THE AMERICAN UNIVERSITY IN CAIRO

الجامعة الأمريكية بالقاهرة

Computer Science and Engineering Department

CSCE330402 - Digital Design II

Project 2 (Bonus): Developing a Maze Router

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Brief description

The maze router implements Lee's algorithm to connect two pins with minimal wiring. Two layers are used: M1 is vertical and M2 is horizontal, and vias are used to move between layers. Our implementation *supports* any number of nets each of which could have any number of pins.

Assumptions

We assumed the size of the Maze to be 200*200 for easy testing.

However, the same mechanism could be used with larger sizes by changing the value of the constant global variable that defines the size in case of implementing the maze as adjacency matrix.

Any bugs or issues

There are no unhandled bugs, and according to the many rigorous test cases, the program works as expecting and produces the right output.

However, since our implementation allows nets to have any number of pins, complexity becomes a concern with high number of pins as will be explained in the technical explanation.

Technical Explanation

The maze was implemented as an adjacency matrix of type cells where each cell is a structure that contains an integer to store a number to mark the cost of distance and a boolean variable to mark whether the cell was visited before or not in order to be able to traverse the path or remove marks.

Lee's algorithm is a breads-first search algorithm that guarantees to find the shortest path, if exists, between two pins. For multiple pins, it connects the first two, then it marks all the nodes on the path as *potential source pins* then applies the algorithm on each of them to be connected to the third pin. The shortest path is the one with the lowest number of steps among them.

Layer 1 allows only vertical movement and layer 2 allows only horizontal movement, and vias are used to connect the two layers when needed. The logic goes as follows:

After applying the algorithm and knowing the shortest path between two pins, we go backward from the destination by moving to the following least number marked by the algorithm. For each layer, we can move to the right/left or up/down, and the marks determine the direction of movement.

After moving horizontally or vertically till a point that we cannot go beyond, we either have reached the source (since we are moving back from the destination) or we need to change direction which requires a via to change the layer to allow a movement in the opposite direction.

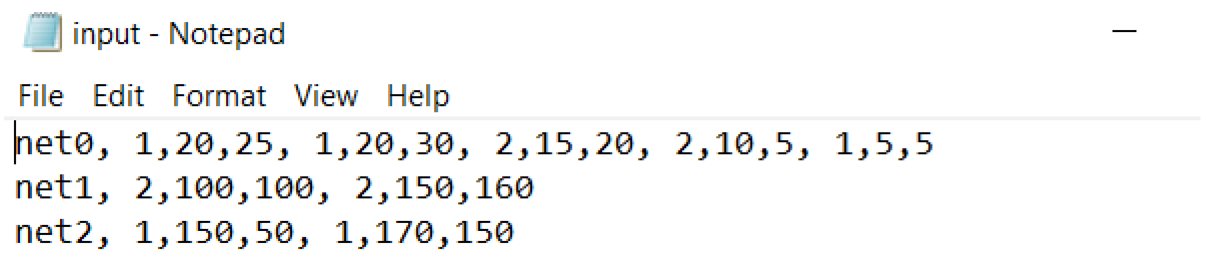
User Guide

The only interaction to the program is done by providing the nets with their pins in a text file named (input). It is done as follows:

Net name, pin1, pin2, pin3, etc.

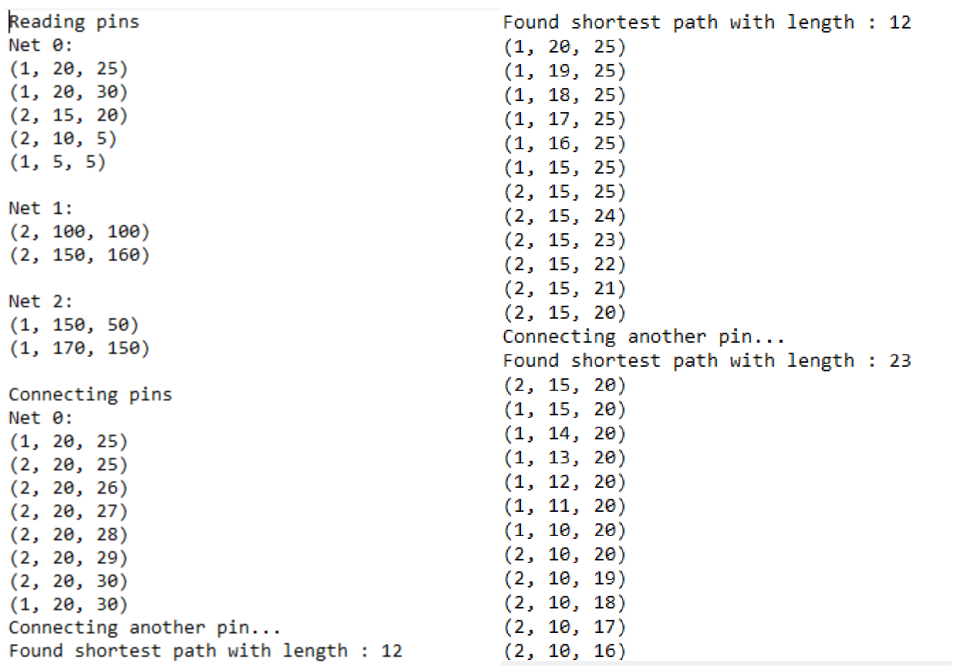
And each pin is written as follows: layer,x,y.

