

- Requirements:

- Basic

1. Generate a graph $G=(V, E)$ in random, the weights and density of the edges in G can be assigned by user.

- For Problem 1 and 2 :

2. Find shortest distance from single source to every vertices (single source all destinations)

3. Find shortest distance between and two points

4. User can trace the process of solving this problem.

- For Problem 3:

2. Find transitive closure of the given graph.

- Advanced

For Problem 1: Report the shortest paths from the source to all destinations (SSAD)

For Problem 2: Report the shortest paths for all pairs

- 執行結果

1. 輸入必要條件後，執行 **Generate graph**

- **Directed graph**(其他功能展示都是以此圖做為初始)

Shortest Path_111701026_張肇政

Read Graph

Randomly generate

n= 12

range (w(e)) 100

if w(e) > 80

w(e) = 9999

Source no. = 0

Generate Graph

☐ Undirected Graph

Shortest Path Solver

Single Source All Destinations

All Pairs

Transitive Closure

G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

▶	9999	9999	42	80	17	71	9999	19	76	24	54	34
	9999	9999	6	19	56	34	9999	58	9999	72	38	50
	42	6	9999	9999	21	51	9999	48	15	14	25	60
	80	19	9999	9999	37	10	3	79	46	53	30	46
	17	56	21	37	9999	60	70	45	9999	56	69	9999
	71	34	51	10	60	9999	26	3	53	67	20	12
	9999	9999	9999	3	70	26	9999	62	76	47	78	9
	19	58	48	79	45	3	62	9999	9999	73	4	65
	76	9999	15	46	9999	53	76	9999	9999	64	42	9999
	24	72	14	53	56	67	47	73	64	9999	13	39
	54	38	25	30	69	20	78	4	42	13	9999	56
•	34	50	60	46	9999	12	9	65	9999	39	56	9999

- **Undirected graph**

Shortest Path_111701026_張肇政

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range(w(e)) 100

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Generate Graph

☒ Undirected Graph

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Single Source All Destinations

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G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

►	9999	16	15	38	9999	31	61	35	4	31	76	41
	52	9999	9999	23	9999	16	41	9999	72	9999	9999	34
	51	5	9999	9999	9999	25	78	34	30	2	49	12
	9999	15	19	9999	47	36	73	15	9999	4	40	53
	32	9999	9999	9999	9999	30	2	49	10	53	46	17
	62	9999	33	47	13	9999	32	10	42	8	8	58
	9999	68	41	27	9999	41	9999	67	66	9999	9999	76
	9999	9999	25	9999	9999	9999	37	9999	29	9999	52	43
	67	15	9999	9999	9999	53	9999	77	9999	57	12	9
	28	72	36	23	2	45	60	37	9999	9999	14	9999
	62	5	71	15	13	65	9999	18	64	24	9999	1
•	9999	3	17	77	43	9999	43	18	9999	9999	60	9999

2. Single source all destination (SSAD)

- Min 顯示 Dijkstra 的過程中，輸出目前距離最小的節點編號

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min = 0
min = 4
min = 7
min = 5
min = 10
min = 9
min = 3
min = 11
min = 6
min = 2
min = 1
min = 8

The shortest distance from 0 to 1 is 44 with path 0-[9999]->0-[17]->4-[21]->2-[6]->1
The shortest distance from 0 to 2 is 38 with path 0-[9999]->0-[17]->4-[21]->2
The shortest distance from 0 to 3 is 32 with path 0-[9999]->0-[19]->7-[3]->5-[10]->3
The shortest distance from 0 to 4 is 17 with path 0-[9999]->0-[17]->4
The shortest distance from 0 to 5 is 22 with path 0-[9999]->0-[19]->7-[3]->5
The shortest distance from 0 to 6 is 35 with path 0-[9999]->0-[19]->7-[3]->5-[10]->3-[3]->6
The shortest distance from 0 to 7 is 19 with path 0-[9999]->0-[19]->7
The shortest distance from 0 to 8 is 53 with path 0-[9999]->0-[17]->4-[21]->2-[15]->8
The shortest distance from 0 to 9 is 24 with path 0-[9999]->0-[24]->9
The shortest distance from 0 to 10 is 23 with path 0-[9999]->0-[19]->7-[4]->10
The shortest distance from 0 to 11 is 34 with path 0-[9999]->0-[34]->11

- SSAD table 每一欄會顯示更新狀況，淺黃色代表數值更新(距離變短)，藍色為沒有更新，每一列的數值只會一直減少或不再減少(更新距離)，最右邊的欄顯示是從哪個節點前來。

Shortest Path_111701026_張肇政

Read Graph

Randomly generate

n= 12

range w(e) 100

if w(e) > 80

w(e) = 9999

Source no. = 0

Generate Graph

☐ Undirected Graph

Shortest Path Solver

Single Source All Destinations

All Pairs

Transitive Closure

G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

	0	1	2	3	4	5	6	7	8	9	10	11	from
0	0	0	0	0	0	0	0	0	0	0	0	0	-
1	∞	73	73	56	56	56	51	51	51	44	44	44	2
2	42	38	38	38	38	38	38	38	38	38	38	38	4
3	∞	54	54	32	32	32	32	32	32	32	32	32	5
4	17	17	17	17	17	17	17	17	17	17	17	17	0
5	71	71	22	22	22	22	22	22	22	22	22	22	7
6	∞	∞	∞	48	48	48	35	35	35	35	35	35	3
7	19	19	19	19	19	19	19	19	19	19	19	19	0
8	76	76	76	75	65	65	65	65	65	53	53	53	2
9	24	24	24	24	24	24	24	24	24	24	24	24	0
10	54	54	23	23	23	23	23	23	23	23	23	23	7
11	34	34	34	34	34	34	34	34	34	34	34	34	0

