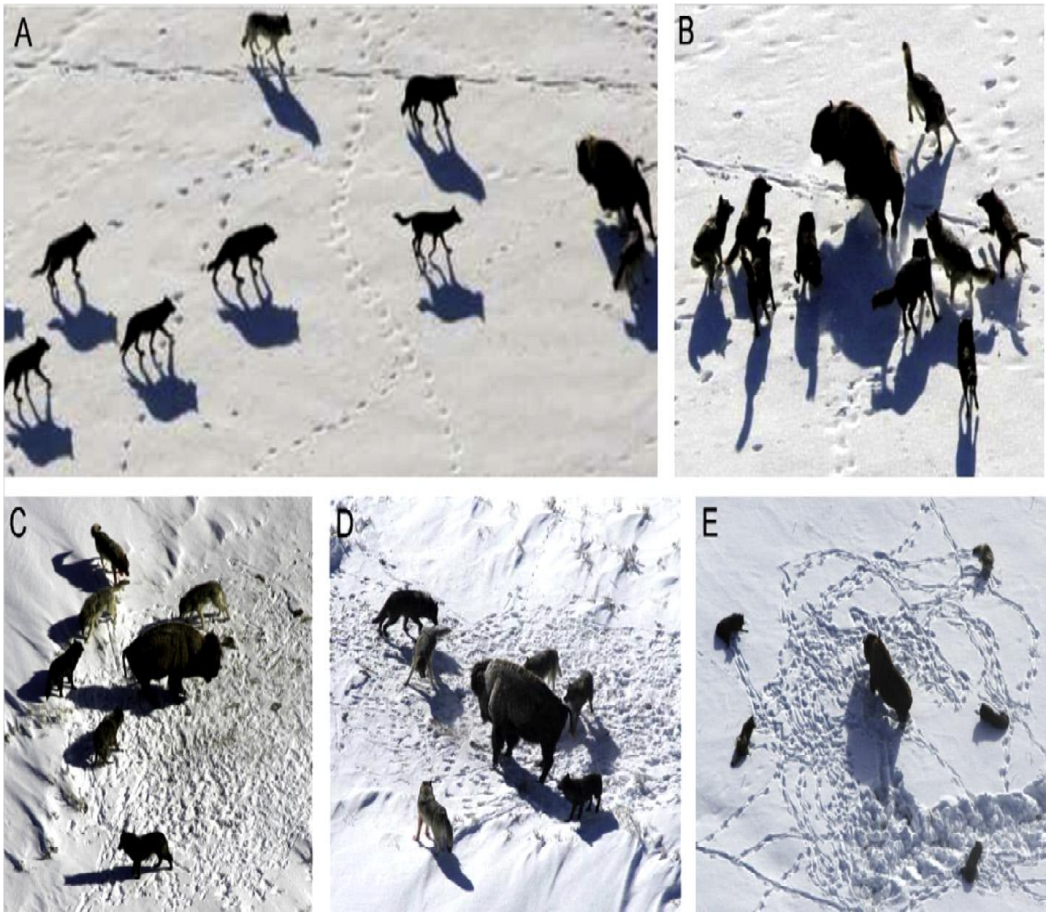

Figure 1.

The GWO algorithm is guided by alpha beta gamma and delta. The grey wolves have an ability to find the situation imitate of quarry. The beta and gamma is also participate in the hunting but it is usually guided by alpha the top most ranking grey wolves [7]. We don't have any idea about the situation of quarry to simulate the hunting behaviour of grey wolves, suppose that alpha beta and gamma have good understanding about the situation of quarry. After finding the location the grey wolves are encircle the quarry during the hunting.

