A
Synopsis
on

Design and Implementation of Cheetah Optimizer Algorithm For Solving Optimization Problem

Submitted in partial fulfillment for

Final Year Project

Submitted by

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1. Name of students with PRN No :

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2. Title of Project :

Design and Implementation of Cheetah Optimizer Algorithm For Solving Optimization Problem

3. Introduction:

Recently, solving optimization problems have become a challenging and exciting topic In most research area. Decision-making problems that are overgrowing
Can be defined as optimization problems. An optimization problem includes one or more objective functions, decision variables, and constraints to be minimized or maximized. Many deterministic approaches, such as linear programming, Newton methods, quadratic programming, dynamic programming, simplex method, gradient method, etc., are the well-known Classical methods to solve optimization problems These algorithms robustly Result in the same solution for a given optimization problem with an identical initial starting point. Although such techniques can find optimal solutions in a reasonable time, they need the objective function and constraints to be convex and derivable. These cause the deterministic algorithms to fall into locally optimal solutions, which is the main shortcoming of such methods in solving real-world problems. This defect becomes more prominent as the dimension
Of the problem increases. Therefore, stochastic methods for dealing with it have been developed. These algorithms intrinsically neglect the characteristics of the objective functions and constraints, so they treat the problem as a black box. Another advantage of the most metaheuristic algorithms is their simplicity

4. Literature review/Existing Work :

Metaheuristic algorithms can be categorized into two main classes, single-solutionbased and multiple-solution-based (or population-based). Te mostpopular single-solution-based metaheuristic algorithm is simulated annealing. Tis algorithm’s process starts with a random candidate solution (a population) and then moves and improves it in the promising search space in aniterative manner to fnd the superior solution. However, multiple-solution-based algorithms implement more than one random candidate solution to enhance the speed and the chance to avoid local optima entrapment.

5. Problem statement :

   Design and Implementation of Cheetah Optimizer Algorithm For Solving Optimization Problem

6. Objectives :
   i. To design Cheetah Optimization Algorithm(COA).
   ii. To implement COA for Optimization
   iii. To compare and analyze the performance of COA with other algorithm.

7. Methodology :

   1. Start
   2. Prepare for new hunt.
   3. Initialize the population size and dimentions.
   4. Generate the initial population of cheetahs and fitness ofcheetahs
   5. Start searching and move to next and update the solutions of members and lead
   6. Search strategy equation :

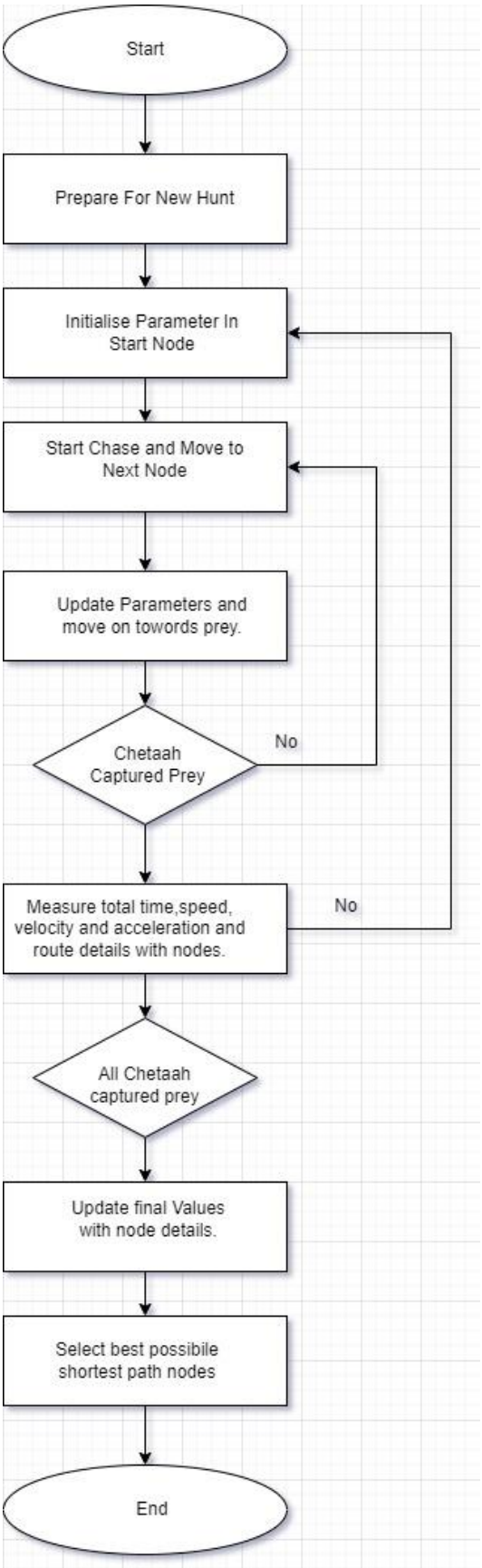
$$X_{i,j}^{t+1} = X_{i,j}^{t} + \hat{r}_{i,j}^{-1}.\alpha_{i,j}^{t}$$

7. Sit-and-wait strategy equation :

$$X_{i,j}^{t+1} = X_{i,j}^{t}$$

8. Attack equation :

$$X_{i,j}^{t+1} = X_{B,j}^{t} + \check{r}_{i,j}.\beta_{i,j}^{t}$$


Start
Prepare For New Hunt
Initialise Parameter In Start Node
Start Chase and Move to Next Node
Update Parameters and move on towords prey.
Chetaah Captured Prey
No
Measure total time,speed, velocity and acceleration and route details with nodes.
No
All Chetaah captured prey
Update final Values with node details.
Select best possibile shortest path nodes
End

8. Technology Required:
   Language : Python
   Libraries : MatPlotlib(For Data Visualization)

9. References:

1. Sergeyev, Y. D., Kvasov, D. E. & Mukhametzhanov, M. S. On the efciency of nature-inspired metaheuristics in expensive global optimization with limited budget. Sci. Rep. 8, 1–9 (2018).

2. Luo, X., Liu, H., Gou, G., Xia, Y. & Zhu, Q. A parallel matrix factorization based recommender by alternating stochastic gradient decent. Eng. Appl. Artif. Intell. 25, 1403–1412 (2012).

3. Lu, T. & Liu, S.-T. Fuzzy nonlinear programming approach to the evaluation of manufacturing processes. Eng. Appl. Artif. Intell. 72, 183–189 (2018).

4. Koc, I., Atay, Y. & Babaoglu, I. Discrete tree seed algorithm for urban land readjustment. Eng. Appl. Artif. Intell. 112, 104783 (2022).

5. Introduction to Stochastic Search and Optimization: Estimation, Simulation, and Control Vol. 65 (Wiley, 2005).

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