Modern intelligent IT
Lab 3 (08.04.2016)
Akira Imada
Student – Grinyuk Dmitry
Group – AS 37

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. Calculate distance matrix (25×25).

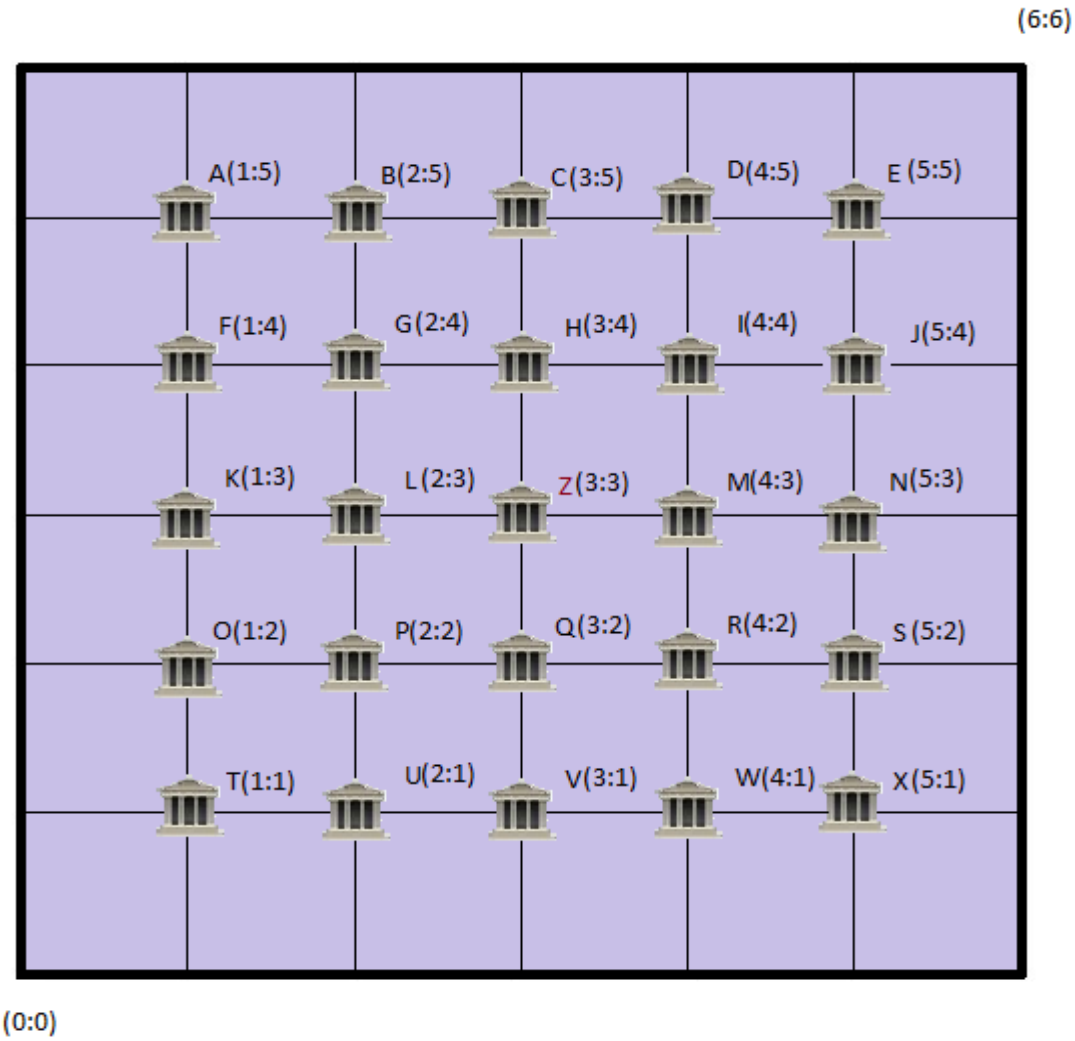
3. Apply GA and evolve chromosomes to be the tours of minimum length.

