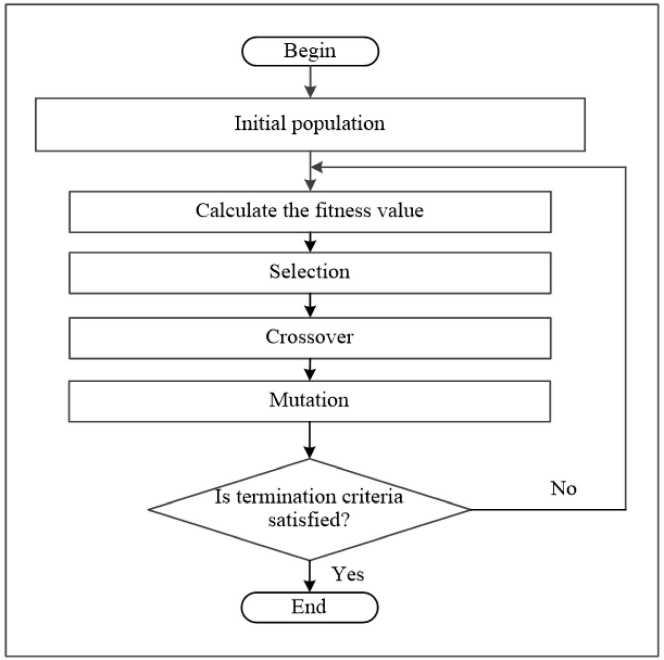
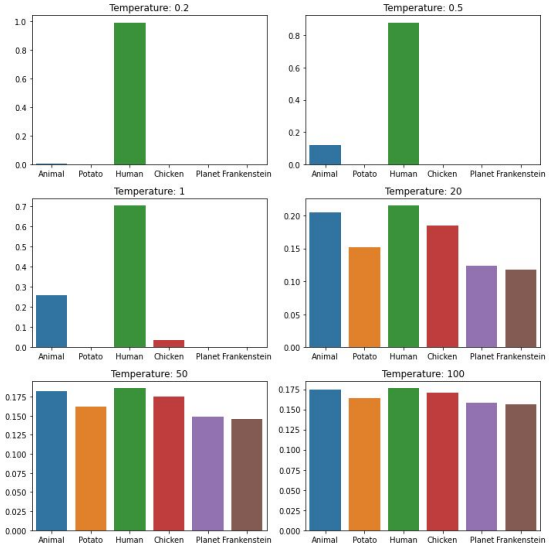
Решение задачи маршрутизации транспорта с ограничениями

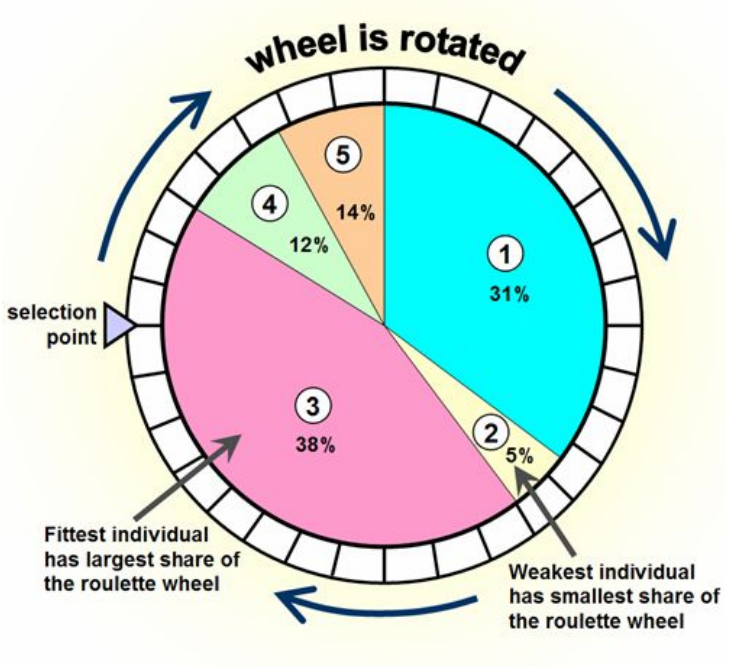
Обзор генетического алгоритма (GA)



