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AN OPTIMIZED SOLUTION FOR THE TRAVELING SALESMAN PROBLEM USING ANT COLONY OPTIMIZATION BY RANDOM MANNER

Savan Panchal[1], Vinit Kumar Gupta[2]
Hasmukh Goswami College Of Engineering, Ahmadabad, India

Abstract: Optimization problems are of high significance for both the first is engineering world and second is scientific world. The research area has simplified many problems in classify to achieve scientific test cases like as the renowned traveling salesman problem (TSP).The TSP model the condition of a travelling salesman who is required to pass through a number of cities. The purpose of the travelling salesman is to pass through these cities (visiting each city just once) so that the entire travelling distance is minimal. Ant colony algorithm (ACO) is a type of probability method used to identify the best path in the graph. Through the whole analysis on the most important reasons ensuing in the impulsive static phenomenon of standard ACO, the updating approach of information hormone is customized, and the changing parameters and local optimal search approach are introduced to effectively restrain the impulsive static phenomenon in the convergence procedure. It means change the some parameter which is constant in early implementation. Here we are using Random Manner for Travelling Salesman Problem. In Random Manner when salesman start the travel after completing the one round if some city remaining so we choose another random source than again the travel and check the all cities are covered or not if not so do same thing till all cities are covered. If yes so do same thing till all city are covered. So it means we select the Random Source. Than change the number of iteration after observe the result and compare with the exiting result.
Keywords: (TSP) Traveling Salesman Problem, Ant colony algorithm (ACO), static phenomenon, Random Manner

I. INTRODUCTION

Travelling Salesman Problem (TSP) is the problem of a salesman who wants to find shortest path, starting from his home town, through a given arrangement of client urban areas and to come back to its main residence. All the more formally, it can be spoken to by an entire weighted chart G = (N, A) with N being the arrangement of hubs, speaking to the urban areas, and A the arrangement of circular segments completely associating the hubs N. Each bend is alloted an esteem dij, which is the length of circular segment (i; j), that is, the separation between urban areas i and j. Voyaging Salesman Problem is a NP-difficult issue in combinatorial streamlining, vital in operation inquire about and hypothetical software engineering [1]. A meta-heuristic strategy, Ant Colony Optimization (ACO) can be utilized to take care of TSP issue. ACO is populace based hunt strategy motivated from genuine ants in which subterranean insect find most brief way between sustenance to settle. In our approach simulated ants will work and perform assignment in view of conduct of genuine ants [2]. In actuality, genuine ants will take after synthetic substances known as Pheromone and dropped by before ants. Same way manufactured insect will perform two stages: Tour Construction and Pheromone Updation. Each fake subterranean insect will develop visit freely that is the reason this calculation is extremely appropriate for parallel execution.

II. ANT COLONY OPTIMIZATION

ACO is a way to deal with take care of troublesome streamlining issue. Subterranean insect state calculation was first proposed by Dorigo and partners as multi specialist approach for combinatorial advancement issues [11, 12, and 13]. ACO calculation was motivated from scavenging conduct of ants for finding most brief way from home to sustenance sources. At the point when ants stroll from home to sustenance source and the other way around ants store a connection substance called pheromone on ground, shaping pheromone trail. Ants notice this pheromone while picking their direction. It has been tentatively demonstrated in [14] that pheromone trail conduct of subterranean insect provinces develops to most limited way. Optimization problem includes ACO metaheuristic, in which ants cooperate with each other for finding good solution to difficult optimization problems. Cooperation is the important feature of ACO algorithm. ACO cooperation is based on the following ideas: Each path followed by an ant is associated with a local solution for a given problem. When an ant moves on a path, it deposits pheromone which is proportional to quality of the corresponding local solution of target problem. The ants must choose a path between two or more paths. The path with higher pheromone concentration is most probably chosen by ants. The probability of choosing a path by an ant k, from node i to node j is a function of the pheromone intensity τ i ,j on edge from node I to node j and the desirability η i, j of edge from node I to node j [15].

$$p_{(i,j)}=(\eta^{\beta}_{i,j})(\tau^{\alpha}_{i,j})/\sum(\eta^{\beta}_{i,l})(\tau^{\alpha}_{i,l}) \quad (1)$$

where p(i, j)is the likelihood of picking next hub to be visited, η i, j is heuristic desirability known as per ceivability data corresponding to 1/j, d i, j is the remove between hub i to hub j, τ i, j is pheromone trail, β-pheromone control parameter, α heuristic control parameter. Subsequent to going through a sufficient number cycles, the ants will give the ideal or a close ideal answer for the objective issue. For ACO calculation a limited size settlement of counterfeit ants scans for good quality answer for enhance issue under thought. Every subterranean insect assembles a arrangement from introductory state, while building an answer insect gathers data from issue trademark what's more, changes the portrayal of issue for other insect. Ants act simultaneously and freely.

