Contemporary Intelligent Intellectual Technology (CIIT)

Practice #3 (08/04/2016)

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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.

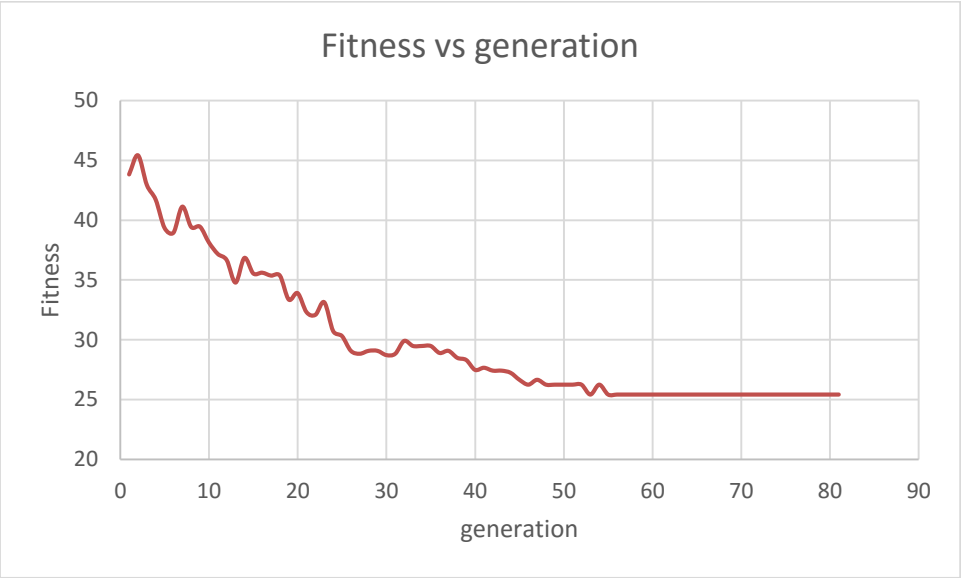
(6) The minimum tour in the 1st, two intermediate, and the final generation.

The map of 25 cities:

Distance matrix:

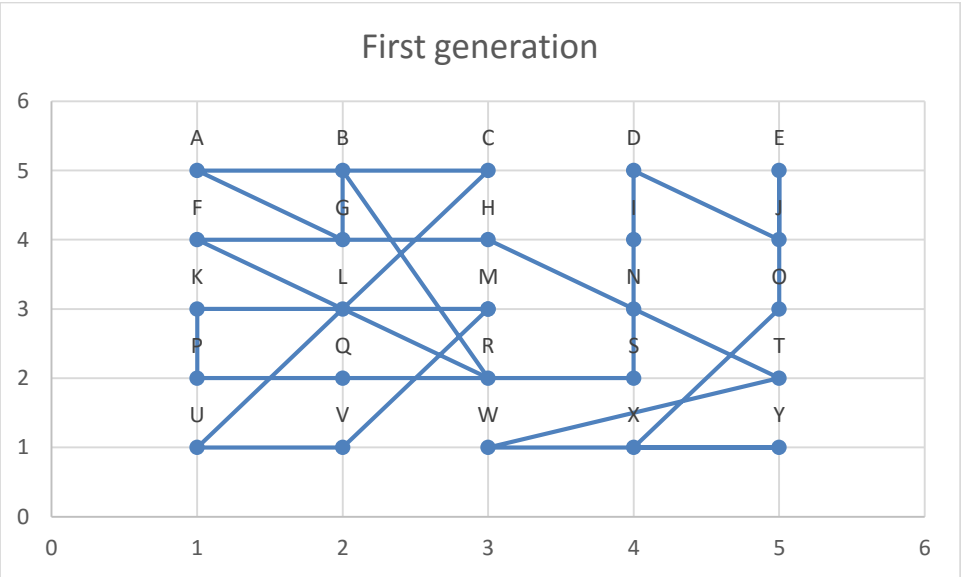
	A	B	C	D	E	F	G	H	I	J	K	L	M (Start)	N	O	P	Q	R	S	T	U	V	W	X	Y
A	0	1	2	3	4	1	1.414214	2.236068	3.162278	4.123106	2	2.236068	2.828427	3.605551	4.472136	3	3.162278	3.605551	4.242641	5	4	4.123106	4.472136	5	5.656854
B	1	0	1	2	3	1.414214	1	1.414214	2.236068	3.162278	2.236068	2	2.236068	2.828427	3.605551	3.162278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