4. Also show

(5) the graph of fitness vs generation.

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

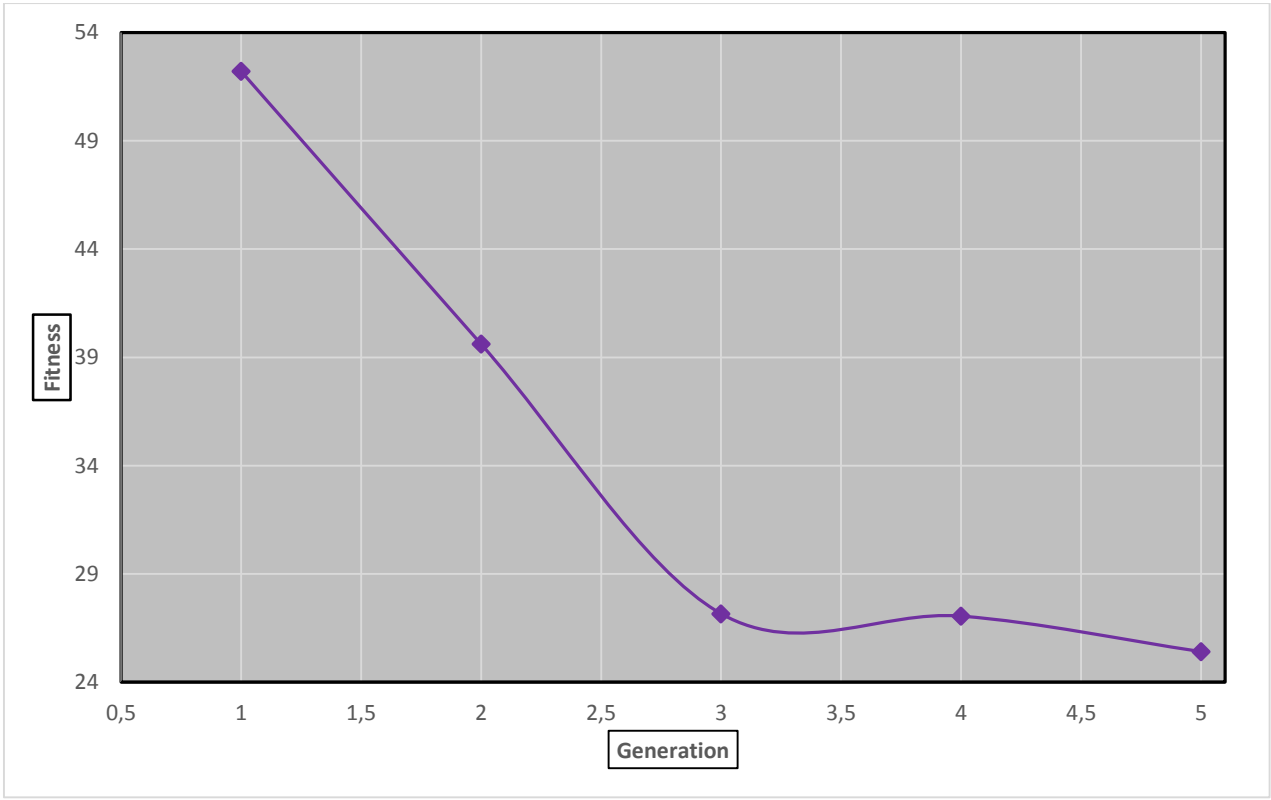
Map of cities



Distance matrix

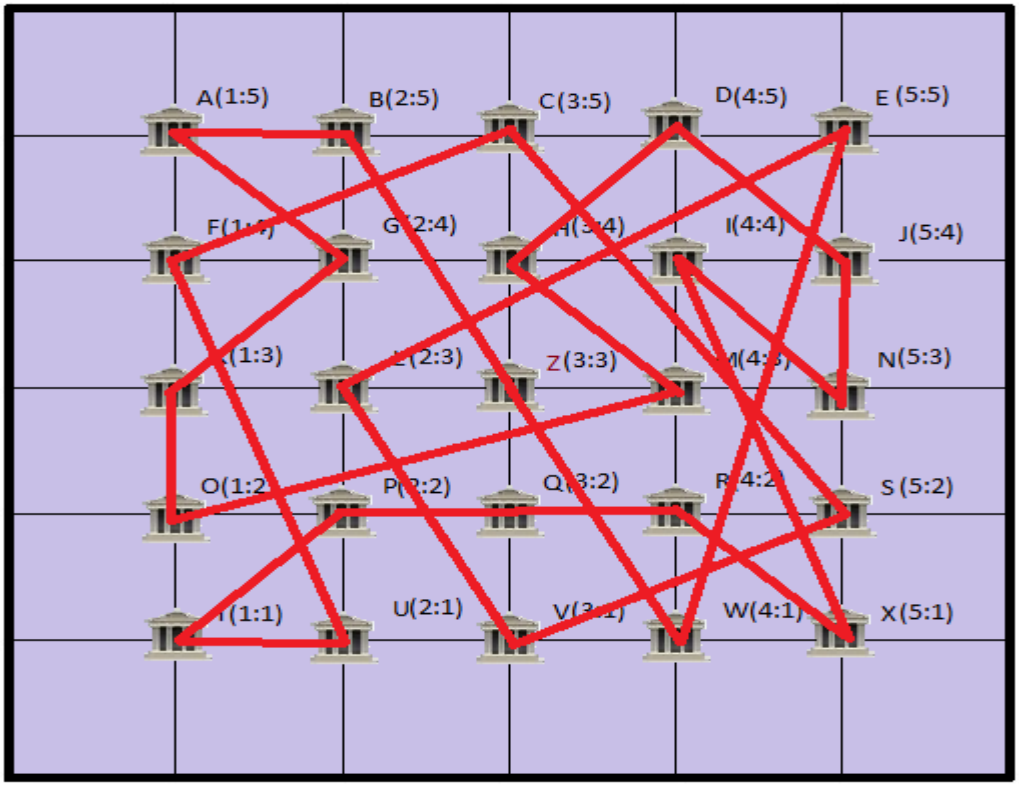
	A	B	C	D	E	F	G	H	I	J	K	L	Z	M	N	O	P	Q	R	S	T	U	V	W	X
A	0	1	2	3	4	1	1,41421	2,23607	3,16228	4,12311	2	2,23607	2,82843	3,60555	4,47214	3	3,16228	3,60555	4,24264	5	4	4,12311	4,47214	5	5,65685
B	1	0	1	2	3	1,41421	1	1,41421	2,23607	3,16228	2,23607	2	2,23607	2,82843	3,60555	3,16228	3	3,16228	3,60555	4,24264	4,12311	4	4,12311	4,47214	5
C	2	1	0	1	2	2,23607	1,41421	1	1,41421	2,23607	2,82843	2,23607	2	2,23607	2,82843	3,60555	3,16228	3	3,16228	3,60555	4,47214	4,12311	4	4,12311	4,47214
D	3	2	1	0	1	3,16228	2,23607	1,41421	1	1,41421	3,60555	2,82843	2,23607	2	2,23607	4,24264	3,60555	3,16228	3	3,16228	5	4,47214	4,12311	4	4,12311
E	4	3	2	1	0	4,12311	3,16228	2,23607	1,41421	1	4,47214	3,60555	2,82843	2,23607	2	5	4,24264	3,60555	3,16228	3	5,65685	5	4,47214	4,12311	4
F	1	1,41421	2,23607	3,16228	4,12311	0	1	2	3	4	1	1,41421	2,23607	3,16228	4,12311	2	2,23607	2,82843	3,60555	4,47214	3	3,16228	3,60555	4,24264	5
G	1,41421	1	1,41421	2,23607	3,16228	1	0	1	2	3	1,41421	1	1,41421	2,23607	3,16228	2,23607	2	2,23607	2,82843	3,60555	3,16228	3	3,16228	3,60555	4,24264
