Maze Router

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Introduction

- Cell Synthesis Steps
- Routing Problem

Lee’s Algorithm

- Step 1: Filling
- Step 2: Back-propagation

Implementation Aspects

- Via usage and wrong direction penalties
- Multiple pins per net
- Avoiding pins from other nets.

Implementation Aspects (cont.)

- Back-propagation implementation issues
- Re-ordering Heuristic

Sample Test Case 1

Test Case 1:

10x10
OBS(3,4)
OBS(5,7)
net1(1,1,2)(2,3,5)(1,5,1)
net2(2,1,2)(1,3,5)
net3(1,1,5)(2,3,1)(2,5,5)(1,2,2)

Output for test case 1:

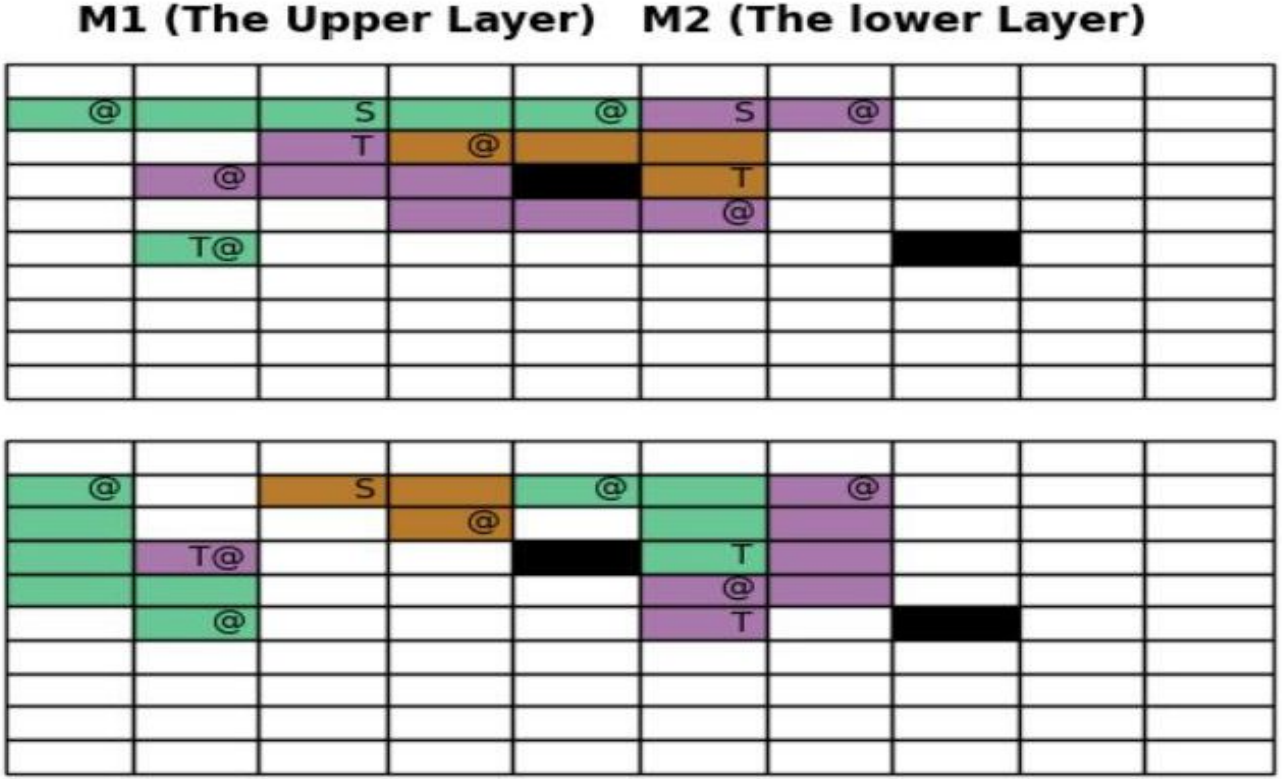
net2(2,1,2)(2,1,3)(2,2,3)(1,2,3)(1,2,4)(1,2,5)(1,3,5)

net3(1,1,5)(1,1,6)(2,1,6)(2,2,6)(2,3,6)(2,4,6)(2,4,5)(2,5,5)(1,4,5)(1,4,4)(1,4,3)(1,3,3)(1,3,2)(1,3,1)(2,3,1)(1,2,2)

net1(1,1,2)(1,1,3)(1,1,4)(2,1,4)(2,1,5)(2,2,5)(2,3,5)(1,1,1)(1,1,0)(2,1,0)(2,2,0)(2,3,0)(2,4,0)(2,4,1)(2,5,1)(1,5,1)

