

Evolutionary Computation Theory and Application

Assignment 2: Traveling Salesman Problem

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May 17, 2018

1 Solution

Parameter	Value
Population size	50
Crossover Rates	0.01, 0.1, 0.99, 0.98
Mutation Rates	0.01, 0.1, 0.99, 0.25
Repetitions	30
Generations	1000
Average best fitness	59.2327
Best fitness	55.8960

Table 1: Parameters for Experiments

Parameter	Value
Population size	100
Fitness	50.7048
Generations	3000
Crossover rate	0.99
Mutation rate	0.1

Table 2: Parameters for Absolute best result

2.1 Different crossover rates

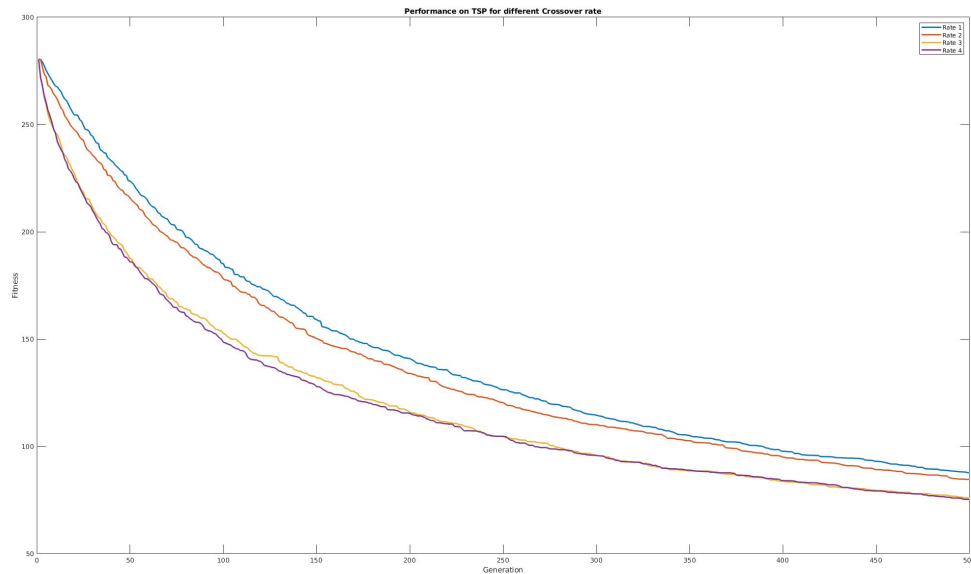


Figure 2: Crossover rate comparison

Describe and explain the different mutation rates and how they influence the learning behaviour. Please remember to also focus on why, not only on what. Also elaborate on the mutation rate you have chosen as best mutation rate.

- We perform single point crossover.
- We choose `sp` individuals and select one with best fitness as father. We choose the mother in the same way.
- We select a `crossPoint` at random and select `1:crossPoint` genes from father's genotype and remaining genes are added in the order in which they appear in mother's genotype.
- We have discovered that crossover rate of 98% performs best.
- As the crossover rate increases, the means fitness becomes better and better. This is expected, because when the rate is high, the child will have higher chance of getting better genes from 2 parents but when the rate is low, child will probably be just a copy of father.
- As it is seen in Figure 2, 98% crossover rate experiment performs almost same with 99% but slightly better at the very end.

2.2 Different mutation rates

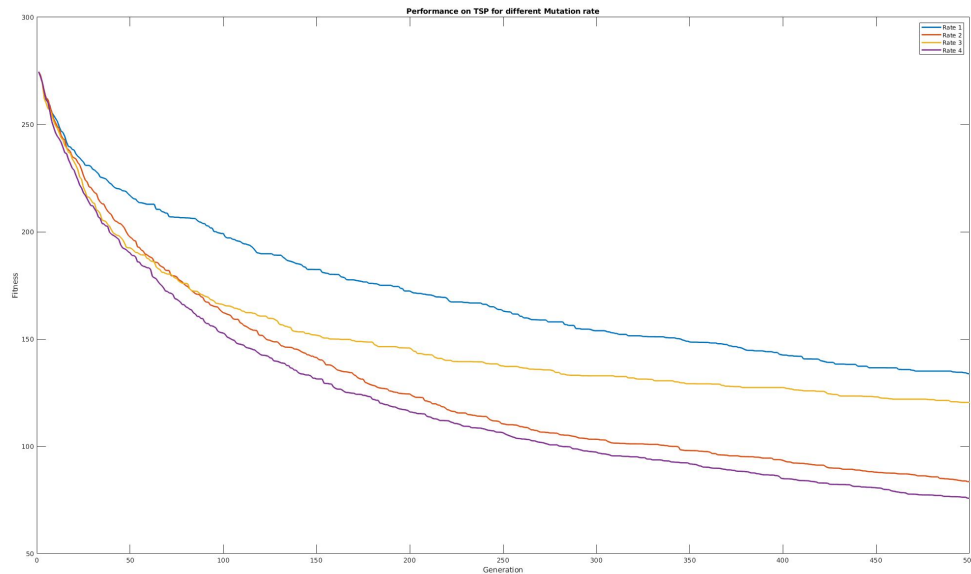


Figure 3: Mutation rate comparison

Describe and explain the different crossover rates and how they influence the learning behaviour. Please remember to also focus on why, not only on what. Also elaborate on the crossover rate you have chosen as best mutation rate.

- We perform *partial shuffle mutation*.
- We mutate an individual with `mutProb` probability.
- We select two points i, j . We reverse the gene string between i and j .
- We have discovered that mutation rate of 25% performs best.
- The reason for this is because 25% is optimal. If the rate is higher than it disrupts the progress of generation and if it is lower than it is not enough progress.

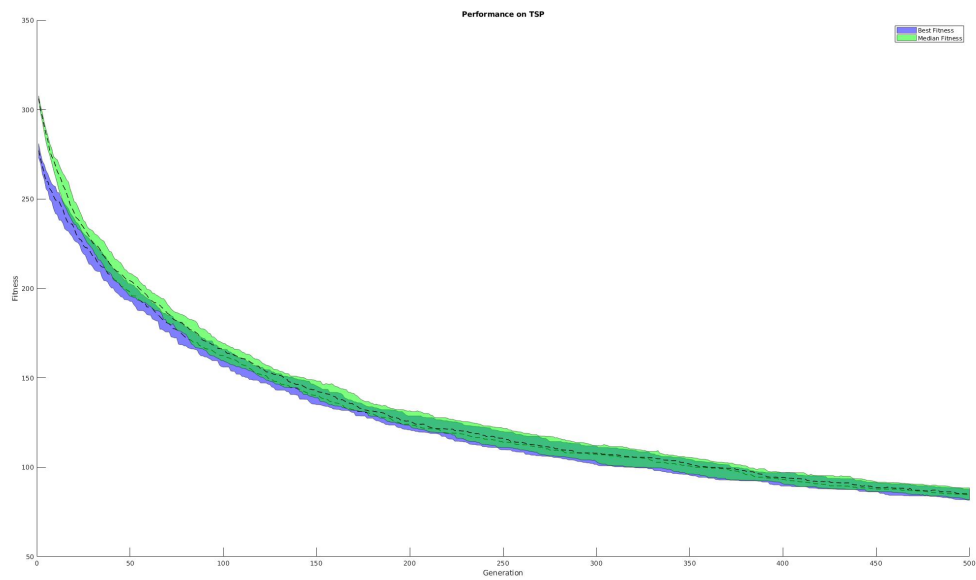


Figure 4: Best and median fitness over 30 Experiments