Report

MT18025
Suraj Pandey

Assumptions

Certain Assumptions ,while doing the Ant Colony Optimisation for Travelling Salesman Problem(TSP). These are as follows:

1. All ants are deposited the same amount of pheremone value per unit distance.
2. Ants will follow the hamiltonian cycle.(Allowed list ,make it to do in that way)
3. Evaporation is done after each ant will trace the path in graph.
4. Convergence occur when the maximum of ants about(85%) will trace the same path.
5. Evaporation rate is also same for each edge per unit distance.

Methodology & Algorithm

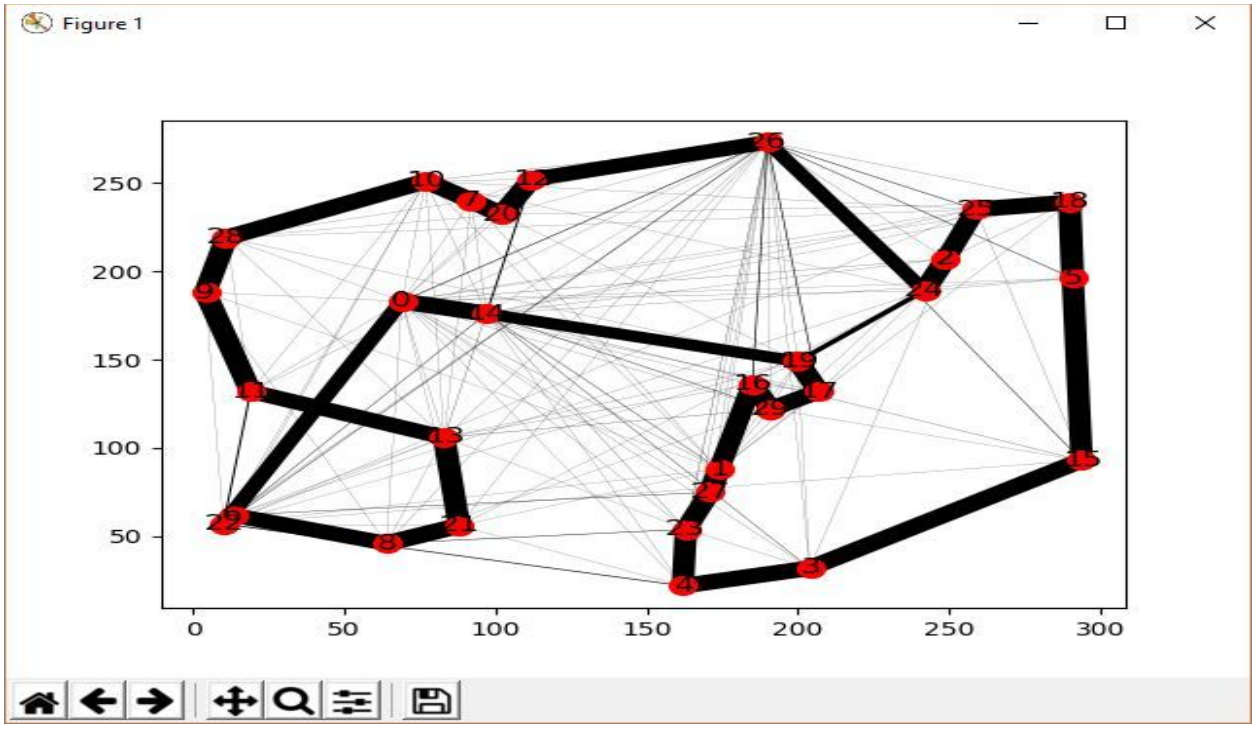
Procedure ACO algorithm for TSP
    Set parameters and initial pheremone trails
    While (termination condition not met) do
        Construct solution as according to pheremone deposition and distance for each ants
        Update trails and pheremone deposition
    End
    End ACO

We have to trace the possible solution for each ants and then after that , update the pheremone depostion .
When convergence occur , return the graph having the ACO in TSP.