Sample Test Case 1

Visualization for test case 1:



Sample Test Case 2

11x9
OBS(9,8)
OBS(5,3)
net1(1,4,5)(2,10,7)(1,7,5)
net2(2,7,1)(1,2,5)
net3(1,2,0)(2,4,1)(2,5,8)(1,8,3)
net4(1,1,4)(1,6,6)(2,5,4)(1,3,3)
net5(1,1,1)(2,6,0)(2,7,7)(1,3,7)

Output for test case 5:

net1(1,4,5)(2,4,5)(2,5,5)(2,6,5)(2,7,5)(1,7,5)(1,7,6)(2,7,6)(2,8,6)(2,9,6)(2,10,6)(2,10,7)

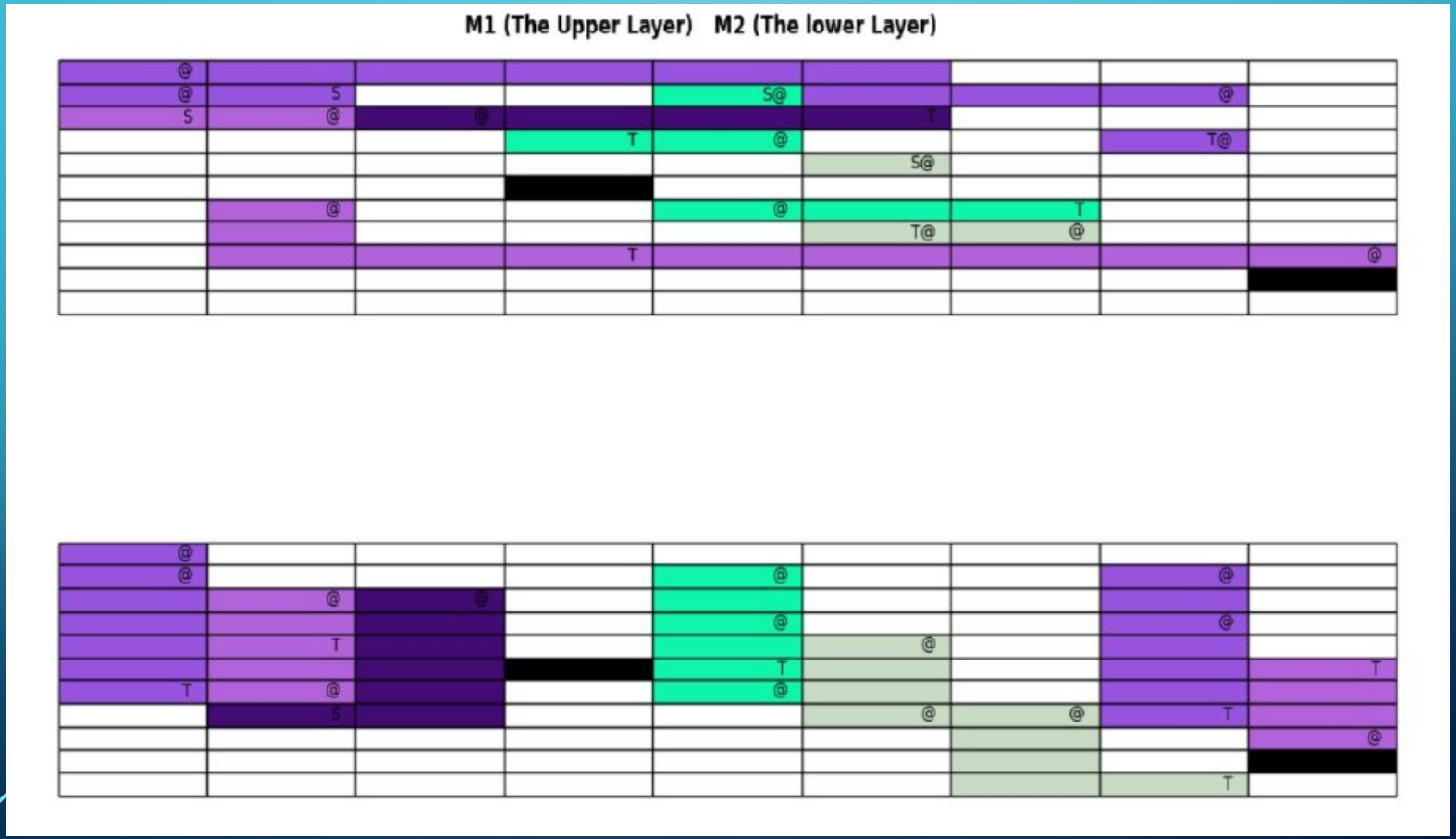
net2(2,7,1)(2,7,2)(2,6,2)(2,5,2)(2,4,2)(2,3,2)(2,2,2)(1,2,2)(1,2,3)(1,2,4)(1,2,5)