H	2,23607	1,41421	1	1,41421	2,23607	2	1	0	1	2	2,23607	1,41421	1	1,41421	2,23607	2,82843	2,23607	2	2,23607	2,82843	3,60555	3,16228	3	3,16228	3,60555
I	3,16228	2,23607	1,41421	1	1,41421	3	2	1	0	1	3,16228	2,23607	1,41421	1	1,41421	3,60555	2,82843	2,23607	2	2,23607	4,24264	3,60555	3,16228	3	3,16228
J	4,12311	3,16228	2,23607	1,41421	1	4	3	2	1	0	4,12311	3,16228	2,23607	1,41421	1	4,47214	3,60555	2,82843	2,23607	2	5	4,24264	3,60555	3,16228	3
K	2	2,23607	2,82843	3,60555	4,47214	1	1,41421	2,23607	3,16228	4,12311	0	1	2	3	4	1	1,41421	2,23607	3,16228	4,12311	2	2,23607	2,82843	3,60555	4,47214
L	2,23607	2	2,23607	2,82843	3,60555	1,41421	1	1,41421	2,23607	3,16228	1	0	1	2	3	1,41421	1	1,41421	2,23607	3,16228	2,23607	2	2,23607	2,82843	3,60555
Z	2,82843	2,23607	2	2,23607	2,82843	2,23607	1,41421	1	1,41421	2,23607	2	1	0	1	2	2,23607	1,41421	1	1,41421	2,23607	2,82843	2,23607	2	2,23607	2,82843
M	3,60555	2,82843	2,23607	2	2,23607	3,16228	2,23607	1,41421	1	1,41421	3	2	1	0	1	3,16228	2,23607	1,41421	1	1,41421	3,60555	2,82843	2,23607	2	2,23607
N	4,47214	3,60555	2,82843	2,23607	2	4,12311	3,16228	2,23607	1,41421	1	4	3	2	1	0	4,12311	3,16228	2,23607	1,41421	1	4,47214	3,60555	2,82843	2,23607	2
O	3	3,16228	3,60555	4,24264	5	2	2,23607	2,82843	3,60555	4,47214	1	1,41421	2,23607	3,16228	4,12311	0	1	2	3	4	1	1,41421	2,23607	3,16228	4,12311