3. All pairs

➤ All pairs 顯示各個點與其他點的最短距離關係

Shortest Path_111701026_張肇政

Read Graph

Randomly generate

n= 12

range w(e) 100

if w(e) > 80

w(e) = 9999

Source no. = 0

Generate Graph

☐ Undirected Graph

Shortest Path Solver

Single Source All Destinations

All Pairs

Transitive Closure

G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

	0	1	2	3	4	5	6	7	8	9	10	11
0	0	44	38	32	17	22	35	19	53	24	23	34
1	44	0	6	19	27	29	22	32	21	20	31	31
2	38	6	0	25	21	32	28	29	15	14	25	37
3	32	19	25	0	37	10	3	13	40	30	17	12
4	17	27	21	37	0	39	40	36	36	35	40	49
5	22	29	32	10	39	0	13	3	47	20	7	12
6	35	22	28	3	40	13	0	16	43	33	20	9
7	19	32	29	13	36	3	16	0	44	17	4	15
8	53	21	15	40	36	47	43	44	0	29	40	52
9	24	20	14	30	35	20	33	17	29	0	13	32
10	23	31	25	17	40	7	20	4	40	13	0	19
11	34	31	37	12	49	12	9	15	52	32	19	0

➤ All pairs table 顯示各個點的連接情形

Shortest Path_111701026_張耀政

Read Graph

Randomly generate

n= 12

range(w(e)) 100

if w(e) > 80

w(e) = 9999

Source no. = 0

Generate Graph

☐ Undirected Graph

Shortest Path Solver

Single Source All Destinations

All Pairs

Transitive Closure

G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

0	2	4	5	0	7	3	0	2	0	7	0
4	1	1	1	2	3	3	5	2	2	2	6
4	2	2	1	2	7	3	10	2	2	2	6
7	3	1	3	3	3	3	5	2	10	7	6
4	2	4	4	4	7	3	0	2	2	7	6
7	3	10	5	0	5	3	5	2	10	7	5
7	3	1	6	3	3	6	5	2	10	7	6
7	3	10	5	0	7	3	7	2	10	7	5
4	2	8	1	2	7	3	10	8	2	2	6
9	2	9	5	2	7	3	10	2	9	9	5
7	2	10	5	0	7	3	10	2	10	10	5
11	3	1	6	3	11	11	5	2	10	7	11

➤ G's adjacent matrix 的 listBox 會接續顯示每個點到其他點的最短路徑

Shortest Path_111701026_張耀政

Read Graph

Randomly generate

n= 12

range(w(e)) 100

if w(e) > 80

w(e) = 9999

Source no. = 0

Generate Graph

☐ Undirected Graph

Shortest Path Solver

Single Source All Destinations

All Pairs

Transitive Closure

G's adjacent matrix Graph in adjacent matrix SSAD tables All Pairs All pairs table Transitive closure

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=====ALL PAIRS=====
The shortest distance from 0 to 1 is 44 with path 0-[17]->4-[21]->2-[6]->1
The shortest distance from 0 to 2 is 38 with path 0-[17]->4-[21]->2
The shortest distance from 0 to 3 is 32 with path 0-[19]->7-[3]->5-[10]->3
The shortest distance from 0 to 4 is 17 with path 0-[17]->4
The shortest distance from 0 to 5 is 22 with path 0-[19]->7-[3]->5
The shortest distance from 0 to 6 is 35 with path 0-[19]->7-[3]->5-[10]->3-[3]->6
The shortest distance from 0 to 7 is 19 with path 0-[19]->7
The shortest distance from 0 to 8 is 53 with path 0-[17]->4-[21]->2-[15]->8
The shortest distance from 0 to 9 is 24 with path 0-[24]->9
The shortest distance from 0 to 10 is 23 with path 0-[19]->7-[4]->10
The shortest distance from 0 to 11 is 34 with path 0-[34]->11
=====
The shortest distance from 1 to 0 is 44 with path 1-[6]->2-[21]->4-[17]->0
The shortest distance from 1 to 2 is 6 with path 1-[6]->2
The shortest distance from 1 to 3 is 19 with path 1-[19]->3
The shortest distance from 1 to 4 is 27 with path 1-[6]->2-[21]->4
The shortest distance from 1 to 5 is 29 with path 1-[19]->3-[10]->5
The shortest distance from 1 to 6 is 22 with path 1-[19]->3-[3]->6
The shortest distance from 1 to 7 is 32 with path 1-[19]->3-[10]->5-[3]->7
The shortest distance from 1 to 8 is 21 with path 1-[6]->2-[15]->8
The shortest distance from 1 to 9 is 20 with path 1-[6]->2-[14]->9
The shortest distance from 1 to 10 is 31 with path 1-[6]->2-[25]->10
The shortest distance from 1 to 11 is 31 with path 1-[19]->3-[3]->6-[9]->11
=====
The shortest distance from 2 to 0 is 38 with path 2-[21]->4-[17]->0
The shortest distance from 2 to 1 is 6 with path 2-[6]->1
The shortest distance from 2 to 3 is 25 with path 2-[6]->1-[19]->3
The shortest distance from 2 to 4 is 21 with path 2-[21]->4
The shortest distance from 2 to 5 is 32 with path 2-[25]->10-[4]->7-[3]->5
The shortest distance from 2 to 6 is 28 with path 2-[6]->1-[19]->3-[3]->6
The shortest distance from 2 to 7 is 29 with path 2-[25]->10-[4]->7
The shortest distance from 2 to 8 is 15 with path 2-[15]->8
The shortest distance from 2 to 9 is 14 with path 2-[14]->9

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4. Transitive closure

表示各個節點是否有接通，有則顯示 1，無則顯示 0

[illegible]