Contemporary Intelligent Intellectual Technology (CIIT)

Practice №3 (08.04.2016)

Kiryl Kaminets (AS-37)

Task: TSP with 25 cities of a fixed location

1. Assume 25 cities as shown in the next page (start from Z and return to Z).
2. Calcurate distance matrix (25×25).

3. Apply GA and evolve chromosomes to be the tours of minimum length.

4. Also show

(5) the graph of fitness vs generation.

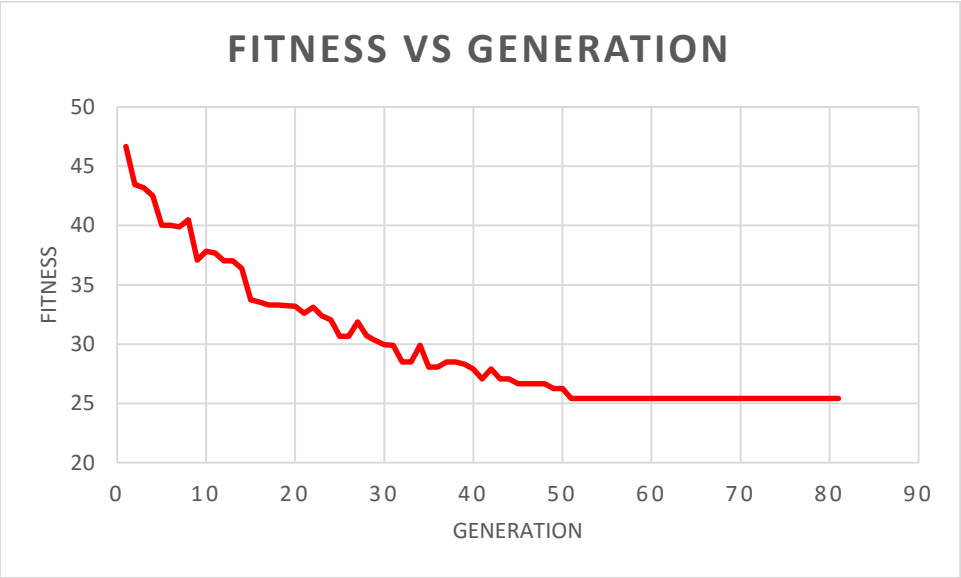
(6) The minimum tour in the 1st, two intermediate, and the final generation.

The map of 25 cities:

Distance matrix:

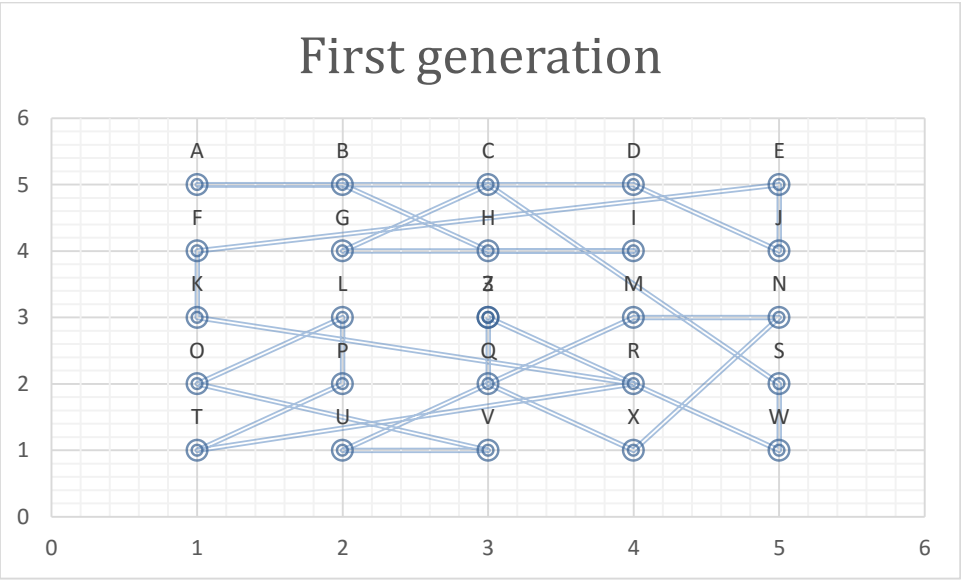
	A	B	C	D	E	F	G	H	I	J	K	L	Z (Start)	M	N	O	P	Q	R	S	T	U	V	X	W
A	0	1	2	3	4	1	1.414214	2.236068	3.162278	4.123106	2	2.236068	2.828427	3.605551	4.472136	3	3.162278	3.605551	4.242641	5	4	4.123106	4.472136	5	5.656854
B	1	0	1	2	3	1.414214	1	1.414214	2.236068	3.162278	2.236068	2	2.236068	2.828427	3.605551	3.162278	3	3.162278	3.605551	4.242641	4.123106	4	4.123106	4.472136	5
C	2	1	0	1	2	2.236068	1.414214	1	1.414214	2.236068	2.828427	2.236068	2	2.236068	2.828427	3.605551	3.162278	3	3.162278	3.605551	4.472136	4.123106	4	4.123106	4.472136
D	3	2	1	0	1	3.162278	2.236068	1.414214	1	1.414214	3.605551	2.828427	2.236068	2	2.236068	4.242641	3.605551	3.162278	3	3.162278	5	4.472136	4.123106	4	4.123106
E	4	3	2	1	0	4.123106	3.162278	2.236068	1.414214	1	4.472136	3.605551	2.828427	2.236068	2	5	4.242641	3.605551	3.162278	3	5.656854	5	4.472136	4.123106	4
F	1	1.414214	2.236068	3.162278	4.123106	0	1	2	3	4	1	1.414214	2.236068	3.162278	4.123106	2	2.236068	2.828427	3.605551	4.472136	3	3.162278	3.605551	4.242641	5
G	1.414214	1	1.414214	2.236068	3.162278	1	0	1	2	3	1.414214	1	1.414214	2.236068	3.162278	2.236068	2	2.236068	2.828427	3.605551	3.162278	3	3.162278	3.605551	4.242641
H	2.236068	1.414214	1	1.414214	2.236068	2	1	0	1	2	2.236068	1.414214	1	1.414214	2.236068	2.828427	2.236068	2	2.236068	2.828427	3.605551	3.162278	3	3.162278	3.605551
I	3.162278	2.236068	1.414214	1	1.414214	3	2	1	0	1	3.162278	2.236068	1.414214	1	1.414214	3.605551	2.828427	2.236068	2	2.236068	4.242641	3.605551	3.162278	3	3.162278
J	4.123106	3.162278	2.236068	1.414214	1	4	3	2	1	0	4.123106	3.162278	2.236068	1.414214	1	4.472136	3.605551	2.828427	2.236068	2	5	4.242641	3.605551	3.162278	3
K	2	2.236068	2.828427	3.605551	4.472136	1	1.414214	2.236068	3.162278	4.123106	0	1	2	3	4	1	1.414214	2.236068	3.162278	4.123106	2	2.236068	2.828427	3.605551	4.472136
L	2.236068	2	2.236068	2.828427	3.605551	1.414214	1	1.414214	2.236068	3.162278	1	0	1	2	3	1.414214	1	1.414214	2.236068	3.162278	2.236068	2	2.236068	2.828427	3.605551
Z (Start)	2.828427	2.236068	2	2.236068	2.828427	2.236068	1.414214	1	1.414214	2.236068	2	1	0	1	2	2.236068	1.414214	1	1.414214	2.236068	2.828427	2.236068	2	2.236068	2.828427
M	3.605551	2.828427	2.236068	2	2.236068	3.162278	2.236068	1.414214	1	1.414214	3	2	1	0	1	3.162278	2.236068	1.414214	1	1.414214	3.605551	2.828427	2.236068	2	2.236068
N	4.472136	3.605551	2.828427	2.236068	2	4.123106	3.162278	2.236068	1.414214	1	4	3	2	1	0	4.123106	3.162278	2.236068	1.414214	1	4.472136	3.605551	2.828427	2.236068	2
O	3	3.162278	3.605551	4.242641	5	2	2.236068	2.828427	3.605551	4.472136	1	1.414214	2.236068	3.162278	4.123106	0	1	2	3	4	1	1.414214	2.236068	3.162278	4.123106
P	3.162278	3	3.162278	3.605551	4.242641	2.236068	2	2.236068	2.828427	3.605551	1.414214	1	1.414214	2.236068	3.162278	1	0	1	2	3	1.414214	1	1.414214	2.236068	3.162278
Q	3.605551	3.162278	3	3.162278	3.605551	2.828427	2.236068	2	2.236068	2.828427	2.236068	1.414214	1	1.414214	2.236068	2	1	0	1	2	2.236068	1.414214	1	1.414214	2.236068
R	4.242641	3.605551	3.162278	3	3.162278	3.605551	2.828427	2.236068	2	2.236068	3.162278	2.236068	1.414214	1	1.414214	3	2	1	0	1	3.162278	2.236068	1.414214	1	1.414214
S	5	4.242641	3.605551	3.162278	3	4.472136	3.605551	2.828427	2.236068	2	4.123106	3.162278	2.236068	1.414214	1	4	3	2	1	0	4.123106	3.162278	2.236068	1.414214	1
T	4	4.123106	4.472136	5	5.656854	3	3.162278	3.605551	4.242641	5	2	2.236068	2.828427	3.605551	4.472136	1	1.414214	2.236068	3.162278	4.123106	0	1	2	3	4
U	4.123106	4	4.123106	4.472136	5	3.162278	3	3.162278	3.605551	4.242641	2.236068	2	2.236068	2.828427	3.605551	1.414214	1	1.414214	2.236068	3.162278	1	0	1	2	3
V	4.472136	4.123106	4	4.123106	4.472136	3.605551	3.162278	3	3.162278	3.605551	2.828427	2.236068	2	2.236068	2.828427	2.236068	1.414214	1	1.414214	2.236068	2	1	0	1	2
X	5	4.472136	4.123106	4	4.123106	4.242641	3.605551	3.162278	3	3.162278	3.605551	2.828427	2.236068	2	2.236068	3.162278	2.236068	1.414214	1	1.414214	3	2	1	0	1
W	5.656854	5	4.472136	4.123106	4	5	4.242641	3.605551	3.162278	3	4.472136	3.605551	2.828427	2.236068	2	4.123106	3.162278	2.236068	1.414214	1	4	3	2	1	0

