TSP Competition

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Ant Colony Optimisation Analysis and Observation:

1> To Improve the minimum cost, we fine tuned the parameters by many trial and errors : -

- Bigger **α**(pheromone factor) means the convergence speed increases but it may get stuck in local optima and lower alpha can lead to exceeded time-limit. So we set **α = 15**
- Bigger **β**(visibility/cost factor) means almost greedy algorithm and smaller leaves it random. So we set **β = 14**
- Bigger **ρ**(evaporation coefficient) reduced convergence speed and smaller **ρ** increased the global search ability. **P = 0.2**
- Bigger **Q**(pheromone deposit factor) will allow it to fall into local optimum whereas smaller will give slow optimization speed. **Q = 1**
- Bigger **#ants** means larger time period to complete 1 iteration and smaller means less pheromone deposits and less directed next iteration. **#ants = 20**

2> At the end of Ant Batch Tours (limited to T = 294 s), we implemented a modified Lin-Kernighan Algorithm for 4 seconds:

```
best_tour = best_tour_of_Ants
for all 2 element shuffles in best_tour as shuffle_tour:
        If cost(shuffle_tour) < best_tour:
                Best_tour = shuffle_tour
```

```
i = len(li)-1
while(i>=0):                                #Lin - Kernigan modified Lambda = 2
    if int((datetime.datetime.now()-start).seconds) >= 299:
        break
    print(path_cost(t_path,adj))
    i0 = t_path.index(li[i][0])
    i1 = t_path.index(li[i][1])
    t_path[i0],t_path[i1] = li[i][1],li[i][0]
    pc = path_cost(t_path,adj)
    if pc < b.cost:
        b.path = t_path
        b.cost = pc
        li  = list(combinations(b.path,2))
        i = len(li)-1

    t_path = b.path[:]
    i = i - 1
```

Conclusion: We improved the min cost by greater amounts by <1> and fine improvements by <2>.