HP1

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Problem 2.1

The best path found can be observed in figure 1 and have a length of 102,4607 which is the first path that was less than 103.

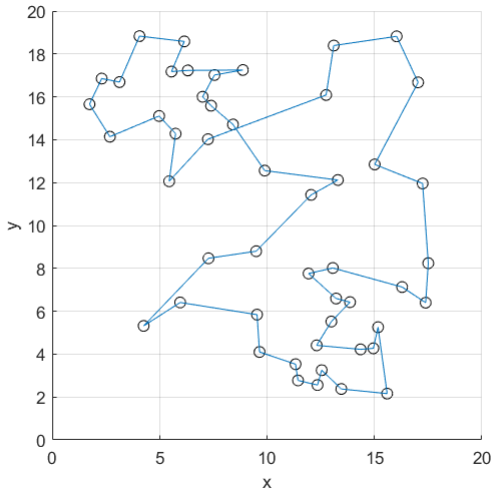

Figure 1: The best path found with AS algorithm.

Problem 2.2

We have the function

$$f(x, y) = (x^2 + y - 11)^2 + (x + y^2 - 7)^2. \tag{1}$$

In figure 2 we have the contour plot of $\log(0.01 + f(x, y))$ where we can observe 4 minima of the function.

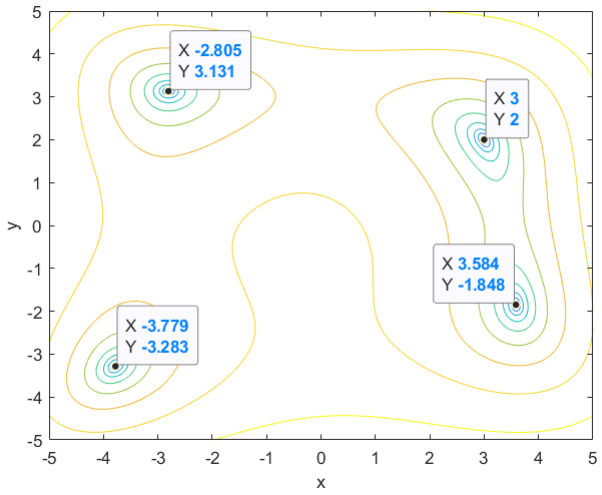

Figure 2: Plot of f(x,y) with 4 minimums identified.

Upon running the PSO algorithm the minima found is displayed in table 1. Here the values of the function is at the approximated points, whereof these values are even smaller with more exact values. As we can see the minima seems to coincide with the ones in figure 2.

x	y	f(x,y)
3.0000	2.0000	0
3.5844	-1.8481	$4.717 \cdot 10^{-8}$
-2.8051	3.1313	$1.6631 \cdot 10^{-8}$
-3.7793	-3.2832	$1.8827 \cdot 10^{-8}$

Table 1: Minima found to f(x,y) rounded to 4 decimals.

Problem 2.3

Upon encoding the network to a chromosome, I implemented the algorithm by creating a population of identical chromosomes like the one generated, and then running the about the same genetic algorithm from Home Problem 1.3. The fitness was created by taking the mean velocity times the distance traveled before termination. In figure 3 we can see the Maximal fitness of the population as a function of which generation it is on.

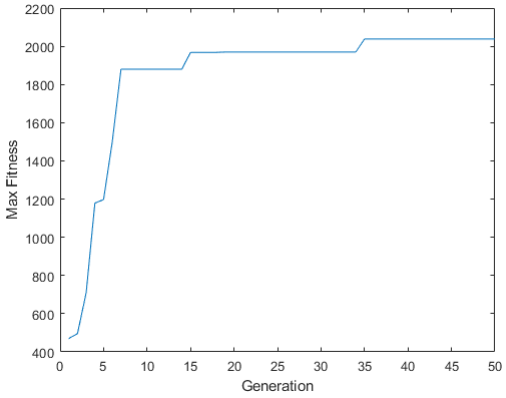

Figure 3: Maximum fitness of population as a function of generations.