In the mathematical form it can be written as:

$$\vec{Y}(t+1) = \vec{Y}p(t) - \vec{D}.\vec{E}$$
$$\vec{E} = \left|\vec{C}..\vec{Y}p(t) - \vec{Y}(T)\right| \quad \textbf{(1)}$$

$$\vec{D} = 2\vec{a}.\vec{r}1 - \vec{a}$$
$$\vec{C} = 2.\vec{r}_2 \quad \textbf{(2)}$$

$$\vec{E}_\alpha = \left|\vec{C}_1.\vec{Y}_\alpha - \vec{Y}\right|$$
$$\vec{E}_\beta = \left|C_2..\vec{Y}_\beta - \vec{Y}\right| \quad \textbf{(3)}$$
$$\vec{E}_\gamma = \left|C_3..\vec{Y}_\gamma - \vec{Y}\right|$$

$$\vec{Y}_1 = \vec{Y}_\alpha - \vec{D}_1(\vec{E}_\alpha)$$
$$\vec{Y}_2 = \vec{Y}_\beta - \vec{D}_2(\vec{E}_\beta) \quad \textbf{(4)}$$
$$\vec{Y}_3 = \vec{Y}_\gamma - \vec{D}_3(\vec{E}_\gamma)$$
$$\vec{Y}(t+1) = \frac{\vec{Y}_1(t) + \vec{Y}_2(t) + \vec{Y}_3(t)}{3} \quad \textbf{(5)}$$

Where t denotes the present iteration $\vec{D}$ and $\vec{C}$ are coefficient vectors. Y_P Is the position vector of the quarry, and Y denotes the position vector of grey wolves. D and C are calculated as in equation (2) r_1 and r_2 are random vectors.

In mathematical model for approaching the quarry, we decrease the value of a. the fluctuating value of D is also decreased by a. the value |D|<1 forces the wolves to attack the quarry. After the attack the grey wolves are search for quarry in the iteration [6].

MODIFIED GREY WOLF ALGORITHM:

Minimal anatomy of search space stops an algorithm from finding an exact approximation of the global most appropriate. On the other hand Minimal manipulation results in local optima status and low the quality of most appropriate. In GWO the changes between anatomy and manipulation is by modifying value of a and D [6]. In this half of the iterations are devoted to anatomy (|D|>1) and the other half are used for manipulation (|D|<1). Higher anatomy of search space results in lower probability of local most appropriate which will probably not give good solution. But too much manipulation is relates to too much randomness. There must be a balance between them [2].

Symbolic code of MGWO algorithm

Compute the hunt factor Y_j (=1,2,3……m)
Compute a, D and C
Evaluate the strength of every hunt factor
$Y_\alpha =$ is first hunt factor
$Y_\beta =$ is second hunt factor
$Y\gamma =$ is third hunt factor
For every hunt factor upgrade the position of the present hunt factor
End for
Upgrade a
Upgrade D and C
Evaluate the strength of all hunt factor
Upgrade $Y_\alpha, Y_\beta, Y_\gamma$
t = t+1
End while
Return Y_α [1]

APPLICATIONS

Optimal power flow is application of this grey wolf algorithmic rule which is solved in system. The aim of this algorithm rule is to minimize the cost of power construction. The

nature of wind farm product is based on two factors under approximation and over approximation [9]. In these components power is higher and lower than the given product. The lower power is regard to the organize power and if the produced power would be more than the organized power then the extra cost is added to the cost result.

CONCLUSION

This work suggested a review on optimization algorithmic rule which is arising by grey wolves. The suggested method imitate the hunting reaction of grey wolves. The presentation of the suggested algorithmic rule is in anatomy and manipulation terms and this result shows the GWO is capable to give highly vying results [8]. GWO algorithmic rule is applied to real problems of engineering. For future work one can develop multifaceted type's algorithms. The mGWO is suggested to prove the ability and advantage. mGWO has an capability to solve RWO [4].

ACKNOWLEDMENT

I have taken efforts in this paper. It would not have possible without the kind support and help of my mentor. I express my sincere respect to my mentor who has given his valuable support and suggestion in completing this paper. I came to know about so many things. I am really thankful to them. I owe a deep sense of gratitude to Dr. Kuldip Katiyar, Department of mathematics.

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