Appendix
Test Problems Data

This chapter presents the data for the randomly generated test problems used in the computational experimentation of our proposed algorithms on the Euclidean distance location and location-allocation problems.

<u>Euclidean Distance Location Problem</u>

The following are the data for the test problems used in Table 6

<u>Problem 5 $n = 3$, $m = 40$</u>

$v =$ 0 0 4

0 0 1

0 0 0

and

$w =$ 5 0 4 3 0 9 5 7 14 11 1 2 7 1 10 0 1 3 7

5 2 7 3 13 3 6 13 9 3 6 12 1 4 4 13 11 8 10

14 11

6 1 13 13 10 9 2 12 7 12 7 3 13 10 4 3 5 14 3

6 12 11 6 13 9 8 9 14 1 0 14 10 14 5 4 14 9 0

8 5

12 9 12 3 5 9 2 11 8 0 12 5 7 14 12 7 6 3 13

9 1 7 1 5 9 14 9 14 12 3 9 12 1 14 11 0 0 2

7 9

(a_j, b_j) = (22, 5), (23, -20), (-23, -4), (-13, 21), (13, 19), (22, 23), (18, 22), (16, 22), (7, 7), (20, -6), (-12,-7), (-5, -2), (-3, 17), (5, 8), (16, 3), (23, 21), (5, -22), (-24, -21), (0, -9), (-2, 4), (1, -8), (-1, 22), (4, -20), (-4, 2), (6, -4), (-3, 1), (11, 2), (18, -10), (-21, -10), (-10, 13), (6, -1), (-11, -23), (-3, -24), (-2, 0), (0, -10), (-3, 19), (7, -2), (-16, 14), (18 -14), and (-3, 13) for j = 1,.., 40.

Problem 6 $n = 5$, $m = 20$

$$v = \begin{matrix} 0 & 0 & 7 & 1 & 7 \\ 0 & 0 & 13 & 1 & 5 \\ 0 & 0 & 0 & 13 & 13 \\ 0 & 0 & 0 & 0 & 14 \\ 0 & 0 & 0 & 0 & 0 \end{matrix}$$

and

$$w = \begin{matrix} 10 & 2 & 10 & 12 & 7 & 8 & 11 & 9 & 6 & 3 & 9 & 1 & 3 & 7 & 10 & 6 & 2 & 2 & 2 & 7 \\ 5 & 11 & 4 & 11 & 8 & 6 & 2 & 6 & 7 & 1 & 8 & 1 & 5 & 8 & 2 & 9 & 7 & 12 & 8 & 8 \\ 8 & 0 & 9 & 9 & 12 & 5 & 10 & 4 & 7 & 11 & 0 & 8 & 8 & 6 & 3 & 2 & 11 & 8 & 8 & 12 \\ 3 & 8 & 9 & 11 & 2 & 5 & 7 & 11 & 9 & 3 & 10 & 12 & 11 & 6 & 11 & 2 & 9 & 3 & 4 & 9 \\ 1 & 12 & 5 & 3 & 1 & 6 & 2 & 6 & 7 & 12 & 3 & 12 & 8 & 1 & 8 & 1 & 1 & 7 & 12 & 11 \end{matrix}$$

(a_j, b_j) = (9, 8), (19, -17), (-3, -22), (-3, -17), (-1, -3), (-16, 4), (9, 14), (25, 13), (17, -22), (-14, -2), (-5, 6), (22, 2), (2, -6), (-1, -22), (-5, -7), (-5, -1), (-26, -12), (-14, 12), (26, 4), and (17, -19) for j = 1,.., 20.

Problem 7 $n = 7$, $m = 15$

$$v = \begin{matrix} 0 & 0 & 5 & 8 & 3 & 6 & 5 \\ 0 & 0 & 7 & 10 & 8 & 2 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 0 & 0 & 3 & 7 & 5 \\ 0 & 0 & 0 & 0 & 0 & 5 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{matrix}$$

$$w = \begin{matrix} 4 & 2 & 4 & 0 & 3 & 0 & 4 & 3 & 4 & 0 & 4 & 2 & 0 & 1 & 2 \\ 0 & 3 & 2 & 4 & 1 & 0 & 3 & 4 & 1 & 4 & 0 & 0 & 2 & 4 & 1 \end{matrix}$$

1	1	0	3	4	2	3	4	3	2	2	4	2	1	3
0	1	3	1	3	0	4	0	2	2	1	3	0	3	1
4	2	3	2	2	2	4	3	0	1	1	1	2	4	0
1	3	1	0	4	3	0	1	1	2	2	1	3	0	1
0	2	3	4	4	3	3	3	4	2	4	2	2	1	2

(a_j, b_j) = (21, 1), (6, 5), (17, 0), (-9, 2), (20, -2), (-19, 6), (9, 0), (15, 0), (0, -4), (-15, -1), (-13, -5), (-8, 5), (17, -1), (-23, -5), and(-3, 6) for j = 1,.., 15.