Селекция

Выбор колеса рулетки (Roulette Wheel Selection) с температурой



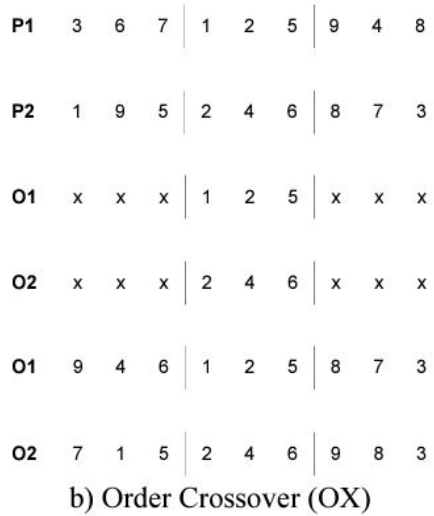


Кроссовер

A kind of variation of PMX with a different repairing procedure

Procedure: OX

1. Select a substring from a parent at random.
2. Produce a proto-child by copying the substring into the corresponding position of it.
3. Delete the cities which are already in the substring from the 2nd parent. The resulted sequence of citires contains the cities that the proto-child needs.
4. Place the cities into the unfixed positions of the proto-child from left to right according to the order of the sequence to produce an offspring.

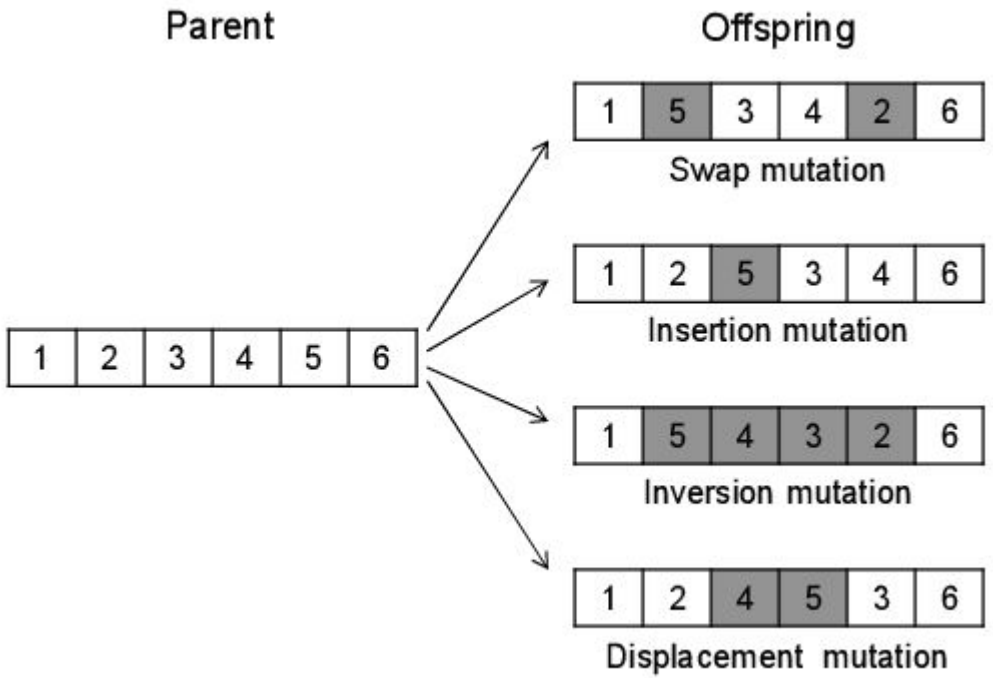


b) Order Crossover (OX)

(1) https://mat.uab.cat/~Alseda/MasterOpt/GeneticOperations.pdf
(2) http://ieomsociety.org/proceedings/2021indonesia/274.pdf

Мутация

- Swap mutation
- Insertion mutation
- Inversion mutation
- Split mutation
- Concat mutation