P	3,16228	3	3,16228	3,60555	4,24264	2,23607	2	2,23607	2,82843	3,60555	1,41421	1	1,41421	2,23607	3,16228	1	0	1	2	3	1,41421	1	1,41421	2,23607	3,16228
Q	3,60555	3,16228	3	3,16228	3,60555	2,82843	2,23607	2	2,23607	2,82843	2,23607	1,41421	1	1,41421	2,23607	2	1	0	1	2	2,23607	1,41421	1	1,41421	2,23607
R	4,24264	3,60555	3,16228	3	3,16228	3,60555	2,82843	2,23607	2	2,23607	3,16228	2,23607	1,41421	1	1,41421	3	2	1	0	1	3,16228	2,23607	1,41421	1	1,41421
S	5	4,24264	3,60555	3,16228	3	4,47214	3,60555	2,82843	2,23607	2	4,12311	3,16228	2,23607	1,41421	1	4	3	2	1	0	4,12311	3,16228	2,23607	1,41421	1
T	4	4,12311	4,47214	5	5,65685	3	3,16228	3,60555	4,24264	5	2	2,23607	2,82843	3,60555	4,47214	1	1,41421	2,23607	3,16228	4,12311	0	1	2	3	4
U	4,12311	4	4,12311	4,47214	5	3,16228	3	3,16228	3,60555	4,24264	2,23607	2	2,23607	2,82843	3,60555	1,41421	1	1,41421	2,23607	3,16228	1	0	1	2	3
V	4,47214	4,12311	4	4,12311	4,47214	3,60555	3,16228	3	3,16228	3,60555	2,82843	2,23607	2	2,23607	2,82843	2,23607	1,41421	1	1,41421	2,23607	2	1	0	1	2
W	5	4,47214	4,12311	4	4,12311	4,24264	3,60555	3,16228	3	3,16228	3,60555	2,82843	2,23607	2	2,23607	3,16228	2,23607	1,41421	1	1,41421	3	2	1	0	1
X	5,65685	5	4,47214	4,12311	4	5	4,24264	3,60555	3,16228	3	4,47214	3,60555	2,82843	2,23607	2	4,12311	3,16228	2,23607	1,41421	1	4	3	2	1	0

