

BILKENT UNIVERSITY
ENGINEERING FACULTY
DEPARTMENT OF COMPUTER ENGINEERING



CS461

Homework 4

Group: RIDDLER

Team Members

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10 distinct randomly generated initial states are as follows:

----- S1 -----

1 - 2 - 3 - 4
5 - 6 - 7 - 0
9 - 10 - 11 - 8
13 - 14 - 15 - 12

----- S2 -----

1 - 2 - 3 - 4
9 - 5 - 6 - 7
13 - 0 - 11 - 8
14 - 10 - 15 - 12

----- S3 -----

1 - 2 - 3 - 4
9 - 5 - 6 - 7
14 - 13 - 11 - 8
10 - 0 - 15 - 12

----- S4 -----

1 - 2 - 3 - 4
5 - 0 - 6 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

----- S5 -----

1 - 2 - 3 - 4
9 - 5 - 6 - 7
14 - 13 - 0 - 8
10 - 15 - 11 - 12

----- S6 -----

1 - 2 - 3 - 4
9 - 5 - 6 - 7
0 - 10 - 11 - 8
13 - 14 - 15 - 12

----- S7 -----

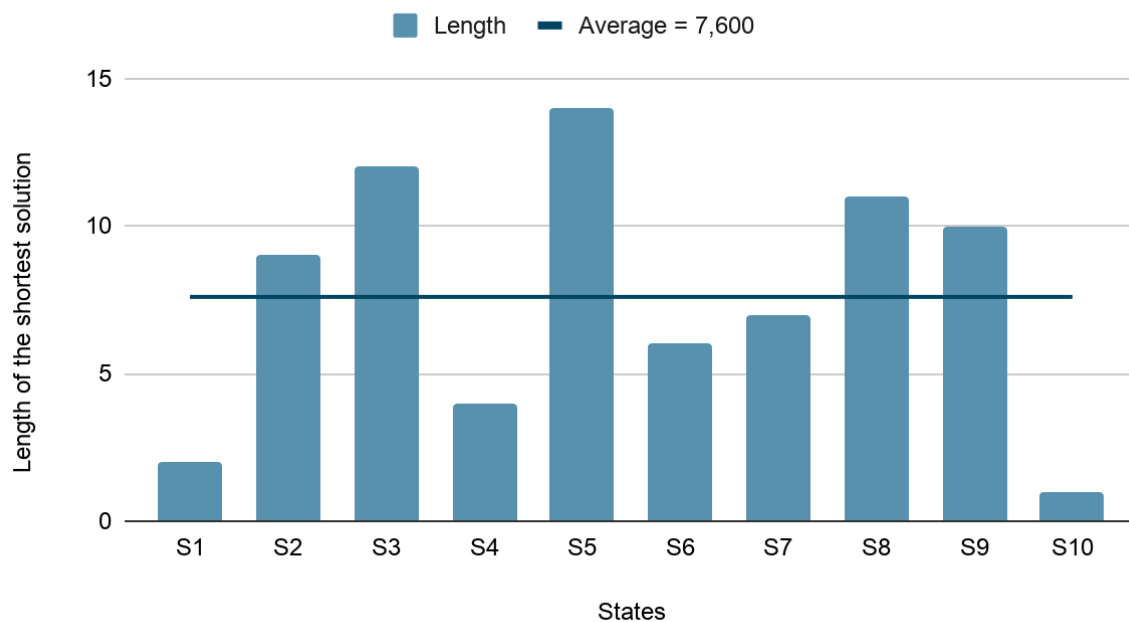
1 - 2 - 3 - 4
9 - 5 - 6 - 7
13 - 10 - 11 - 8
0 - 14 - 15 - 12

----- S8 -----
 1 - 2 - 3 - 4
 9 - 5 - 6 - 7
 13 - 11 - 15 - 8
 14 - 10 - 0 - 12

----- S9 -----
 1 - 2 - 3 - 4
 9 - 5 - 6 - 7
 0 - 13 - 11 - 8
 14 - 10 - 15 - 12

----- S10 -----
 1 - 2 - 3 - 4
 5 - 6 - 7 - 8
 9 - 10 - 11 - 12
 13 - 14 - 0 - 15

Graph below indicates the length of the shortest solution for each distinct state. Also, it shows the average (over 10 distinct initial states) solution length which is 7.600 in our case.



A graphical solution sequence starting with the initial state 4 (S4):

Solve puzzle S: 4

1 - 2 - 3 - 4
5 - 0 - 6 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

6 ---> left

1 - 2 - 3 - 4
5 - 6 - 0 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

7 ---> left

1 - 2 - 3 - 4
5 - 6 - 7 - 0
9 - 10 - 11 - 8
13 - 14 - 15 - 12

8 ---> up

1 - 2 - 3 - 4
5 - 6 - 7 - 8
9 - 10 - 11 - 0
13 - 14 - 15 - 12

12 ---> up

1 - 2 - 3 - 4
5 - 6 - 7 - 8
9 - 10 - 11 - 12
13 - 14 - 15 - 0

Number of movements made to reach goal state: 4

A graphical solution sequence starting with the initial state 5 (S5):

Solve puzzle S: 5

1 - 2 - 3 - 4

9 - 5 - 6 - 7

14 - 13 - 0 - 8

10 - 15 - 11 - 12

11 ---> up

1 - 2 - 3 - 4

9 - 5 - 6 - 7

14 - 13 - 11 - 8

10 - 15 - 0 - 12

15 ---> right

1 - 2 - 3 - 4

9 - 5 - 6 - 7

14 - 13 - 11 - 8

10 - 0 - 15 - 12

13 ---> down

1 - 2 - 3 - 4

9 - 5 - 6 - 7

14 - 0 - 11 - 8

10 - 13 - 15 - 12

14 ---> right

1 - 2 - 3 - 4

9 - 5 - 6 - 7

0 - 14 - 11 - 8

10 - 13 - 15 - 12

10 ---> up

1 - 2 - 3 - 4
9 - 5 - 6 - 7
10 - 14 - 11 - 8
0 - 13 - 15 - 12

13 ---> left

1 - 2 - 3 - 4
9 - 5 - 6 - 7
10 - 14 - 11 - 8
13 - 0 - 15 - 12

14 ---> down

1 - 2 - 3 - 4
9 - 5 - 6 - 7
10 - 0 - 11 - 8
13 - 14 - 15 - 12

10 ---> right

1 - 2 - 3 - 4
9 - 5 - 6 - 7
0 - 10 - 11 - 8
13 - 14 - 15 - 12

9 ---> down

1 - 2 - 3 - 4
0 - 5 - 6 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

5 ---> left

1 - 2 - 3 - 4
5 - 0 - 6 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

6 ---> left

1 - 2 - 3 - 4
5 - 6 - 0 - 7
9 - 10 - 11 - 8
13 - 14 - 15 - 12

7 ---> left

1 - 2 - 3 - 4
5 - 6 - 7 - 0
9 - 10 - 11 - 8
13 - 14 - 15 - 12

8 ---> up

1 - 2 - 3 - 4
5 - 6 - 7 - 8
9 - 10 - 11 - 0
13 - 14 - 15 - 12

12 ---> up

1 - 2 - 3 - 4
5 - 6 - 7 - 8
9 - 10 - 11 - 12
13 - 14 - 15 - 0

Number of movements made to reach goal state: 14