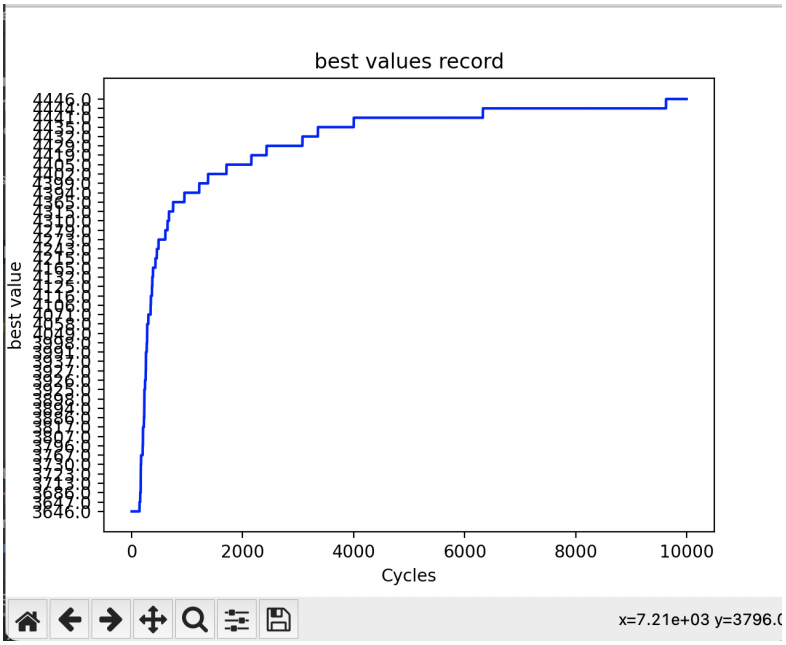
ECMM409
Nature-Inspired-Computation CA1

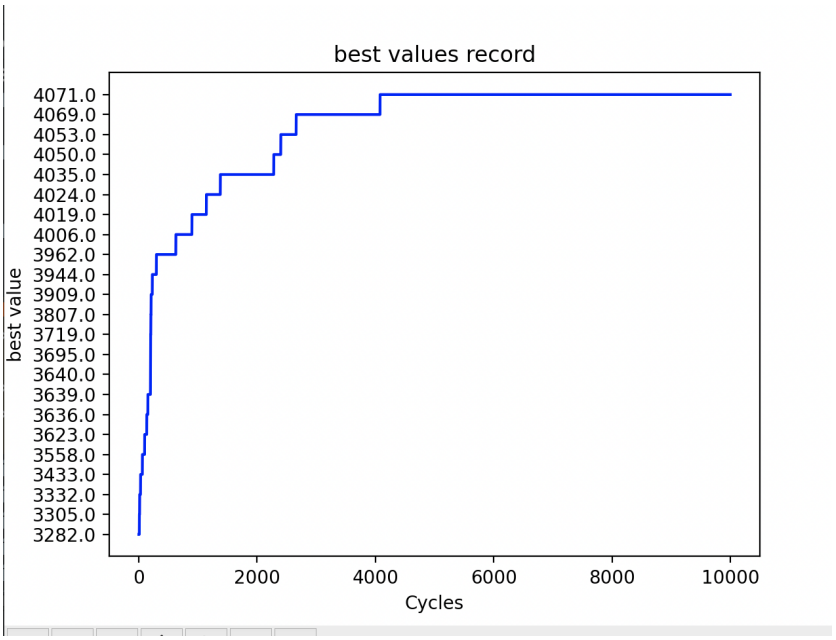
1. Implementation and Experimentation

1.1Algorithm graph

picture1: mutation rate = 0.1, population size = 10



picture2 : mutation rate = 0.4, population size = 10



2.Question

Question 1: Which combination of parameters produces the best results?

Answer: The best results were obtained when the parameters mutation rate=0.1, crossover rate=0.8 and population size=15 were combined. The most dramatic results were obtained when these characteristics were combined, as the average fitness of the population increased over the course of the trial.

Question 2: Why do you think this is the case?

Answer: I think that when the mutation rate becomes low, the number of mutations is small, so more possibilities can be traversed in a large number of cycles. For the crossover rate, other schemes become more and more perfect, so the new scheme can pass Cross-obtain excellent combinations of other schemes; through the weakest replacement, all schemes become better and better, and the population will gradually find the optimal solution

Question 3: What was the effect when you removed mutation? What about crossover?

Answer: If the mutation is canceled, all possible combinations cannot be traversed in the loop, which will greatly reduce the possibility of finding the optimal solution, and the innovative combinations of experimental results will also be correspondingly reduced; if there is no crossover, the new The solution cannot benefit from the solutions we generated before, because we use the weakest replacement, and the combination of solutions is getting better and better;

Question 4: If you were to extend your EA to work with a multi-objective version of this problem, which functions in your program would you change and why?

Answer: If I extend my EA to a multi-objective version that deals with this problem, I will first change the reading data; for the fitness algorithm, it will also be adjusted according to the newly added multi-objective to calculate the appropriate fitness rate

3.Tentative Conclusions & Further Experiments

The exploration ability and operating efficiency of the algorithm are mainly affected by the mutation rate and crossover. When the mutation rate is smaller, the generation curve of the optimal solution will be more stable, and it will be easier to find the optimal solution. The initial population solution will traverse more scenarios. , indicating that in the case of low mutation rate, the search ability of the algorithm is better and more stable. When the mutation rate is high, the curve of the algorithm will become less stable; for crossover, it is the key to continuously improve the solution. Partly, through crossover, the new solution can benefit from the previous solution, because with the continuous evolution, the combination scenario of the solution is more in line with the optimal solution; the impact of the initial population on the evolution is relatively small, Because the initial random scheme is generally not particularly ideal, it does not play a decisive role in the subsequent schemes. On the contrary, if the initial population is large, it will significantly slow down the evolution rate.

Through continuous experiments, we found that it is not always possible to find the optimal solution every time, because in the process of evolution, each combination is relatively random; the evolutionary algorithm can only become better through a large number of operations, but not always An algorithm that can directly obtain an excellent solution, it has the coverage of traversing all situations, when the combination of solutions is particularly large, the efficiency of the evolutionary algorithm will appear to be relatively slow