# Traveling Sales Person using GA and SA

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# Simulated Annealing

## Problem Formulation

* States: class State { chromosome; fitness } //In chromosome, value in index(i) and index(i+1) represents path from first to second
* Actions and Successor function: randomly selecting two indeces and reversing path between them
* Fitness function: Negative of sum of distances of path
* Schedule function: a – t/b //a and b are variables. a: initial value of temp. b: rate of temperature decrease

# Genetic Algorithms

## Problem Formulation

* Chromosome design: Same as Simulated Annealing
* Fitness function: Same as Simulated Annealing
* Crossover methods used: Partially Mapped Crossover(PMX)
* Mutation method used: replacing one value with another random value and replacing value of index having this new value with old value of first index
* Termination conductions used: fitness\_condition\_input <= fitness of current best path OR iteration limit reached

# Result

In this section you will give results on form of following table. You can also create graph but that is optional.

Table Simulated Annealing Effect of temperature on results

|  |  |  |
| --- | --- | --- |
| Rate of temp decrease | Time consumed to find goal | Fitness of goal |
| 1/100 | 00:01 | -91392 |
| 1/1000 | 00:08 | -39935 |
| 1/10000 | 01:20 | -39753 |

Table 2 Genetic Algorithm Effect of population size on results

Values Used: Mutation Rate=0%. No. Of Iterations=100.

|  |  |  |
| --- | --- | --- |
| k | Time consumed to find goal | Fitness of goal |
| 150 | 01:35 | -218623 |
| 200 | 01:19 | -237024 |
| 250 | 01:18 | -227551 |

Table 2 Genetic Algorithm Effect of mutation rate on results

Values Used: No. Of Iteration=100. K=200

|  |  |  |
| --- | --- | --- |
| alpha | Time consumed to find goal | Fitness of goal |
| 5 | 01:14 | -223799 |
| 10 | 01:13 | -210810 |
| 15 | 01:10 | -212765 |

# Discussions and Conclusion

Both Simulated Annealing(SA) and Genetic Algorithm(GA) get better if no. of iterations increased. GA takes alot of time to give good solution. On other hand, SA takes very short time to find very good solution.

I also tried to use cycle crossover but failed to make second offspring right. The code I wrote is available at the end of GA file.