The Solution of Logistics and Transport Problems by Means of Genetic Algorithms

1. Introduction

They are problems that are necessary to solve in practice and transport and logistics problems belong among them. The correct optimization of such problems enables us to minimize the cost and time. The genetic algorithms can help us with such problems.

2. Logistics optimalization

The solution of logistics problem can be presented in the following case. We have defined the coordinates of pick-up places (for example pick-up of mail, garbage, etc.) and we determine the number of collection centers where the fabricator will be placed. The problem is to determine the coordinates of such collection centers and respective pick-up places. The method of clustering can be used and the genetic algorithms optimize the solution. During the process of calculation the pick-up places are divided into clusters and then the coordinates of center of each cluster are calculated. The number of pick-up places and collection centers are not restricted.

Part of Tab.1. shows the number and coordinates of pick-up places and their relative collection center. The Tab.2. shows calculated coordinates of collection centers A,B,C.

Number	Pick-up places		Collection center
	X	Y	
…..	…..	…..	…...
22	25.00	4.19	A
23	16.00	2.62	A
24	111.00	16.79	C
25	66.80	10.10	B
26	20.40	4.10	A
27	120.00	17.01	C
28	56.80	5.69	B
29	59.90	10.80	B
…..	…..	…..	…...

Tab.1. Pick-up places

Coordinates		Collection center
X	Y	
18.4	3.1	A
59.8	9.0	B
106.8	15.9	C

Tab.2. Collection centers

The process of optimalization determines the placement of collection centers and relative pick-up places in such a way to minimize the distances among them. The Fig.1. shows the pick-up places and collection center which solve the mentioned problem and thus to minimize the costs and time.

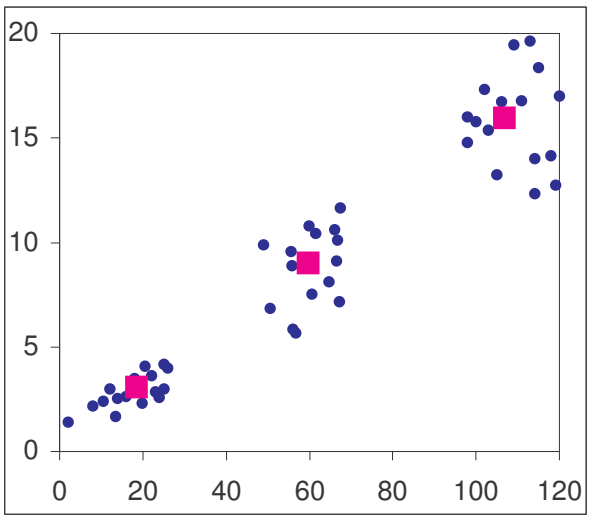

Fig.1. The pick-up places and collection center A,B,C

3. Travel optimization

The solution of travel problem can be presented in the following case. When we know the coordinates of pick-up places and collection centers we can determine the traffic distances among them for each group. The problem is to determine the shortest traffic route of places which we have to visit. The genetic algorithms can help us to solve such problem especially when the number of visited places is high. During the process of calculation is searched the shortest traffic route.

Part of the Tab.3. shows the traffic distances among collection center A (CCA) together with pick-up places in group A (PPAx) in km. The Tab.4. shows the order of visited places before and after optimization. The traffic route measures after (before) optimization 327 (441) km. The Fig.2. shows these two traffic routes. The shortest traffic route enables us to minimize the costs and time.

	CCA	.....	PPA2	PPA3	PPA4	PPA5	.....
.....	.....	.....	.....	.....	.....	.....	.....
PPA2	30	.....	0	14	30	30	.....
PPA3	24	.....	14	0	18	17	.....
PPA4	36	.....	30	18	0	15	.....
CCA	0	.....	30	24	36	24	.....
PPA5	24	.....	30	17	15	0	.....
.....	.....	.....	.....	.....	.....	.....	.....

Tab.3. Travel distances

Order	Before optimalization	After optimalization
1	CCA	CCA
2	PPA1	PPA13
3	PPA2	PPA12
4	PPA3	PPA10
5	PPA4	PPA9
6	PPA5	PPA8
7	PPA6	PPA7
8	PPA7	PPA11
9	PPA8	PPA1
10	PPA9	PPA4
11	PPA10	PPA3
12	PPA11	PPA5
13	PPA12	PPA6
14	PPA13	PPA2
15	PPA14	PPA14
1	CCA	CCA
Total:	441 km	327 km

Tab.4. Traffic route

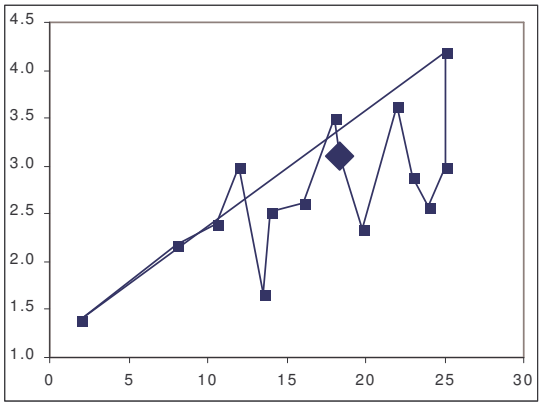

Fig.2a. Traffic route (441 km)

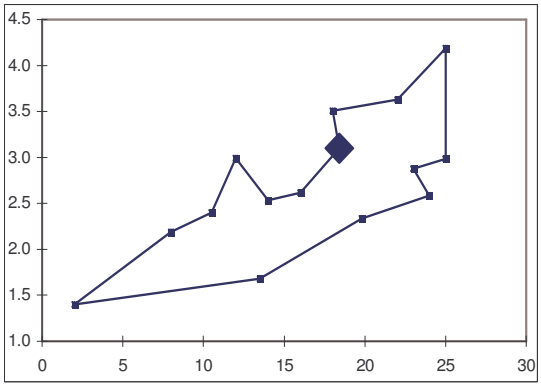

Fig.2b. Traffic route (327 km)

4. Conclusion

The genetic algorithms enable us to solve complicated logistics and traffic problems. The correct optimalization and application of results in practice enables us to minimize the costs, increase the profit and save our environment.