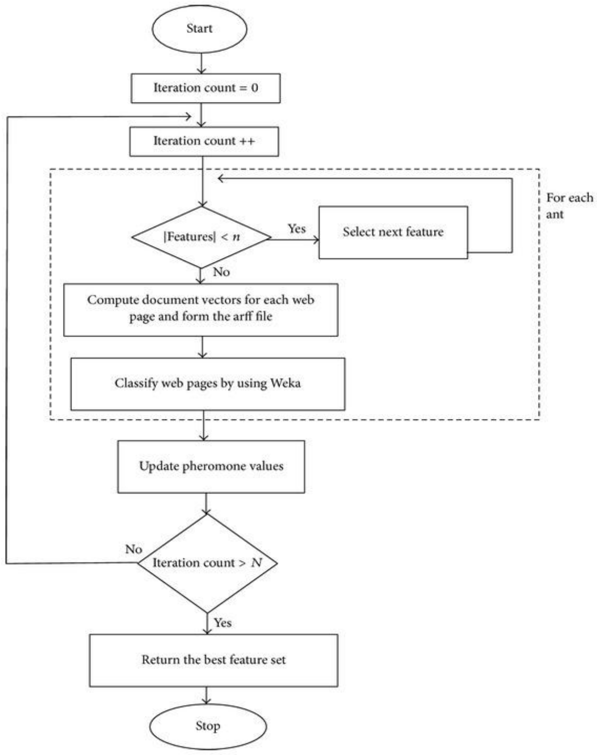

Figure 1: Basic Algorithm of ACO

III. OPTIMIZATION

Define a parameter to set the maximums number of iterations out Ants will be traversing the problem area

Step 1: First find/define the problem area for implement ACO Algorithm

Step 2: After starting the Procedure every ants will traverse the problem graph (With two Different Colors) and put up each ant solution

$T_{(i,j)} \leftarrow P.T_{(i,j)} + \Delta\ T_{(i,j)}$

Where,

P : disappearance parameter

$\Delta\tau(i,j)$: pheromone level

Step 3: Store the best solution built so far

Step 4: Do maximum iterations (For more iteration source point will be different because it is possible to get optimum solution or output of other source point)

Step 5: In the last step do the more iteration analyze the optimum output/solution.

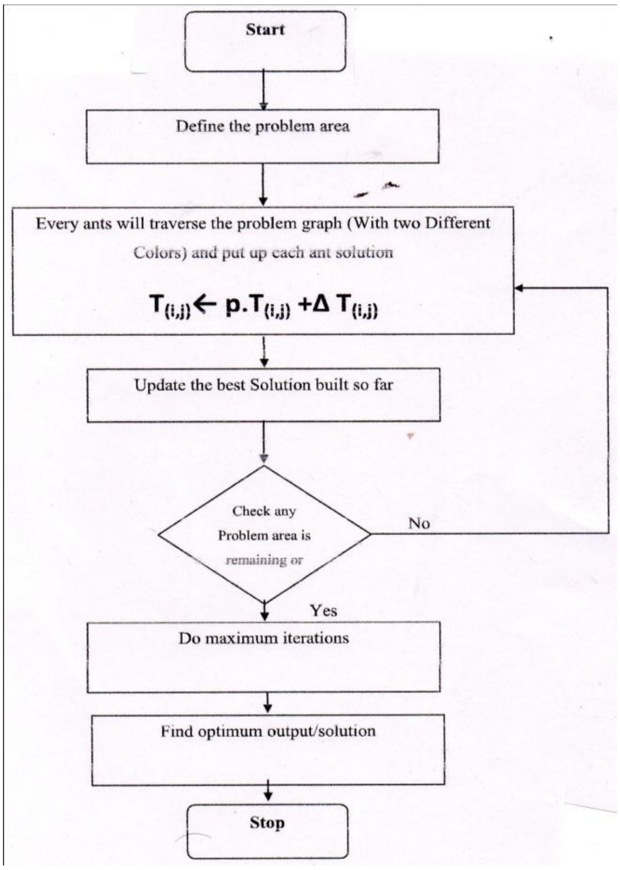

Figure 2: Optimization Algorithm using Random Manner

IV. COMPARISION

Comparison between the other approach of the other paper are on the random network. Here we are using the random manner for the travelling salesman problem. In the random manner when salesman start the travel after completing the one round if remaining so we choose another random source than again the travel and check the all cities are covered or not. In the exiting approach some time some town are remaining. But here using random manner salesman complete the all cities. So it means we select random source.

