OPTIMIZATION OF GREEN SIGNAL TIMING USING WOLF BAT ALGORITHM

==========

[REPORT]

Name : Gurucharan rao
Reg.no :11804634
Roll.no : B43
Section :KM108
College :Lovely Professional University
Email id :raoguru2001@gmail.com
GitHub :
https://github.com/Raogurucharan/Green-Signal-Optimisation

INTRODUCTION :

The highest fuel consumption on urban arterials is associated with driving in congested traffic, characterized by higher speed fluctuations and frequent stops at intersections. The best flow of traffic on arterial streets, in terms of fuel consumption and emissions, is the one with fewest stops,

shortest delays, and moderate speeds maintained throughout a commute .

One of the ways to reduce excessive stop-and-go driving on urban streets is to optimize signal timings. Historically, signal timing optimization tools were developed to reduce delays and stops experienced by urban drivers. More recently new methods in traffic signal optimization have incorporated changes in drivers' behavior to achieve optimum performance at signalized intersections.

METHODOLOGY :

Methodologically, this paper presents a novel and simplistic method to derive vehicle position and order in the vehicular queue based on basic kinematic formulas for speed and discharge headways/saturation flow rates. Another significant contribution is the integration of the grey wolf and bat algorithm .The tests are performed on a two-intersection traffic network whose simulation performance metrics are calibrated and validated to resemble those observed in the field.

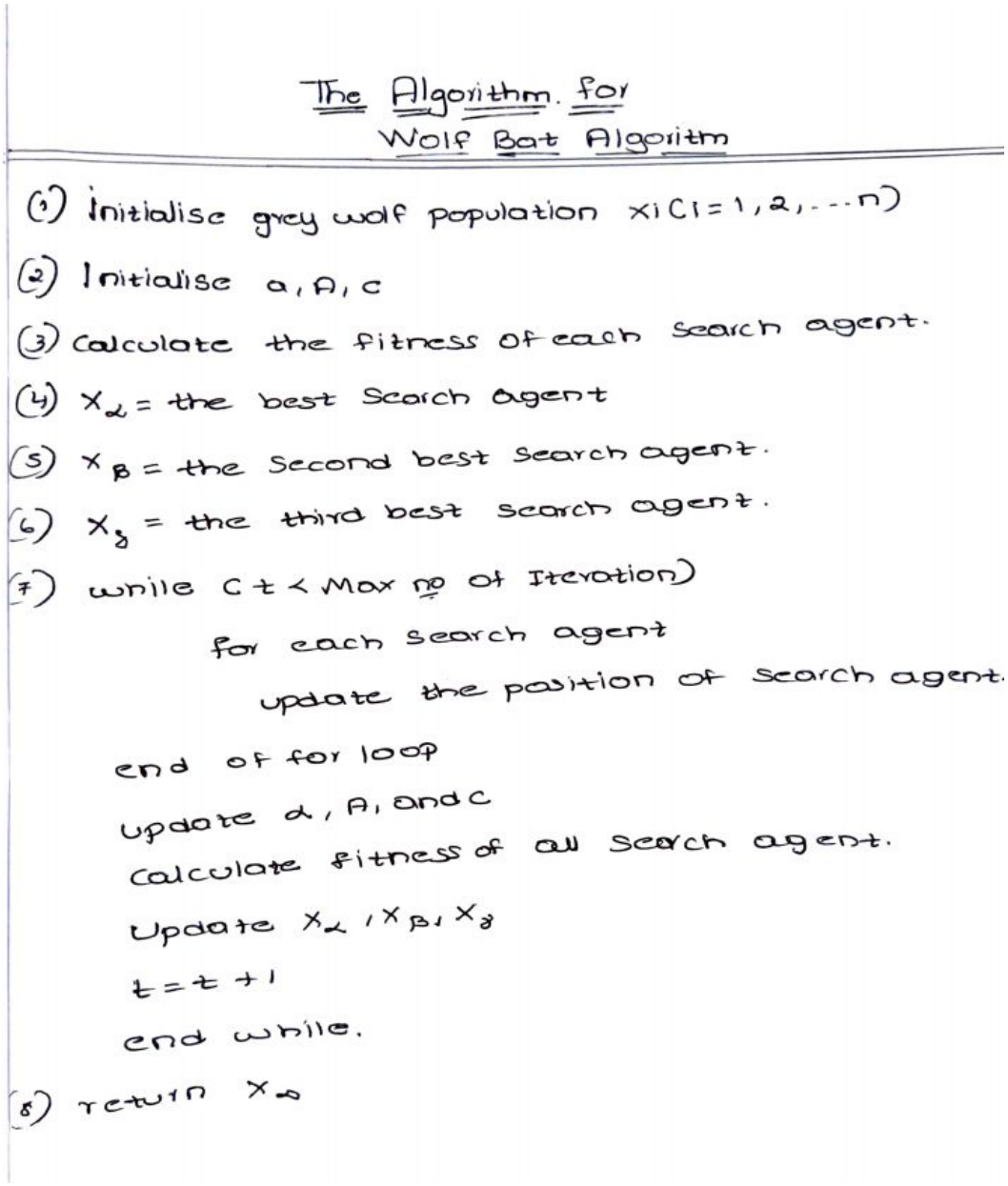
ABOUT ALGORITHM:

Bio-inspired algorithms are now becoming powerful methods for solving many real-world optimization problems. In this paper, we propose a hybrid approach involving Grey Wolf optimizer (GWO) and Bat swarm optimizer (BA) for global function optimization problems. GWO is well known for its balanced exploration/exploitation behavior, while BA is known to be more exploitative due to its low exploration ability in some conditions. We use GWO exploration skills to explore the search space effectively and BA local search capabilities to refine the solution. In our hybrid algorithm, namely (GWOBA), GWO is used to explore the problem space alone and pass the best two solutions to BA to guide its local search, then BA digs deeper and finds the best solution. The new proposed approach has been tested using 30 standard benchmark functions from CEC2017 benchmark suite. The performance of the hybrid algorithm has been compared to the original GWO, BA and the Whale optimization algorithm (WOA). We use a set of performance indicators to evaluate the efficiency of the method. Results over various dimensions show the superiority of the proposed algorithm.

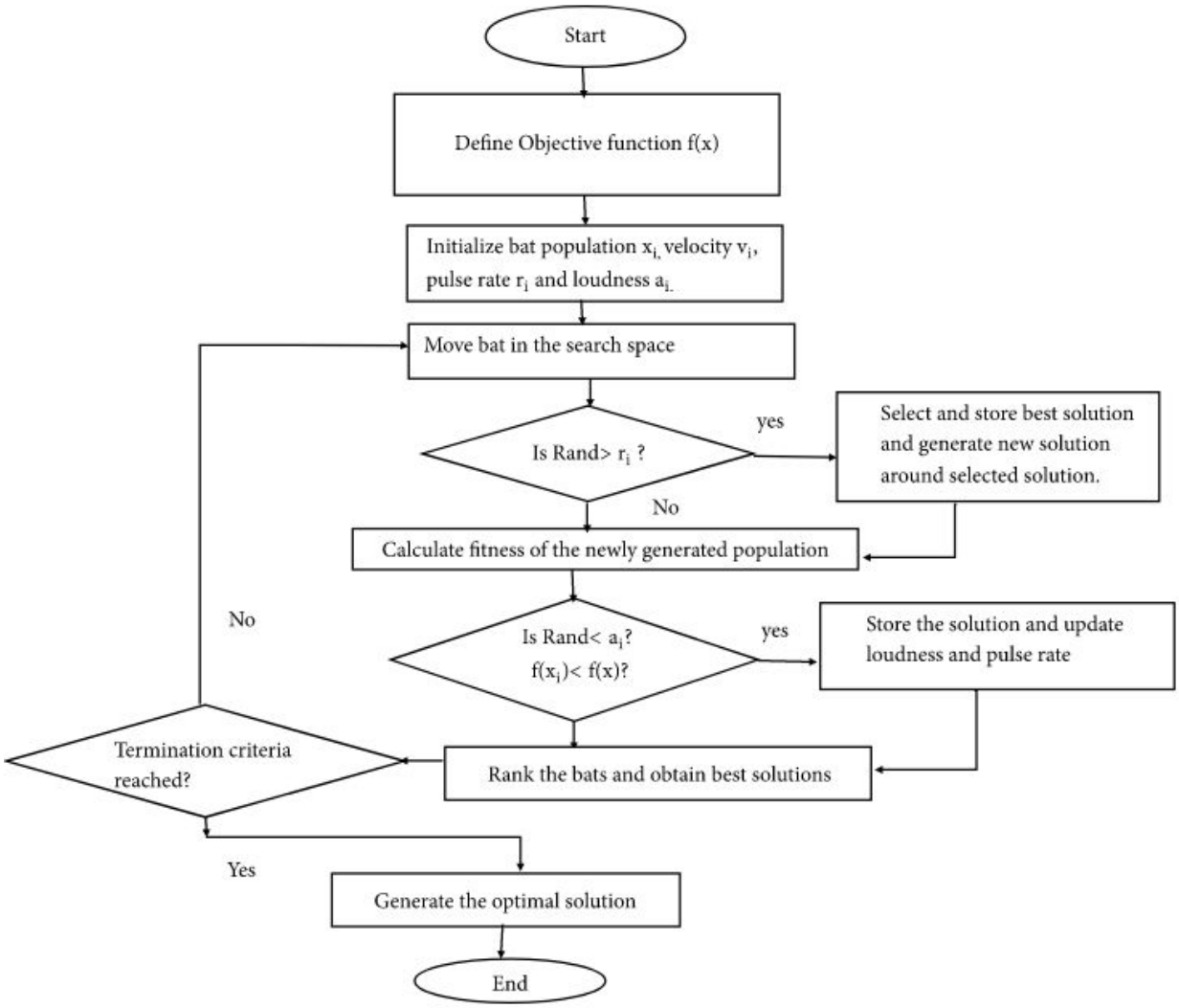
Grey wolf optimizer:

