Laboratory 2 report

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1 Parameters

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Population Size: 500
Number of parents: 60
Tournament Size: 8
Mutation Probability: 0.4 (40%)
Target fitness: 8000
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2 Genetic Algorithm

2.1 Representation

Each individual solution is represented by an array of unique city indices which is the path taken through all cities.

2.2 Fitness Function

Our fitness function calculates the total length from an *initial city* through all other cities and back again to the *initial city*. The higher the total length is, the worse the fitness is. Our formula of the function is:

$$fitness = \sum_{i=1}^{n-1} \sqrt{(x_{i+1} - x_i)^2 + (y_{i+1} - y_i)^2} \tag{1}$$

where n is the number of cities in the individual.

2.3 Selection Strategy

As our selection strategy we used *Tournament Selection* with *8* as the tournament size. We select 8 individuals randomly from the population and choose only the best, according to the fitness function, out of all 8 to be a parent for the new generation. The number of repetitions is dependent on our desired number of parents which is *60*.

2.4 Crossover

To do the crossover we begin with choosing 2 random parents from the *Tournament Selection*, *parent A* and *parent B*. We then create a sequence of a random length between 1 and the number of elements in the individuals. The sequence contains unique numbers that represents which elements from *parent A* that the child will directly inherit. Lastly we copy over the remaining unique elements in *parent B* that the child not already contains. Due to the fact that each child has 2 parents, the number of children for the new generation is half of the number of parents.

2.5 Mutation

The mutation involves just taking a randomly sized sequence of elements from the child and reversing it, and replacing the previous sequence in the child with the new. The probability for the mutation to occur is *0.4 (40 % of the children is mutated)*.

2.6 Replacement

Our replacement strategy is using *ELITISM*, so it entails replacing the worst individuals in the population with the new children according to our fitness function, and therefore always keeping the best individuals for every generation.
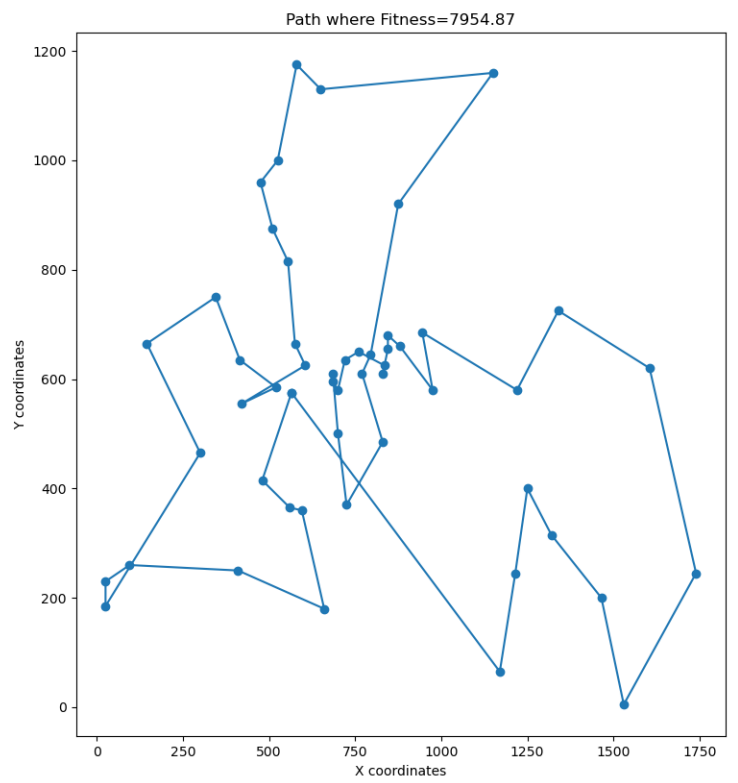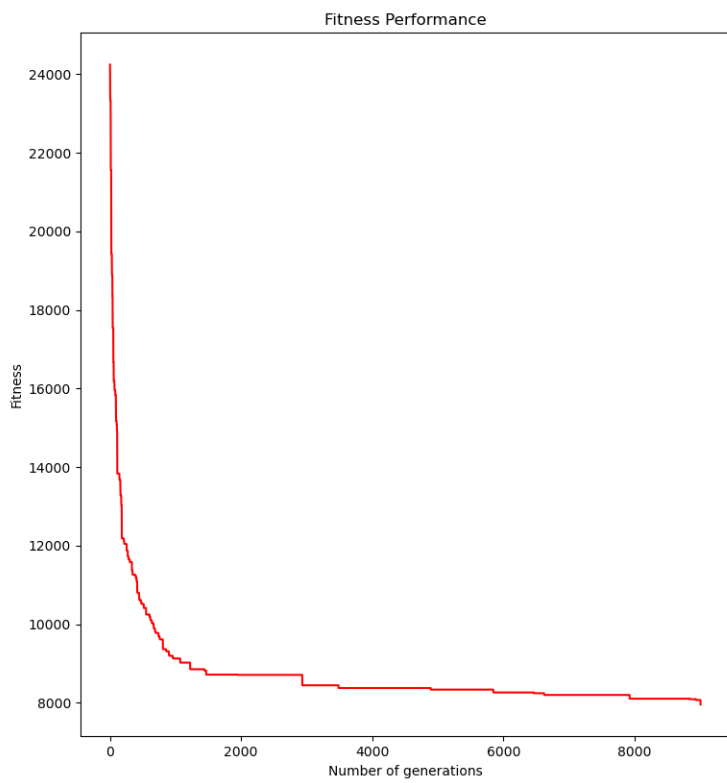
3 Result

Figure 1: Caption