V. RESULTS

Here for the results we are taking matrix of some cities. Matrix is covered nine cities. We are taking one input for the results then follow the algorithm and get the results for the shortest path for the travelling salesman problem using ant colony optimization.

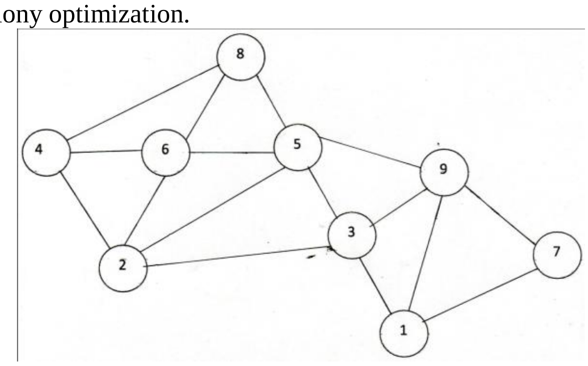

Figure 3: Initial Graph

A Cities shown in the diagram after the completing we get the optimum path.

- Take the Input in the Form of adjacency matrix.
- Taking randomly Node
- Apply the ACO Technique to traverse the all cities.
- Take the Tour length and Find the Minimal Tour Path
- Compare Result

$$\begin{Bmatrix} 0&9&6&5&3&4&9&6&5&3 \\ 1&0&0&0&0&4&2&0&4&0 \\ 5&2&0&4&0&2&0&0&0&8 \\ 9&0&0&0&0&8&9&6&5&3 \\ 8&0&0&8&5&0&2&0&4&0 \\ 1&0&0&0&4&9&2&0&4&5 \\ 4&2&0&4&0&0&0&0&0&0 \\ 3&9&6&5&3&7&9&6&5&3 \\ 7&0&0&0&0&0&2&0&4&0 \\ 0&9&8&7&8&4&2&0&4&0 \end{Bmatrix} 9*9$$

Input for the travelling salesman problem 9*9 matrix

Here we get the optimum solution of the travelling salesman problem using ant colony optimization. As per our perform the steps in first.

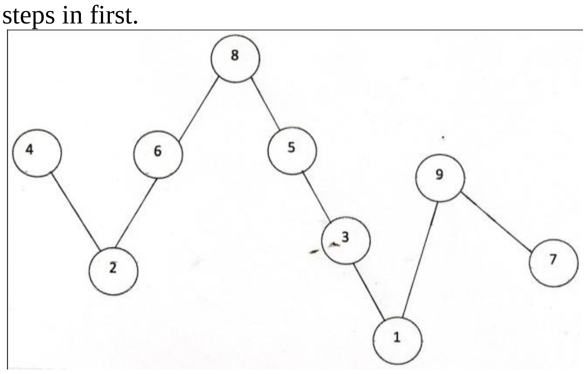

Figure 4: Output of Initial Graph

Now we are taking the graphical representation of the output.

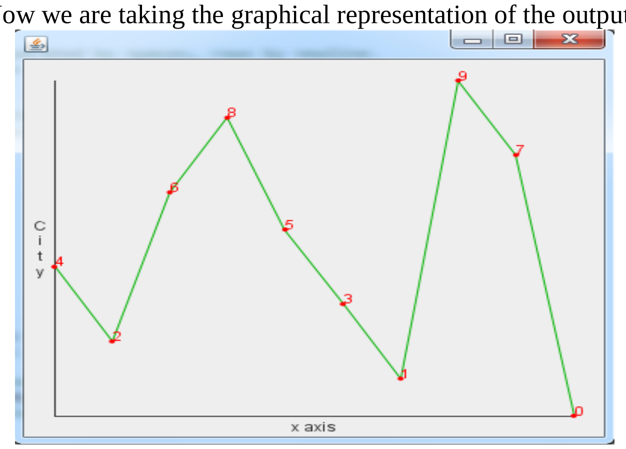

Figure 5: Graphical representation of the output of TSP.

VI. CONCLUSION

In this paper we presented an optimized solution for the travelling salesman problem using ant colony optimization by random manner. a distributive algorithm, to bind the network diameter without requiring global knowledge. Different ants wondering across the random manner collects, propagate local information, and are used to create new links. Pheromone trails followed by ants on unvisited path are used to ensure complete coverage of random manner. This algorithm provide fully distributed environment, bounded number of links. Using prior knowledge of network, it is possible to find optimized shortest path and time reducing and best path for the travelling salesman problem

REFERENCES

[1] Wikipedia, "Travelling Salesman Problem [Online]" http://en.wikipedia.org/wiki/Travelling_salesman problem

[2] M. Dorigo, "Optimization, learning and natural algorithms," Ph.D. dissertation, Dipartimento di Elettronica, Politecnico di Milano, 1992.

