Application of Computational Intelligence

Homework 3 – SA / TS Algorithm

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Problem:

Make up a 10-node Travel Salesman Problem optimization and find it's optimal tour which starts from node 1, visits each node and returns to node 1 with the shortest distance. The distance matrix is composed of random integer values between 10 and 50. This problem is symmetric so the distance from city I to city J is the same as that from city J and city I. You may develop either SA or TS algorithm to find the optimal tour.

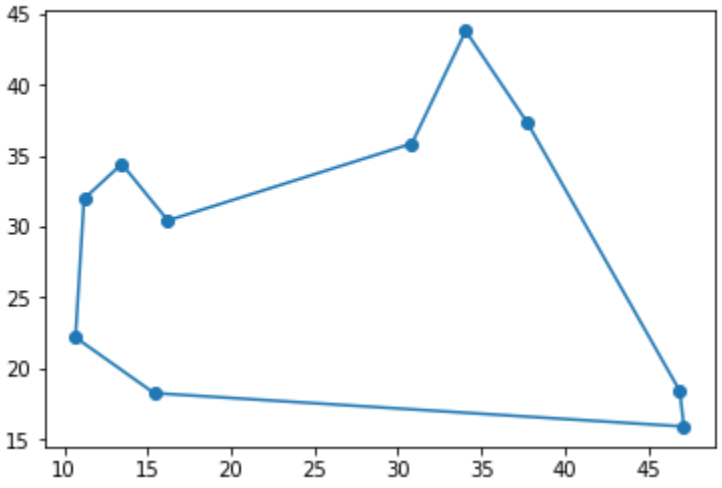
1. Distance Matrix of the problem
   I created 10 cities with random coordinates around the plane.

	x	y
0	47.139413	15.898193
1	11.184208	31.981482
2	16.208700	30.447601
3	46.888318	18.420386
4	15.385731	18.256732
5	30.836389	35.884154
6	37.762090	37.343061
7	13.446912	34.439402
8	34.060440	43.839355
9	10.671286	22.187960

2. Algorithm used
   I use Simulated Annealing for the problem. There is no real reason for my choosing between SA or TS (Taboo Search) as it is simply part of my group's final project to try using this algorithm on problem that we have.
3. Modification used
   - I used geometrical cooling schedule with it's constant valued at 0.95 so the cooling is slower.
   - Number of iterations I use is linearly increasing with its α and β constant valued at $\alpha = 0.1$ and β = same as the number of city created (10). I valued it like this so that the random route exchange has plenty of chance to try random all the route.

4. Result

```
Out[9]: <matplotlib.lines.Line2D at 0x10510710>
```



I also did the animation for it's convergence, and it can be seen in the code (Jupyter Notebook)