The program is not sensitive to spaces, and it is kept for easy visualization.



```
net0, 1,20,25, 1,20,30, 2,15,20, 2,10,5, 1,5,5
net1, 2,100,100, 2,150,160
net2, 1,150,50, 1,170,150
```

The output is then produced in a text file named output. Brief explanation for the progress of the program is left for easy tracking.



```
Reading pins
Net 0:
(1, 20, 25)
(1, 20, 30)
(2, 15, 20)
(2, 10, 5)
(1, 5, 5)

Net 1:
(2, 100, 100)
(2, 150, 160)

Net 2:
(1, 150, 50)
(1, 170, 150)

Connecting pins
Net 0:
(1, 20, 25)
(2, 20, 25)
(2, 20, 26)
(2, 20, 27)
(2, 20, 28)
(2, 20, 29)
(2, 20, 30)
(1, 20, 30)
Connecting another pin...
Found shortest path with length : 12
```

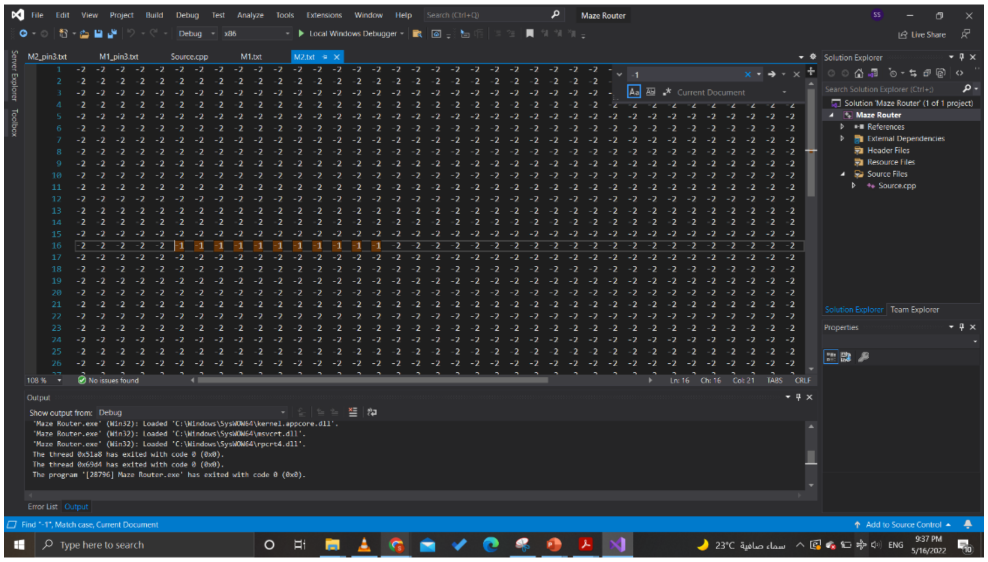
```
Found shortest path with length : 12
(1, 20, 25)
(1, 19, 25)
(1, 18, 25)
(1, 17, 25)
(1, 16, 25)
(1, 15, 25)
(2, 15, 25)
(2, 15, 24)
(2, 15, 23)
(2, 15, 22)
(2, 15, 21)
(2, 15, 20)
Connecting another pin...
Found shortest path with length : 23
(2, 15, 20)
(1, 15, 20)
(1, 14, 20)
(1, 13, 20)
(1, 12, 20)
(1, 11, 20)
(1, 10, 20)
(2, 10, 20)
(2, 10, 19)
(2, 10, 18)
(2, 10, 17)
(2, 10, 16)
```

Test Cases

10 test cases are provided in addition to the following basic test case that is explained in details.