[3] M. Dorigo, V. Maniezzo, and A. Colorni, "The ant system: Optimization by a colony of 11cooperating agents," IEEE Transactions on Systems, Man, and Cybernetics–Part B, vol. 26, no. 1, pp. 29–41, 1996.

[4] Wikipedia, "TSP [Online]" http://www.ams.org/samplings/feature-column/fcarc-tsp

[5] UgurCekmez, Mustufa Ozsiginan, "A UAV Path planning with parallel ACO algorithm on CUDA platform", IEEE Unmanned Aircraft Systems (ICUAS), 2014

[6] Wikipedia, "CUDA [Online]", http://en.wikipedia.org/wiki/CUDA

[7] Xue Yang, Jie-sheng Wang "Application of Improved Ant Colony Optimization Algorithm on Traveling Salesman Problem" 2016 IEEE

[8] Xue Yang, Jie-sheng Wang "Application of Improved Ant Colony Optimization Algorithm on Traveling Salesman Problem" 2016 IEEE

[9] Adam Byerly, Dr. Alexander Uskov "A New Parameter Adaptation Method for Genetic Algorithms and Ant Colony Optimization Algorithms" 668-673 IEEE,2016

[10] Zhao Jiang "Discrete Bat Algorithm for Traveling Salesman Problem" 2016 3rd International Conference on Information Science and Control Engineering 343-347 IEEE,2016

[11] Mamta Bannapure, Vinayak L.Pati l"Ant Colony Optimization for Random Network" 2014 IEEE Global Conference on Wireless Computing and Networking 42-46 IEEE, 2014

[12] Marco Dorigo, Member, ZEEE, Vittorio Maniezzo, and Albert0 Colorni "Ant System: Optimization by a Colony of Cooperating Agents" IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS-PART B CYBERNETICS, VOL

26, NO 1, FEBRUARY 1996 29-41 IEEE, 1996

[13] Yimeng Yue and Xin Wang "An Improved Ant Colony Optimization Algorithm for Solving TSP" International Journal of Multimedia and Ubiquitous Engineering Vol.10, No.12 (2015), pp.153-164 SCRSC, 2015

[14] Gu Weidong, Feng Jinqiao, Wang Yazhou, Zhong Hongjun, Huo Jidong "Parallel Performance of an Ant Colony Optimization Algorithm for TSP" 2015 8th International Conference on Intelligent Computation Technology and Automation 625-629 IEEE, 2015

[15] Abdul Quaiyum Ansari, Ibraheem and Sapna Katiyar "Comparison and Analysis of Solving Travelling Salesman Problem Using GA, ACO and Hybrid of ACO with GA and CS"

[16] Dewen Zeng, Qing He, Binheng, "Improving Ant Colony Optimization algorithm based on Dynamically Adjusting Ant Number", IEEE International Conference on Robotics and Biomimetics December 11-14, 2012, Guangzhou, China

[17] Ling Lin, Huailin Dong, Qingfeng Wu "Research and Improvement of Ant Colony Algorithm based on TSP", IEEE, 2011

[18] Ramlakhan Singh Jadon, Unmukh Datta "Modified Ant Colony Optimization Algorithm with Uniform Mutation using Self-Adaptive Approach for Travelling Salesman Problem" 4th ICCCNT 2013 July 4-6, 2013, Tiruchengode, India

[19] Almin Milanović, Mustafa Duranović and Novica Nosović "Performance Analysis of the Traveling Salesman Problem Optimization Using Ant Colony Algorithm and OpenMP" 1310-1313 MIPRO, 2013

[20] Pragya, Maitreyee and Dutta Pratyush "TSP Solution Using Dimensional Ant Colony Optimization" 2015 Fifth International Conference on Advanced Computing & Communication Technologies 506-512 IEEE, 2015

[21] Sourabh Joshi, Sarabjit Kaur "Comparative Analysis of Two Different Ant Colony Algorithm for Model of TSP" 2015 International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India 669-671 IEEE, 2015

[22] https://en.wikipedia.org/wiki/Java_(programming_language) [Online]

[23] https://en.wikipedia.org/wiki/Eclipse_(software) [Online]

[24] MathWorld, "NP Problems [Online]", http://mathworld.wolfram.com/NP-Problem.html