net4(1,1,4)(2,1,4)(2,2,4)(2,3,4)(1,3,4)(1,3,3)(2,4,4)(2,5,4)(2,6,4)(1,6,4)(1,6,5)(1,6,6)

net5(1,1,1)(1,1,0)(2,1,0)(2,2,0)(2,3,0)(2,4,0)(2,5,0)(2,6,0)(2,0,0)(1,0,0)(1,0,1)(1,0,2)(1,0,3)(1,0,4)(1,0,5)(1,1,5)(1,1,6)(1,1,7)(2,1,7)(2,2,7)(2,3,7)(1,3,7)(2,4,7)(2,5,7)(2,6,7)(2,7,7)

net3(1,2,0)(1,2,1)(2,2,1)(2,3,1)(2,4,1)(2,5,1)(2,6,1)(1,6,1)(1,7,1)(1,8,1)(1,8,2)(1,8,3)(1,8,4)(1,8,5)(1,8,6)(1,8,7)(1,8,8)(2,8,8)(2,7,8)(2,6,8)(2,5,8)

Sample Test Case 2



Sample Test Case 3

30x30
OBS(23,0)
OBS(24,14)
net1(1,11,12)(2,3,25)(1,15,10)
net2(2,11,12)(1,13,25)
net3(1,16,10)(2,23,3)(2,10,11)(1,21,0)
net4 (1,1,4)(1,6,6)(2,5,4)(1,3,3)
net5(1,9,5)(2,8,2)(2,3,5)(1,1,3)
net6(1,1,5)(2,3,1)(2,5,5)(1,2,2)

Output for test case 6:

net2(2,11,12)(1,13,25)(2,11,12)(2,12,12)(2,13,12)(1,13,12)(1,13,13)(1,13,14)(1,13,15)(1,13,16)(1,13,17)(1,13,18)(1,13,19)(1,13,20)(1,13,21)(1,13,22)(1,13,23)(1,13,24)(1,13,25)

net3(1,16,10)(2,23,3)(2,10,11)(1,21,0)(1,16,10)(1,16,11)(2,16,11)(2,15,11)(2,14,11)(2,13,11)(2,12,11)(2,11,11)(2,10,11)(1,16,9)(1,16,8)(1,16,7)(1,16,6)(1,16,5)(1,16,4)(1,16,3)(1,16,2)(1,16,1)(2,16,1)(2,17,1)(2,18,1)(2,19,1)(2,20,1)(2,21,1)(1,21,1)(1,21,0)(1,21,2)(1,21,3)(2,21,3)(2,22,3)(2,23,3)