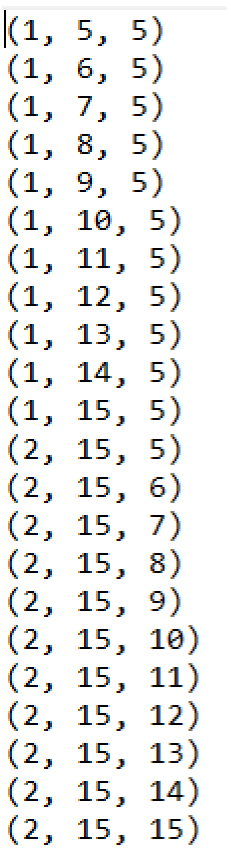
Net0, 1,5,5 2,15,15, 1,10,9

After applying the algorithm, the first two pins are connected together by moving from horizontally from the destination, which exists in layer 2 then moving vertically along layer 1 after going through the via as shown in the screenshots below where -1s represent the shortest path and -2s represent empty cells.

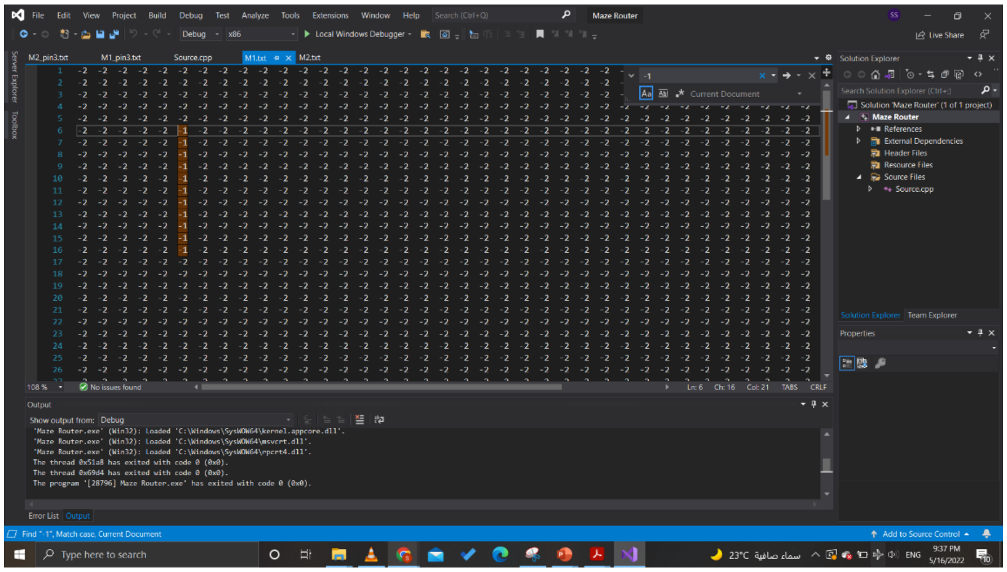


```
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
```

```
Show output from: Debug
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel.appcore.dll'.
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcrt.dll'.
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\rpcrt4.dll'.
The thread 0x51a8 has exited with code 0 (0x0).
The thread 0x69d4 has exited with code 0 (0x0).
The program '[28796] Maze Router.exe' has exited with code 0 (0x0).
```



```
(1, 5, 5)
(1, 6, 5)
(1, 7, 5)
(1, 8, 5)
(1, 9, 5)
(1, 10, 5)
(1, 11, 5)
(1, 12, 5)
(1, 13, 5)
(1, 14, 5)
(1, 15, 5)
(2, 15, 5)
(2, 15, 6)
(2, 15, 7)
(2, 15, 8)
(2, 15, 9)
(2, 15, 10)
(2, 15, 11)
(2, 15, 12)
(2, 15, 13)
(2, 15, 14)
(2, 15, 15)
```



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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
```

