Selection

# Genetic Algorithm Performance with Different Selection Strategies in Solving TSP

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<https://www.semanticscholar.org/paper/Genetic-Algorithm-Performance-with-Different-in-TSP-Razali-Geraghty/010b545848cfd29fe6e83987d494fdd00b486229>

## Best to use tournament selection.

Tournament selection is probably the most popular selection method in genetic algorithm due to its efficiency and simple implementation [8].

In tournament selection, larger values of tournament size lead to higher expected loss of diversity [12, 14]

The results also revealed that the GA based tournament selection is more efficient in obtaining minimum total distance with less number of generation and fastest iteration time compared to the other two strategies. However, this is only applicable for small problem size (i.e. 10-city, 20-city and burma14). As the size of problem increase, tournament selection as well as proportional roulette wheel becomes susceptible to premature convergence. Rank-based selection on the other hand continues to explore the search space and reaching the lowest traveling distance in the tour.

[8] D.E. Goldberg and K. Deb, A comparative analysis of selection schemes used in genetic algorithms, in: G.J.E. Rawlins (Ed.), Foundations of Genetic Algorithms, Morgan Kaufmann, Los Altos, 1991, pp.69–93.

[12] T. Blickle, L. Thiele, A Comparison of Selection Schemes used in Genetic Algorithms. TIK-Report, Zurich, 1995

[14] D. Whitley, “The genitor algorithm and selection pressure: Why rankbased allocation of reproductive trials is the best,” In Proceeding of the 3rd International Conference on Genetic Algorithms, 1989

Initial set up is tournament with size 2 and 2 parents.

Crossover

# <https://dl.acm.org/citation.cfm?id=3009966>

<https://www.researchgate.net/publication/215499183_Genetic_Evolution_of_a_Neural_Network_for_the_Autonomous_Control_of_a_Four-Wheeled_Robot>

For this domain other methods don’t really work so you gotta custom rig it :/

Keep neurons information together, aka weights and bias for specific neurons.

Uniform crossover.

And one / more points random crossover.

<https://pmt-eu.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_proquest1770060445&context=PC&vid=44NAP_ALMA_VU1&lang=en_US&search_scope=everything&adaptor=primo_central_multiple_fe&tab=default_tab&query=any,contains,crossover%20operators&sortby=rank&offset=0>

Tests

# Effect of population size

Seems that large population size increases initial diversity and therefore overall fitness but not consistent and not enough. 500 population size seems to be not converging and also its too slow. Maybe we haven’t explored all of the population yet?

# Increase the tournament pressure

## Hypothesis

Increasing the pressure will only increase the coverage of the initial population. Also it will help loose gene diversity over time.

# Increase the hidden Neurons

## Hypothesis

Increases the length of the chromosome and therefore allowing more combinations to be possible.

# Increase the Mutation Rate

## Hypothesis

Increases the probability of a gene to be mutated. Too low will not change often enough, too high will change too much at a time to produce good reproduction. **Therefore better try to change only few genes aka 1-3 over the length of the chromosome**.

# Increase the Mutation Change

## Hypothesis

Increases the amount with which we move the weights. Too little and will not be noticed. Too much and we will not be able to fine tune it. **Therefore lowest possible will help with fine tuning.**