The graph fitness vs generation



Tour in the 1st

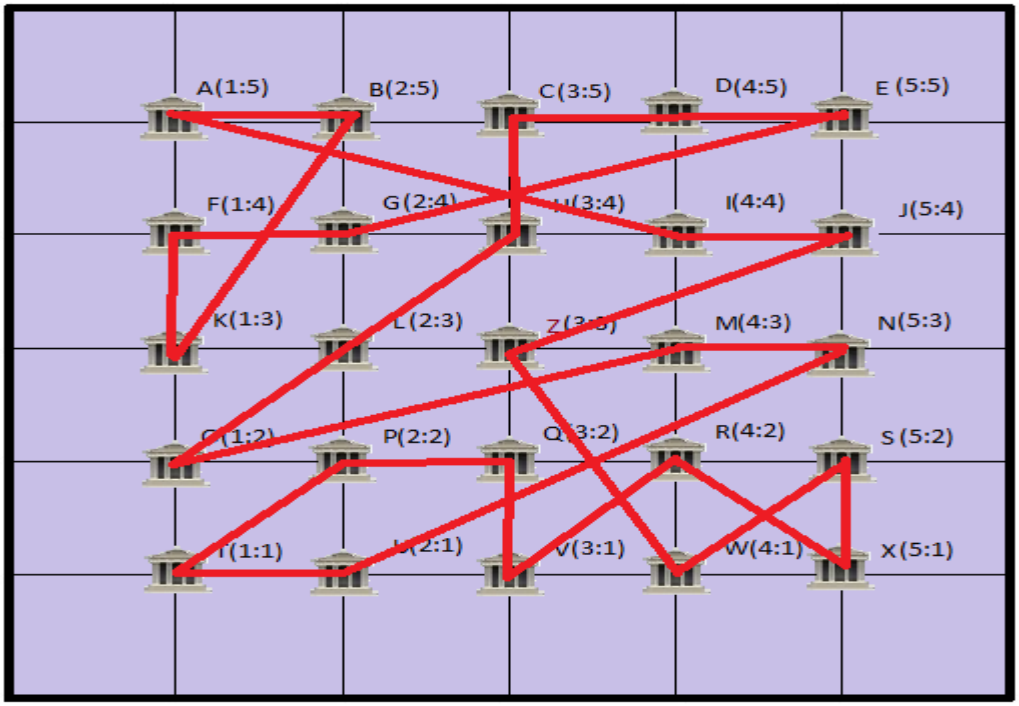
(6:6)



(0:0)