Результаты

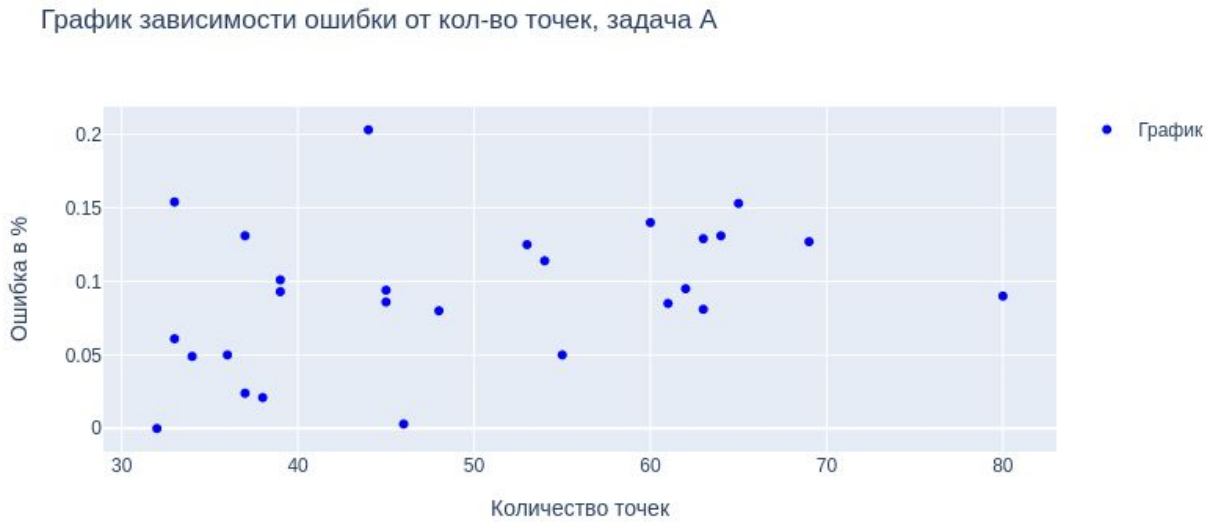


График зависимости ошибки от кол-во точек, задача А
Ошибка в %
0.2
0.15
0.1
0.05
0
30
40
50
60
70
80
Количество точек
График

Результаты

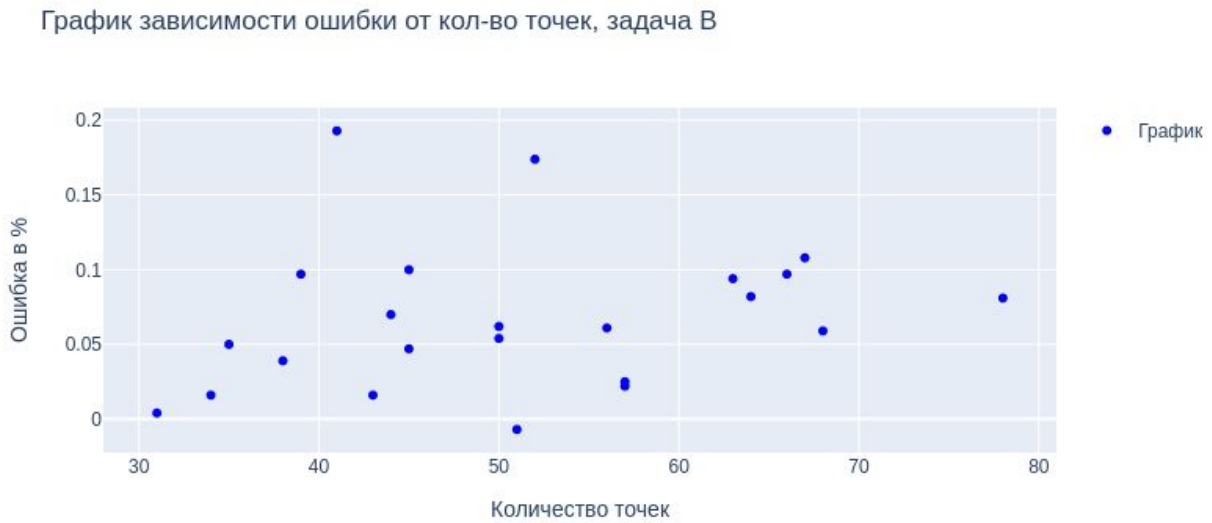


График зависимости ошибки от кол-во точек, задача B
Ошибка в %
0.2
0.15
0.1
0.05
0
30
40
50
60
70
80
Количество точек
График