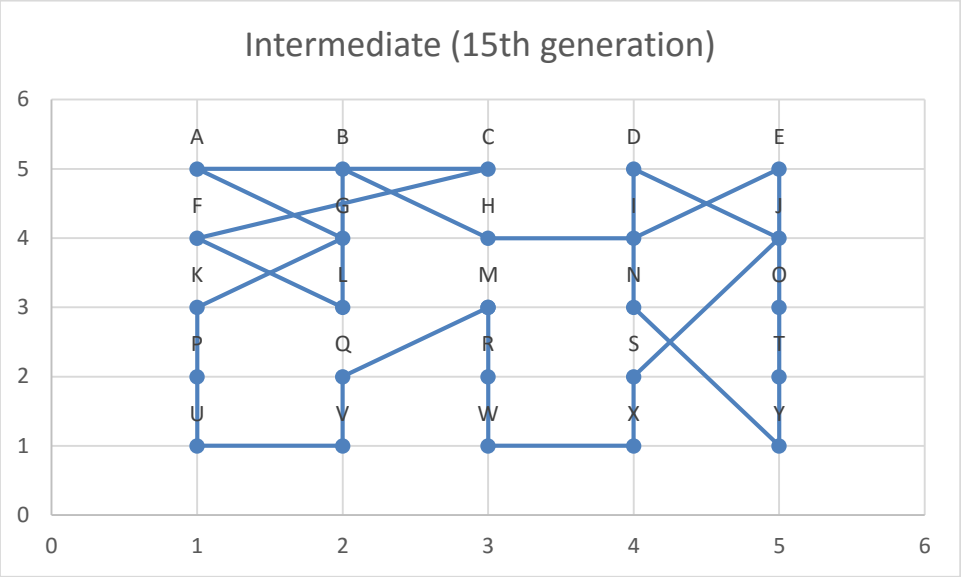


First generation:

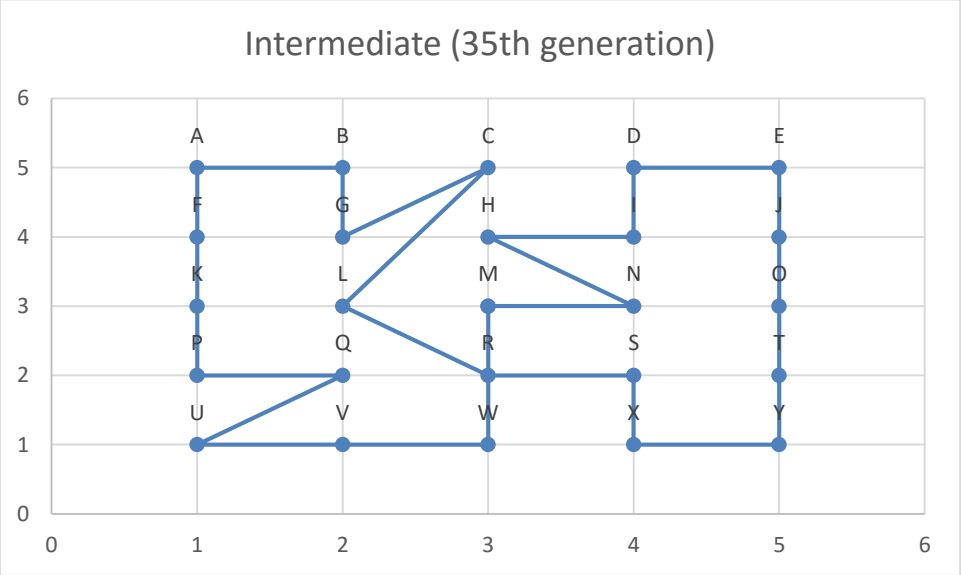
Route: M-V-U-L-C-A-G-B-R-F-H-T-W-Y-X-O-E-J-D-I-N-S-Q-P-K-M



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



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



Final generation:

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