```
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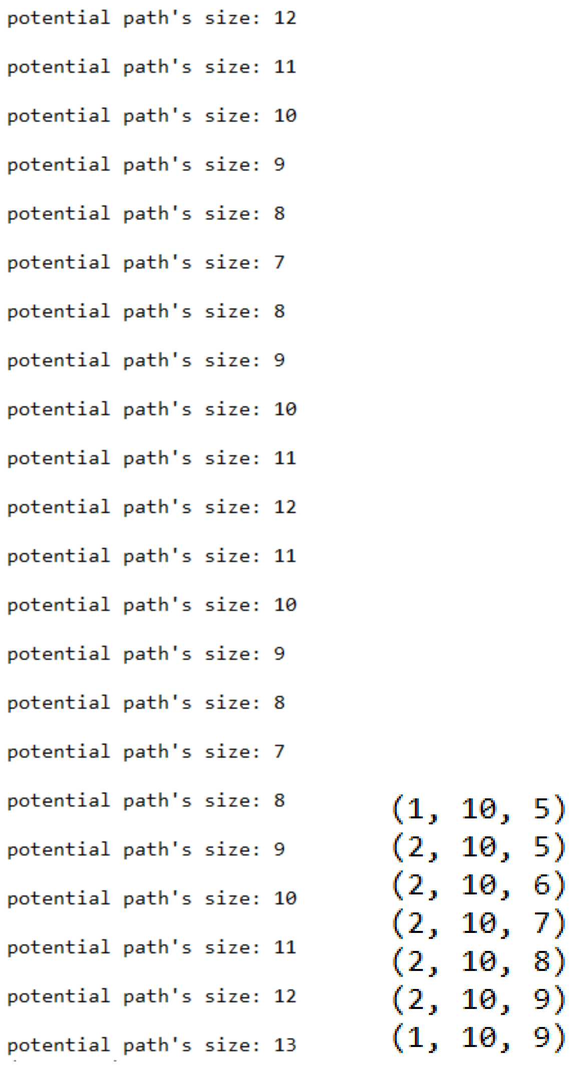
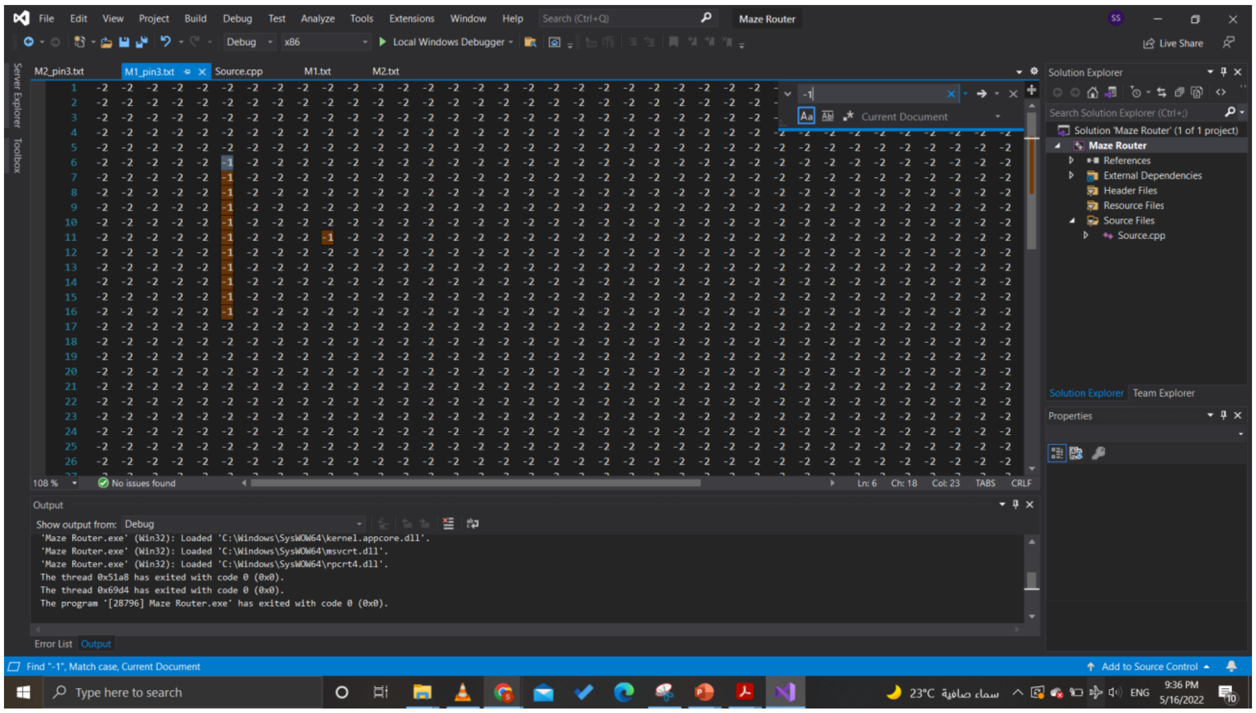
The program '[28796] Maze Router.exe' has exited with code 0 (0x0).
```

The algorithm then tries to connect the third layer, therefore, it starts to investigate all the potential paths from the path just routed to the destination pin as shown in the following figure.