Tour in the 2nd

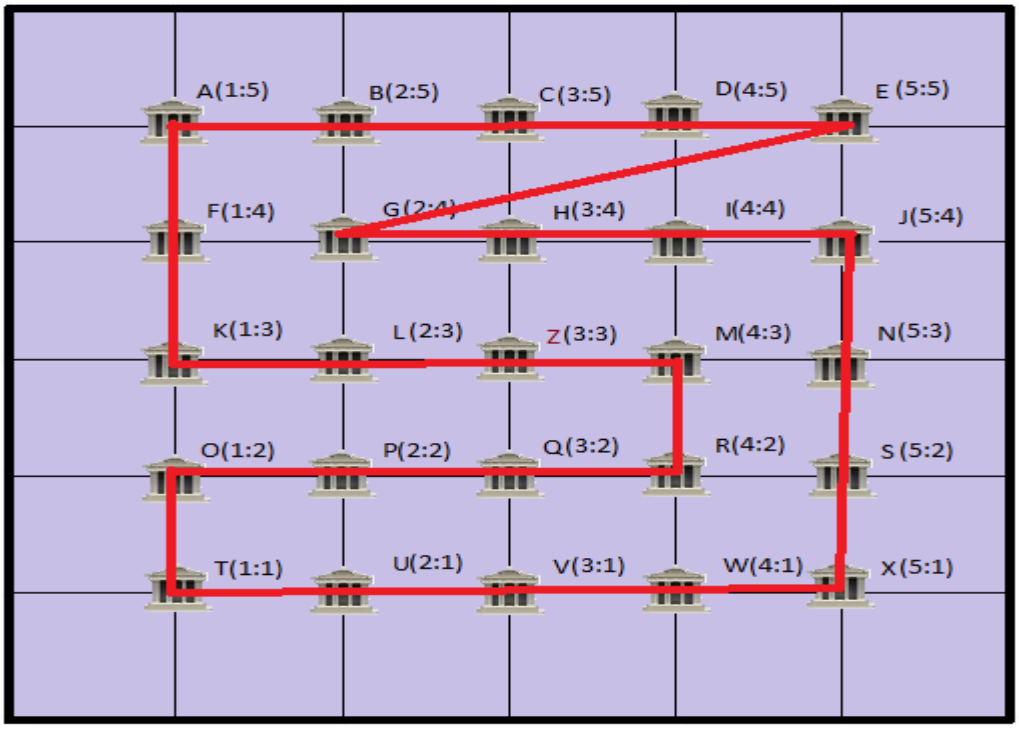
(6:6)



(0:0)

Tour in the 3rd

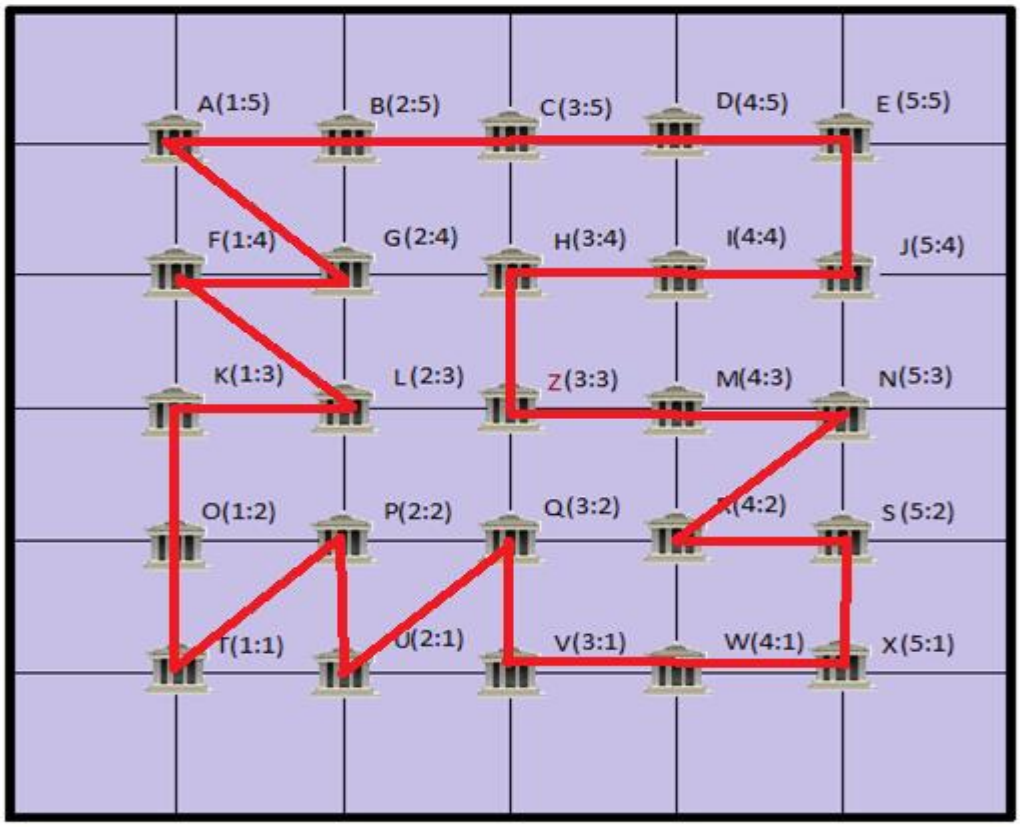
(6:6)