<u>Problem 8 n = 10 , m = 15</u>

v =

0	7	3	0	12	6	14	11	0	12
0	0	9	3	1	4	12	12	9	3
0	0	0	2	2	8	12	2	3	12
0	0	0	0	0	11	1	0	9	4
0	0	0	0	0	11	10	1	11	6
0	0	0	0	0	0	7	1	1	8
0	0	0	0	0	0	0	13	7	0
0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0

and

w =

2	8	3	7	11	2	7	2	11	4	0	10	1	8	5
11	4	12	9	2	10	4	11	3	2	3	2	9	8	10
2	0	11	11	8	10	10	10	12	8	6	7	8	1	9
8	5	11	0	5	12	6	6	10	4	1	11	6	10	2
8	6	4	2	5	0	9	8	12	12	1	6	6	7	6
7	11	0	6	12	11	7	4	11	1	11	5	0	11	9
9	10	2	1	9	7	7	10	5	12	6	8	7	1	8
11	7	0	7	12	0	5	9	12	9	0	9	7	4	3

10	5	9	4	4	10	9	5	12	7	7	6	9	1	8
7	7	12	10	3	0	5	5	7	1	2	1	11	7	12

(a_j, b_j) = (18, 3), (9, 11), (12, -12), (-7, -12), (-3, -13), (-17, 11), (15, -18), (-10, -21), (0, -12), (-9, -23), (-20, 5), (18, -22), (-12, 10), (5, 23), and (20, -19) for j = 1,.., 15

<u>Euclidean Distance Location-Allocation Problem</u>

The following are the data for the test problems used in Table 9

<u>Problem 1 n = 2, m = 2</u>

c = 5 8
6 0

and

d_j = 10, 3 for j =1, 2.

s_i = 6, 7 for i= 1, 2.

(a_j, b_j) = (0, 0), (0, 4) for j =1, 2.

<u>Problem 2 n = 2, m = 4</u>

c = 1 3 2 4
3 0 1 8

and

d_j = 8, 9, 4, and 13 for j =1, 4.

s_i = 28, 6 for i =1, 2.

(a_j, b_j) = (0, 1), (0, 0), (0, 2), (4, 10) for j =1, 4.

Problem 3 $n = 2$, $m = 4$

$c =$ 9 5 8 6

4 6 6 3

and

d_j = 9, 10, 15, and 9 for j =1, 4.

s_i = 27, and 16 for i =1, 2.

(a_j, b_j) = (0, 0), (0, 3) (2, 3), and (3, 4) for j =1, 4.

Problem 4 $n = 3$, $m = 5$

$c =$ 8 7 2 2 0

4 12 0 2 8

1 5 11 1 7

and

d_j = 15, 3, 4, 2, and 3 for j =1, 5.

s_i = 5, 11, 11 for i =1, 3.

(a_j, b_j) = (0, 13), (0, 10), (0, 0), (4, 6), and (8, 11) for j =1, 5.

Problem 5 $n = 3$, $m = 5$

$c =$ 3 5 6 7 1

2 6 2 3 5

1 14 23 23 2

and

d_j = 11, 13, 15, 7, and 7 for j =1, 5.

s_i = 7, 19, and 27 for i =1, 3.

(a_j, b_j) = (0, 0), (0, 1), (2, 4), (5, 8), and (4, 6) for j =1, 5.

<u>Problem 6 n = 3, m = 9</u>

c = 5 0 0 0 3 3 9 1 1
0 1 11 19 4 9 10 11 7
3 0 17 2 17 11 15 14 6

and

d_j = 8, 9, 3, 14, 2, 14, 2, 7, 10 for j =1, 9.

s_i = 38, 28, and 3 for i =1, 3

(a_j, b_j) = (0, 3), (0, 0), (3, 2), (0, 2), (4, 10), (5, 6), (12, 14), (2, 22), and (10, 1) for j =1, 9.

<u>Problem 7 n = 3, m = 9</u>

c = 7 6 8 1 3 1 2 5 3
12 15 17 8 15 0 11 9 1
4 9 1 19 13 17 18 25 24

and

d_j = 13, 2, 11, 8, 3, 2, 7, 14, and 10 for j =1, 9.

s_i = 29, 3, and 38 for i =1, 3.

(a_j, b_j) = (0, 4), (2, 10), (2, 18), (0, 6), (0, 17), (1, 24), (5, 0), (7, 16), and (4, 4) for j =1, 9.

<u>Problem 8 n = 4, m = 8</u>

c = 4 5 9 12 14 7 8 5
0 5 7 12 13 15 21 8
10 24 25 5 22 12 16 19

18 16 2 12 22 3 21 21

and

d_j = 15, 6, 10, 11, 5, 10, 1, and 7 for j =1, 8.

s_i = 26, 23, 1, and 15 for i =1, 4.

(a_j, b_j) = (0, 6), (0, 10), (0, 12), (4, 16), (5, 9), (1, 13), (4, 19), and (10, 0) for j =1, 8.