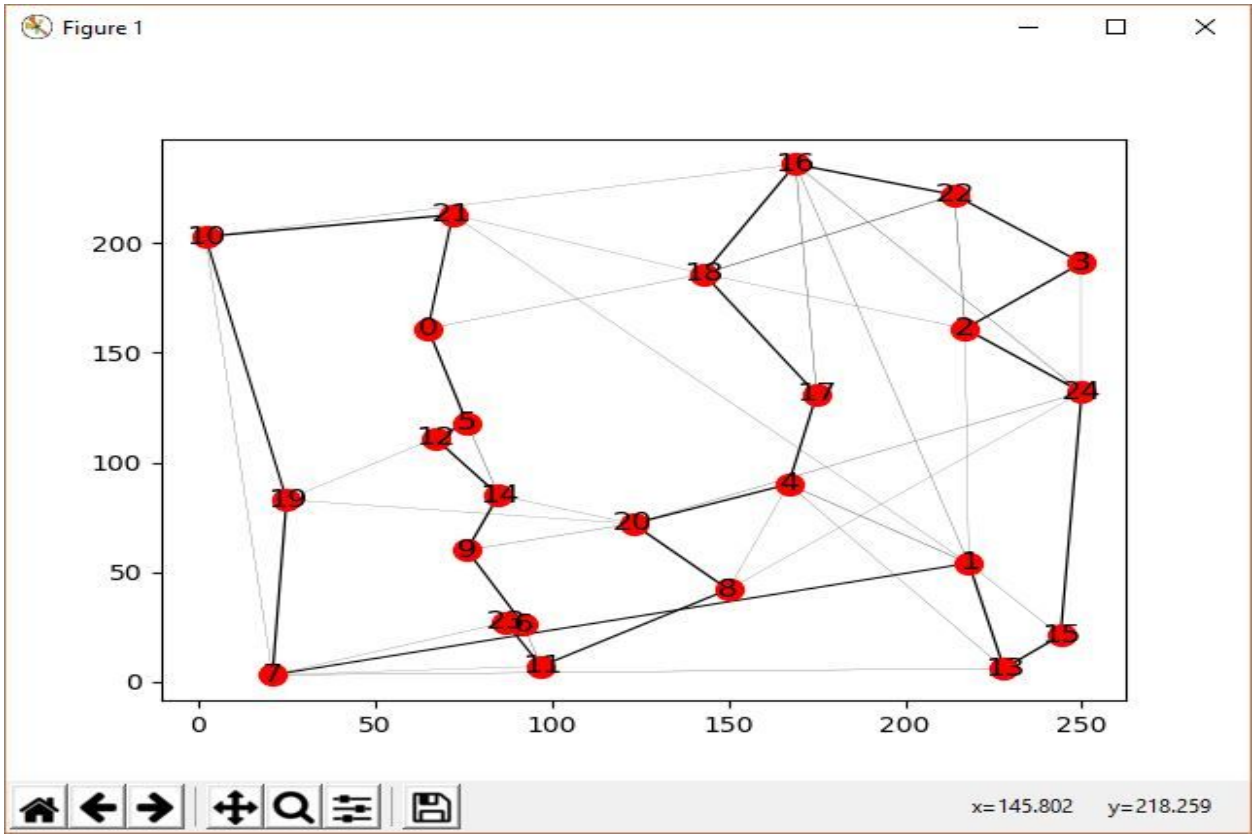
Observation

In Ant Colony Optimisation, the ants are trying to perceive the path which has shortest distance and more pheremone deposition onto it and it is regulated by using the alpha and beta value.
Alpha will correspond to the value of pheremone deposition on that edge and Beta corresponds to the value of 1/distance.
Since in TSP ,we want the shortest distance , so that is why we make inverse of distance of edge;more less value of distance ,higher the value of inverse.

As by increasing the evaporation level, the convergence reaches much faster. And by giving the priority to inverse distance and pheremone deposition as value alpha and beta, making the beta value more make more contribution of shortest distance of edges and by making alpha more ,will make contribution of peremone more.
So, made alpha and beta as 4 and 6 respectively, such that to give the more priority to shortest distance.



For cities=45 ,ants =60



For cities = 25,number of ants=40

Result

S. No.	Number of Cities	Number of Ants	Evaporation Level	Time Taken	Number of Iterations	Alpha	Beta
1	30	45	0.8	160	80	4	6
2	45	60	0.8	172	88	4	6
3	30	15	0.8	12	7	4	6
4	15	15	0.2	129	60	4	6
5	15	15	0.9	23	11	4	6
6	20	20	0.9	42	21	4	6
7	5	10	0.9	4	2	4	6
8	10	10	0.9	12	5	4	6

9	10	15	0.9	20	9	4	6
10	10	15	0.9	24	10	2	2
11	10	15	0.6	15	5	2	2
12	10	15	0.6	14	6	8	8
13	10	15	0.6	65	30	1	1
14	100	200	0.9	242	122	4	6
15	25	40	0.1	45	21	4	6
16	6	10	0.1	5	2	4	6
17	20	30	0.1	18	8	4	6

Inference

- In ACO, convergence is faster if evaporation level is high because the evaportion at each edge will be done.So, only desired path of ant in graph will be there .But it will give not best result.
- By making beta more than alpha will make result more good because now we give more priority to distance than pheremone depostion.
- In ACO , we do not always get the optimal result i.e, there may be the case because of ants polarisation to some path, make it local optimum path in graph.
- So, ACO tries to capture the nature of ants to trace the path by their pheremone deposition.
- So, it may give the suboptimal result. In TSP.