Результаты

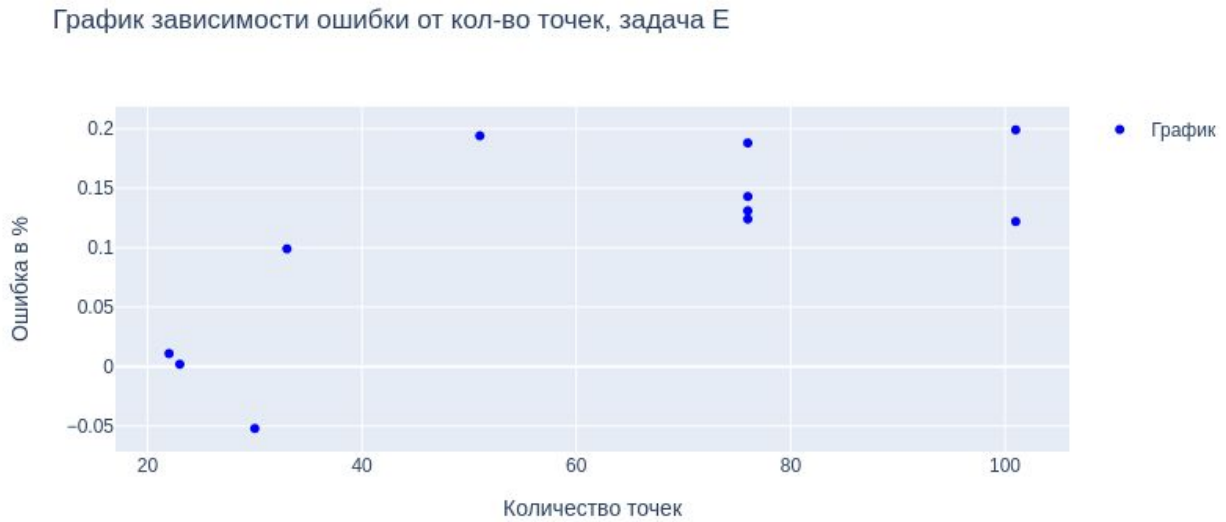
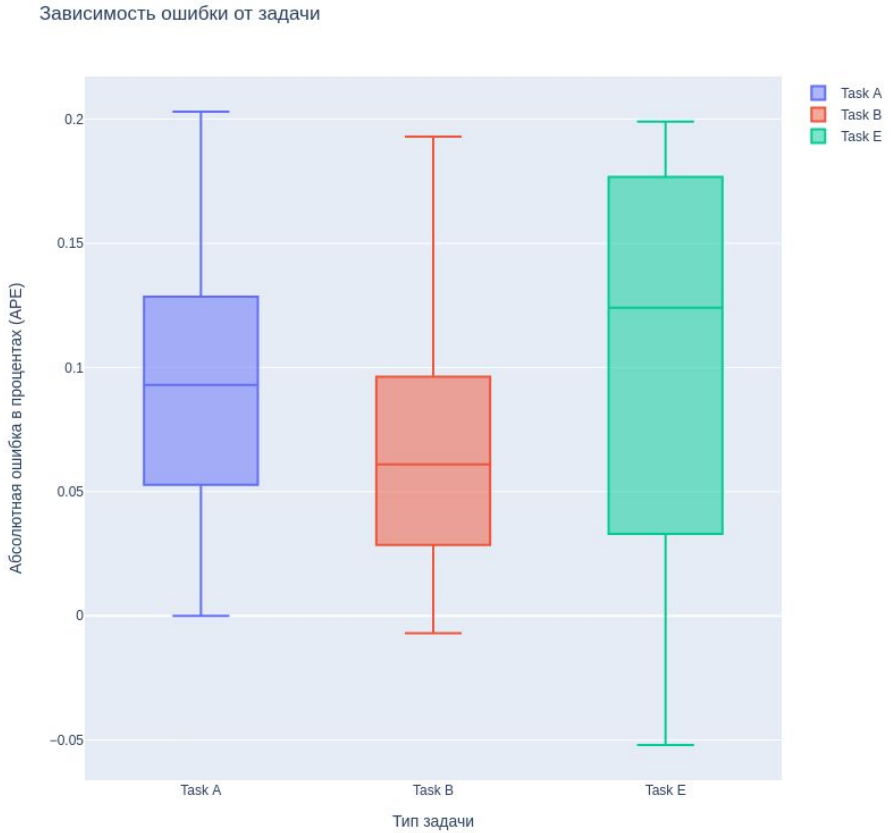