The Grey wolf optimizer was proposed in 2013. According to the authors, their algorithm imitates the leadership hierarchy and hunting mechanisms of grey wolves in the wild. For the modeling of the leadership hierarchy four types of grey wolves are used: alpha, beta, gamma and omega. Mathematical

modeling of the leadership hierarchy of grey wolves suggests that alpha is the best-known solution of the problem. Beta and gamma are, respectively, the second and third solutions according to the quality.



BAT Algorithm:



Attributes used:

```
,NumberOfVehicle,AverageSpeed,DistanceBetweenVehicleAverage
0,57,87,46
1,30,45,79
2,33,79,53
3,91,58,53
4,88,43,48
5,56,77,40
6,33,87,52
7,90,47,57
8,85,65,50
9,35,42,47
10,49,32,72
11,56,64,90
12,36,40,55
```

CONCLUSIONS AND FUTURE RESEARCH:

The results suggest that the GLOSA application using wolf bat algo does not have an equal effect on traffic with fixed-time and actuated -coordinated signal timing plans, where the latter ones are collected as averages from historic records and embedded into the GLOSA algorithm. If the phase durations are predictable, as with fixed-time signal timing plans, then GLOSA has a significantly positive effect on all performance measures. However, if accurate signal timings are not known (as it is the case with actuated-coordinated signal operations) then it is likely that GLOSA will not bring a positive impact on (or it could even worsen) traffic performance.

Future research should include additional experiments to confirm results of the vehicular 23 fuel consumptions. More particularly, application of the proposed methodology on a larger 24 traffic network would further validate potential

benefits. Also, research should investigate how 25 an increase in congestion (e.g. oversaturation) affects this and similar algorithms.

REFERENCES :

---

1) Barth, M., and Boriboonsomsin, K. (2008). "Real-World CO2 Impacts of Traffic Congestion." In Proceedings of the 87th Annual Meeting of the Transportation Research Board, Washington, D.C.

2) Widodo, A.,. Hasegawa, T., and Tsugawa, S. "Vehicle fuel consumption and emission estimation in environment-adaptive driving with or without inter-vehicle communications," In Proc. of the IEEE Intelligent Vehicles Symposium, 2000, pp. 382–386.

3) Sanchez, M. J.-C. Cano, and Kim, D. "Predicting traffic lights to improve urban traffic fuel consumption," in 2006 6th International Conference on ITS Telecommunications Proceedings. IEEE, 2006, Proceedings Paper, pp. 331–336.

4) Impact of Signal Phasing Information Accuracy on Green Light Optimized Speed Advisory Systems Aleksandar Stevanovic* Assistant Professor Department of Civil, Environmental, and Geomatics Engineering Florida Atlantic University