(0:0)

Tour in the 4th

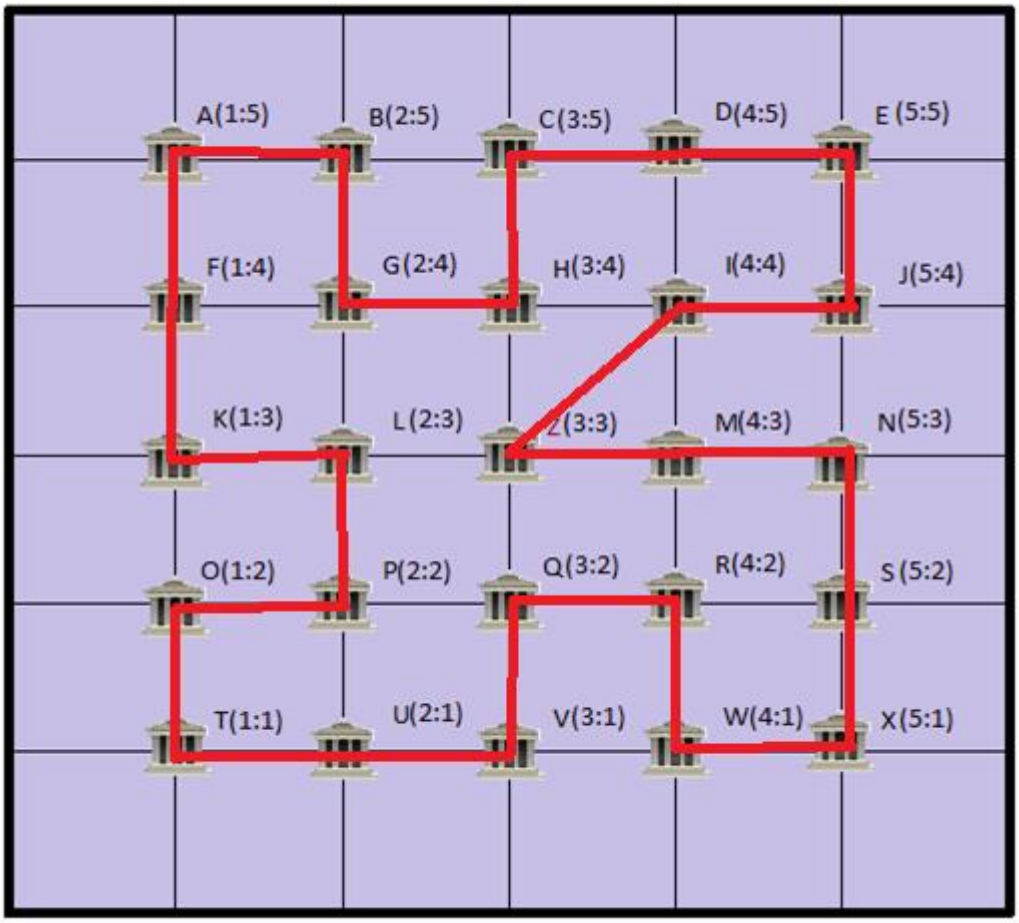
(6:6)



(0:0)

The final generation

(6:6)



(0:0)