Fitness vs generation:

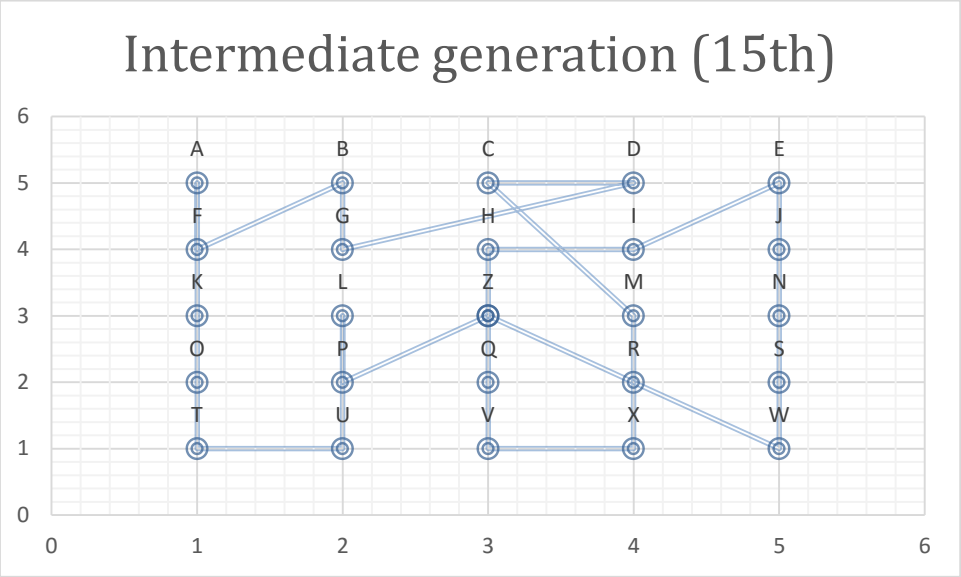


First generation:

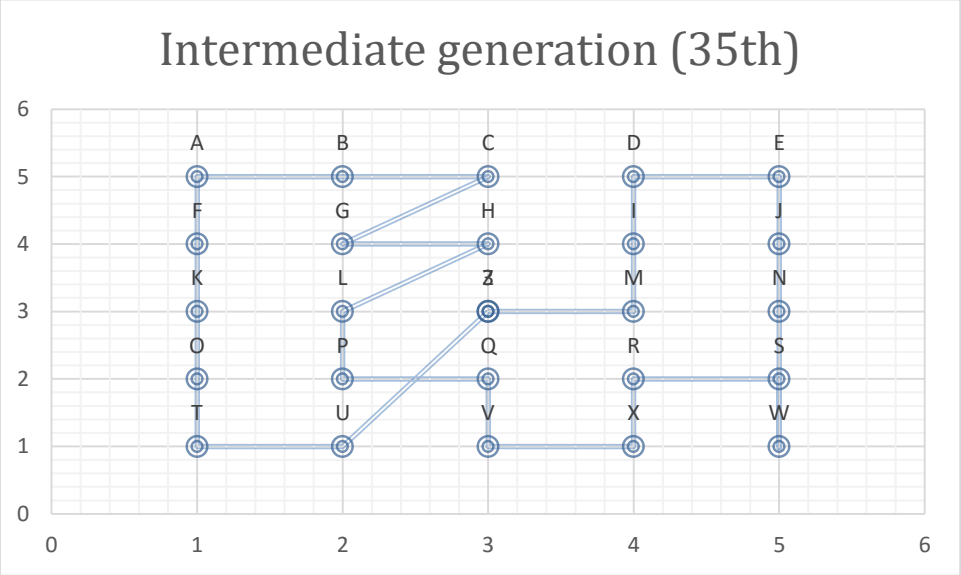
Route: Z-Q-X-N-M-U-V-O-L-P-T-R-K-F-E-N-D-A-B-H-I-G-C-S-W-Z



Intermediate generation (15th generation):
Route: Z-P-L-U-T-O-K-A-F-B-G-D-C-M-X-V-Q-H-I-E-J-N-S-W-R-Z



Intermediate generation (35th generation):
Route: Z-U-T-O-K-F-A-B-C-G-H-L-P-Q-V-X-R-S-W-N-J-E-D-I-M-Z



Final generation:
Route: Z-Q-V-U-T-O-P-L-K-F-A-G-B-C-H-I-D-E-J-N-S-W-X-R-M-Z