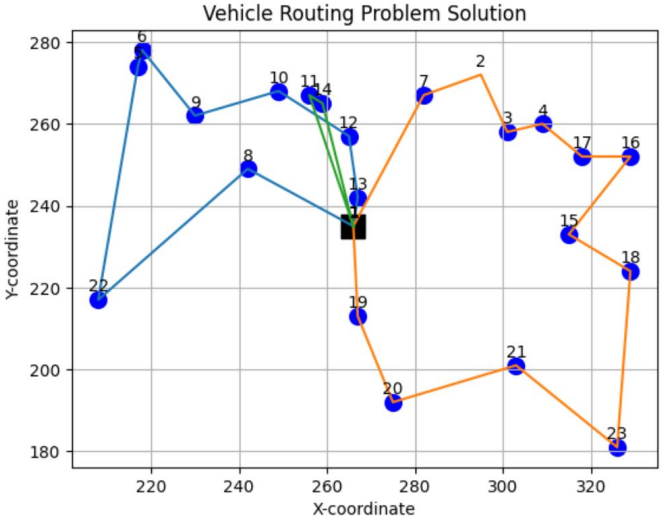
График зависимости ошибки от кол-во точек, задача E
Ошибка в %
0.2
0.15
0.1
0.05
0
−0.05
20
40
60
80
100
Количество точек
График

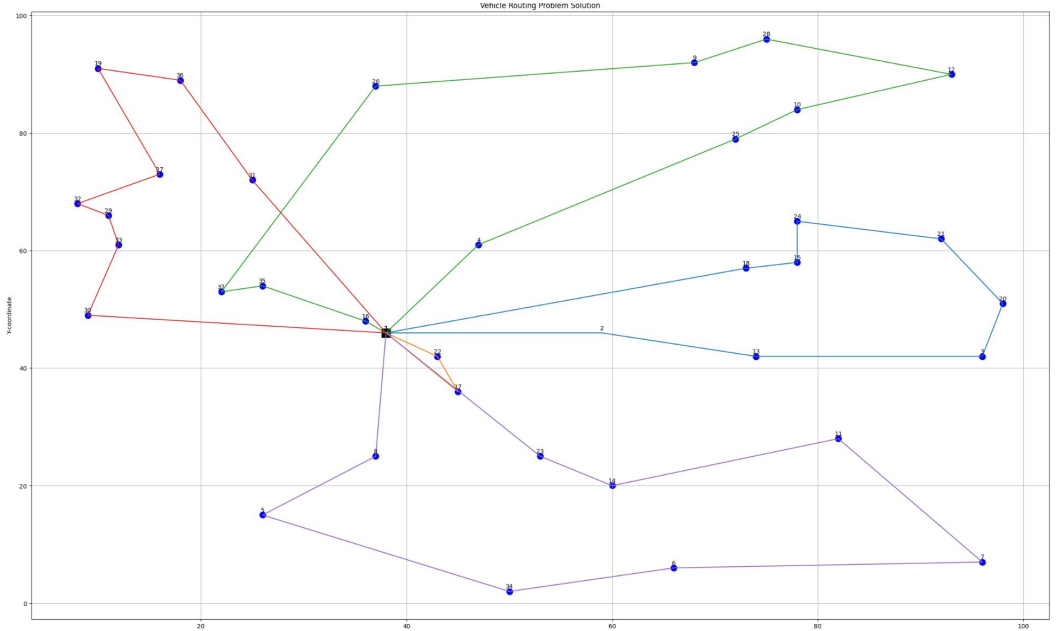
Результаты

“One thing should be noticed, namely that in the case of B-n51-k7, the proposed algorithm finds a shorter distance than the best known one by using one more vehicle.”
Computing and Informatics, Vol. 30, 2011, 721–732



Пример


Vehicle Routing Problem Solution
Y-coordinate
X-coordinate
280
260
240
220
200
180
220
240
260
280
300
320
6
9
10
11
14
12
7
2
3
4
17
16
8
13
1
15
18
22
19
21
20
23


Vehicle Routing Problem Solution
Y-coordinate
100
80
60
40
20
0
20
40
60
80
100