Report

Title :- Optimaization of green signal timings of traffic light controllers using grasshopper optimization.

Name:- Purushotam Lalaso Kakade **Reg :-** 11803394

Roll No :- B32 **Section** :- KM108

Github Link :- https://github.com/purushottam007k/code-of-project.git

Abstract :-

Traffic lights are source of signalling device for road junctions. Traffic light controllers are programmed to assign timely directions to road users in Red, Yellow and Green. Present Traffic Light Controllers are based on microcontroller.TLC have limitations as it uses pre-defined hardware, which functions according to program that does not have flexibility of modification on real time basis. Grasshopper Optimization algorithm is one of the recent algorithm for optimization. This algorithm is swarm based nature inspired algorithm which mimics and mathematically models the behaviour of grasshopper swarm in nature. The proposed algorithm can be used for solving the engineering optimization problems. The GOA is tested for different benchmark test functions to validate and verify the performance of the algorithm. Results obtained from GOA are compared with actual values (results) of the test functions.

Keywords :-

Optimization; Grasshopper optimization algorithm; Constrained optimization; Swarm intelligence; Heuristic algorithm; Constrained and unconstrained test functions

Introduction :-

All developed nations have well developed transportations system with efficient traffic control on road, rail and air. Transportation of goods, industrial products, manpower and machinery are the key factors which influence the industrial development of any country. Also, the drastic/rigorous changing condition of road traffic is rising as a serious problem for people to move, infrastructure wise and as nation's economic point of view. Hence traffic congestion leads to long waiting hours along with fuel and money wastage. So, the Traffic management on road is crucial to reduce these problems. Now, control and management of city traffic has become a major problem in many countries even though Regional Traffic Office has found solutions to overcome these traffic issues. One way to improve traffic flow and safety of current transport system is to apply automation and intelligent control methods to road infrastructure . Also, measures like new roads, flyovers, ring roads, city trains are applicable for traffic management. But as the number of road users increase and resources provide by current infrastructures are limited dynamic control of traffic is need of hour.

Grasshopper Optimization Algorithm :-

Grasshoppers are insects and consider as a pest. They usually damage the crop production as well as agriculture which lead to consider them as pest. Usually we see the grasshopper individually in nature but most of the time they join large swarm among all creatures in nature. The swarm of grasshopper maybe a nightmare for farmers as the size of the swarm can be much large. The grasshopper swarm possesses one unique characteristic which is that we found the swarming behaviour in both the nymph as well as adulthood in grasshopper. The nymph grasshopper move like rolling cylinders in millions of numbers. They almost eat all the vegetation which comes in their path during their movement. When they become adult from nymph, they form a swarm in air and then they migrate over a very large distance. The swarm usually has very slow movement when they are in larval phase. The small step of the grasshopper is main characteristic of the swarm in larval phase. Opposite of that the main feature of swarm in adulthood is long range and abrupt movement of swarm. Swarming of grasshopper is mainly formed for searching of food source.

Survey:-

Nowadays, vehicles on road are increasing each day like growing cities of this world. Traffic Management on road has become the need of hour in today's urban lifestyle. Efficient techniques are needed to reduce travel time, usage of money, fuel and waiting hours along with gamut of other problems too. Thus need arises for simulating and optimizing current system for the traffic controllers to better accommodate this increasing demand by road users around the world.Traffic lights are commonly used devices to regulate roadway intersection traffic with a view to both safety and smoothness of vehicle flow, for generations where it is still considered the best practices . Various methods and approaches are suggested in literature for solving the traffic control problem. It includes rule based learning to the modern fuzzy and neural network approaches. In this section, the various solutions to the traffic control problems suggested in the literature are discussed, along with their merits and demerits.

Since the traffic light was invented ages ago, there have been significant revolutions lined down in various aspects about same. The most common revelation which we can visualize is the displays of traffic light itself. The other revolution which is being enhanced and improved is the traffic light controllers.

Result :-

This section presents the test problem with known optima and performance of GOA algorithm. The results are then provided and analyzed in details.

Initialize the swarm Xi (I =1,2,3,…....,n)

Initialize cmax,cmin, and maximum number of iterations calculate the fitness of each search agent

T= the best search agent

While (l < Max number of iterations)

For each search agent

Normolizes the distance between grasshoppers in udate the position of current search agent by the equation bring the search agent back if it goes outside the boudaries

End for

Udate T if there is a better solution

L = l+1

End while

return

Conclusion:-

This work presented the optimization algorithm called grasshopper optimization Algorithm used to validate the results of GOA by using optimization test functions. Both constrained and unconstrained optimization test functions are used to validate the results obtained from GOA. A mathematical model is studied which is based on the swarming behaviour of grasshopper in nature. A mathematical model simulates the repulsive and attractive forces between the grasshoppers. GOA contains a coefficient that adaptively decreases the comfort zone which is used in balancing of exploration and exploitation. Finally the best solution given by swarm is considered the optimum solution of the optimization problem. In order to validate the performance of the GOA, the test functions are used in paper. The test functions are solved by the using Grasshopper optimization algorithm. The results obtained by GOA are observed to check the performance of the algorithm qualitatively and quantitatively. The experiment and discussion support the following conclusions: y Grasshopper optimization algorithm avoids local optima and able to find the global optima in the given space. y GOA balances exploration and exploitation to find the global optimum solution of optimization problem.

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