```
potential path's size: 12
potential path's size: 11
potential path's size: 10
potential path's size: 9
potential path's size: 8
potential path's size: 7
potential path's size: 8
potential path's size: 9
potential path's size: 10
potential path's size: 11
potential path's size: 12
potential path's size: 11
potential path's size: 10
potential path's size: 9
potential path's size: 8
potential path's size: 7
potential path's size: 8        (1, 10, 5)
potential path's size: 9        (2, 10, 5)
potential path's size: 10       (2, 10, 6)
                                (2, 10, 7)
potential path's size: 11       (2, 10, 8)
potential path's size: 12       (2, 10, 9)
potential path's size: 13       (1, 10, 9)
```

It then choses the path with the lowest number of steps and moves along it vertically and horizontally according to the layer on the path as shown in the screenshots below.



M2_pin3.txt M1_pin3.txt Source.cpp M1.txt M2.txt

```
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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```

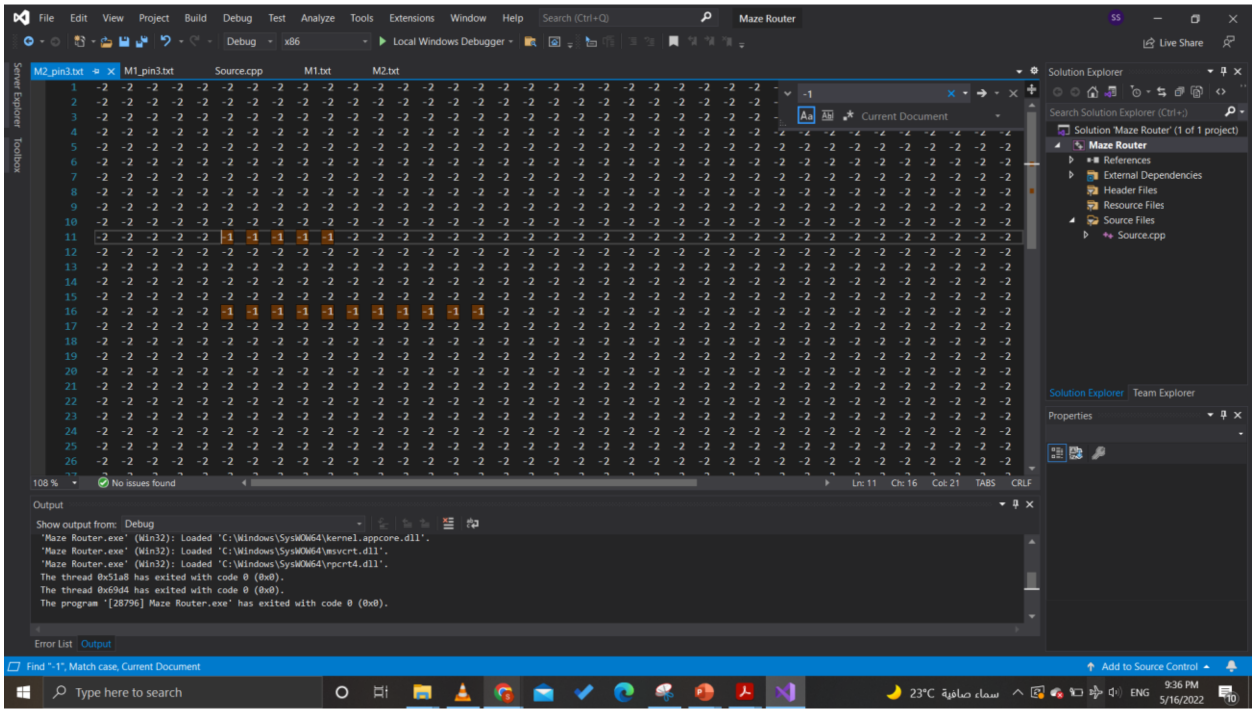
108 % No issues found Ln: 6 Ch: 18 Col: 23 TABS CRLF

Output

Show output from: Debug

```
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel.appcore.dll'.
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcrt.dll'.
'Maze Router.exe' (Win32): Loaded 'C:\Windows\SysWOW64\rpcrt4.dll'.
The thread 0x51a8 has exited with code 0 (0x0).
The thread 0x69d4 has exited with code 0 (0x0).
The program '[28796] Maze Router.exe' has exited with code 0 (0x0).
```

Find "-1", Match case, Current Document



M2_pin3.txt M1_pin3.txt Source.cpp M1.txt M2.txt

```
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -1 -1 -1 -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
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-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
```

108 % No issues found Ln: 11 Ch: 16 Col: 21 TABS CRLF

Output

Show output from: Debug

```
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```

Find "-1", Match case, Current Document