<u>Problem 9 n = 5, m = 15</u>

c = 11 7 5 4 1 8 3 12 10 15 12 6 11 8 16
19 9 14 13 0 19 10 25 13 25 23 25 6 25 20
20 16 12 22 3 20 16 12 1 25 6 3 3 14 9
10 2 7 11 24 21 16 19 4 12 2 25 8 22 13
15 16 15 15 13 25 3 17 0 7 22 7 1 25 20

d_j = 36, 41, 11, 26, 11, 12, 41, 3, 10, 26, 25, 8, 45, 42, and 2 for j =1, 15.

s_i = 10, 20, 9, 74, 226 for i =1, 5.

(a_j, b_j) = (0, 8), (0, 2), (3, 4), (4, 0), (7, 19), (13, 11), (5, 15), (7, 17), (8, 2), (0, 7), (8, 7), (8, 14), (6, 5), (7, 17), and (1, 12) for j =1, 15.

<u>Problem 10 n = 5, m = 20</u>

c = 11 12 12 15 14 11 19 9 12 6 6 12 22 9 20 19 11 3 1 0
16 23 9 2 19 15 19 0 4 10 19 22 11 0 11 15 8 5 10 25
11 24 0 11 7 18 18 9 24 14 17 18 11 14 1 9 15 14 16 1
7 21 14 3 16 23 15 12 8 5 0 0 19 16 2 1 24 20 17 0
25 20 5 7 0 0 20 20 1 2 14 24 11 20 0 4 9 17 4 4

and

d_j = 32, 17, 6, 9, 6, 24, 3, 20, 29, 19, 53, 20, 10, 32, 50, 29, 55, 8, 31, and 30 for j =1, 20.

s_i = 52, 308, 24, 87, and 12 for i =1, 5.

(a_j, b_j) = (0, 20), (0, 0), (1, 18), (1, 25), (3, 23), (6, 19), (11, 15), (4, 7), (2, 13), (5, 7), (4, 18), (13, 1), (11, 2), (9, 11), (20, 12), (16, 7), (1, 23), (3, 3), (20, 3), and (16, 15) for j =1, 20

<u>Problem 11 n = 5, m = 20</u>

c = 1 15 22 0 2 15 8 0 0 10 1 11 16 0 9 3 11 3 23 21
23 3 24 17 13 3 17 19 20 12 18 6 17 17 16 16 25 1 8 6
6 7 15 20 16 6 25 4 14 9 1 12 1 15 21 10 4 2 14 4
6 16 0 1 0 3 0 1 13 12 25 13 15 7 6 12 23 20 1 23
22 16 12 1 11 0 15 16 16 8 18 13 15 0 2 19 7 3 0 15

and

d_j = 2, 9, 3, 11, 2, 7, 9, 11, 3, 12, 12, 2, 4, 1, 15, 12, 2, 6, 15, and 6 for j =1, 20.

s_i = 66, 2, 30, 37, and 9 for i =1, 5.

(a_j, b_j) = (0, 21), (1, 3), (7, 21), (5, 18), (17, 18), (24, 10), (24, 3), (0, 7), (5, 8), (20, 18), (5, 24), (9, 21), (3, 0), (22, 1), (24, 3), (17, 10), (0, 13), (11, 0), (13, 0), and (7, 3) for j =1, 20.

<u>Problem 12 n = 5, m = 30</u>

c = 8 11 9 2 5 8 4 4 2 4 14 14 10 21 18 9 19 12 20 6 1 17
7 21 25 4 3 0 17 12
19 25 11 7 25 16 12 15 20 5 19 0 13 1 5 7 5 20 6 25 19 12
12 14 14 6 4 10 12 6
13 8 17 1 3 14 9 3 5 14 17 9 14 15 1 25 25 25 21 5 11 20
12 8 8 23 12 11 10 7
13 9 11 3 20 14 17 15 8 22 2 6 20 13 17 16 12 1 11 20
11 22 13 11 2 1 7 11 16 16

22 14 18 16 22 1 16 12 25 2 10 17 1 4 16 20 18 24 23 19
16 20 25 10 15 21 19 1 14 14

and

d_j = 49, 29, 10, 57, 25, 61, 14, 3, 38, 58, 4, 35, 2, 31, 28, 37, 32, 63, 44, 1, 9, 63, 5, 3, 67, 36, 10, 11, 15,0, and 26 for j =1, 30.

s_i = 74, 391, 77, 297, and 27 for i =1, 5.

(a_j, b_j) = (0, 12), (0, 21), (0, 25), (0, 20), (1, 9), (2, 25), (1, 22), (6, 21), (15, 15), (14, 9), (11, 14), (4, 4), (14, 8), (9, 7), (23, 15), (20, 2), (0, 0), (11, 2), (1, 5), (4, 19), (1, 4), (12, 17), (14, 10), (1, 5), (12, 24), (1, 4), (21, 12), (16, 0), (8, 24), and (4, 8) for j =1, 30.