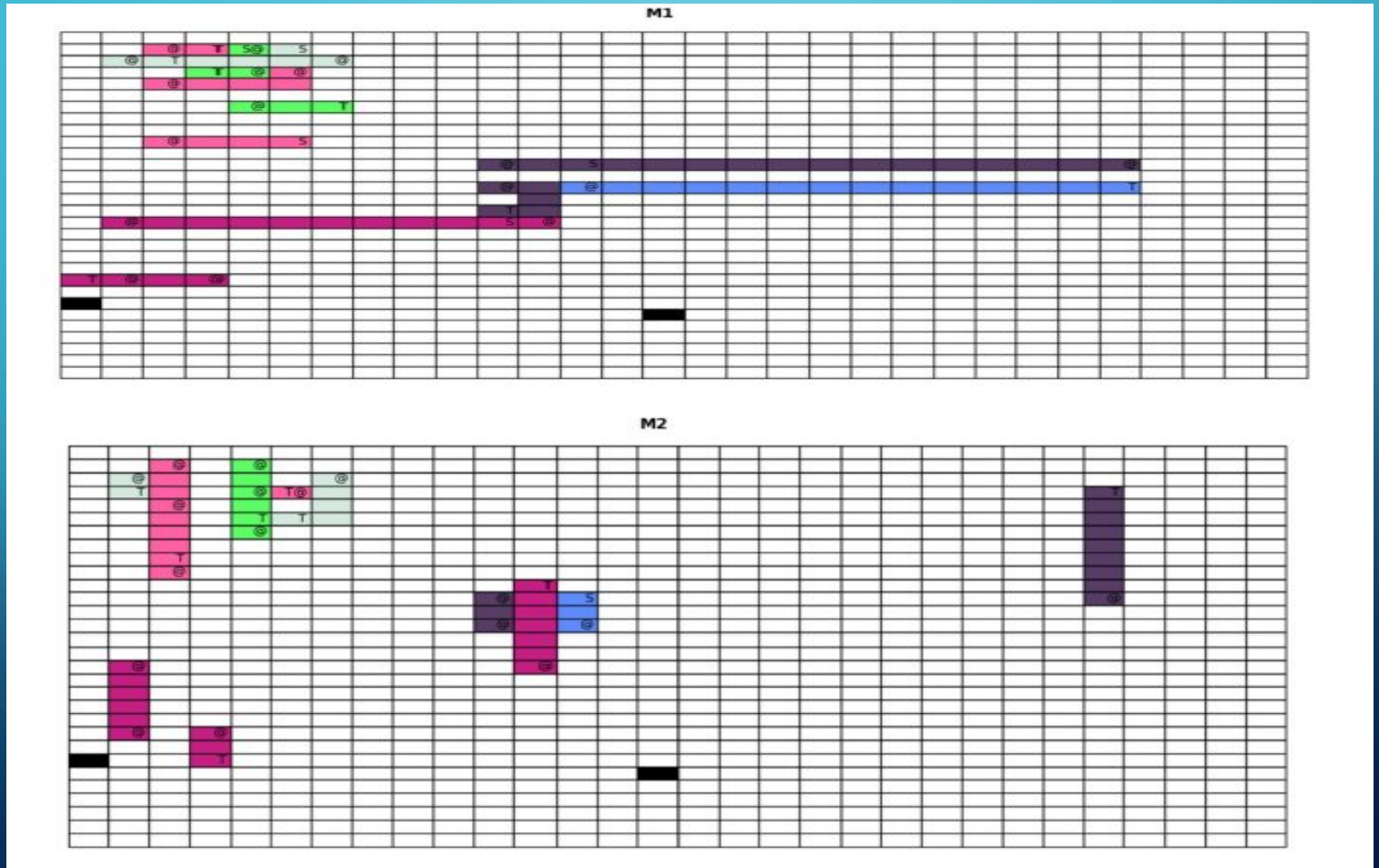
net6(1,1,5)(2,3,1)(2,5,5)(1,2,2)(1,1,5)(1,2,5)(1,2,4)(1,2,3)(1,2,2)(1,2,1)(2,2,1)(2,3,1)(1,2,6)(2,2,6)(2,3,6)(2,4,6)(2,5,6)(2,5,5)

net1(1,11,12)(2,3,25)(1,15,10)(1,11,12)(1,11,11)(1,11,10)(2,11,10)(2,12,10)(2,13,10)(1,13,10)(1,13,11)(1,14,11)(1,15,11)(1,15,10)(1,11,13)(1,11,14)(1,11,15)(1,11,16)(1,11,17)(1,11,18)(1,11,19)(1,11,20)(1,11,21)(1,11,22)(1,11,23)(1,11,24)(1,11,25)(2,11,25)(2,10,25)(2,9,25)(2,8,25)(2,7,25)(2,6,25)(2,5,25)(2,4,25)(2,3,25)

net4(1,1,4)(2,1,4)(2,2,4)(2,3,4)(2,4,4)(2,5,4)(1,3,4)(1,3,3)(2,6,4)(1,6,4)(1,6,5)(1,6,6)

net5(1,9,5)(2,8,2)(2,3,5)(1,1,3)(1,9,5)(1,9,4)(1,9,3)(1,9,2)(2,9,2)(2,8,2)(2,7,2)(2,6,2)(2,5,2)(2,4,2)(1,4,2)(1,4,3)(1,4,4)(1,4,5)(1,3,5)(2,3,5)(2,3,2)(2,2,2)(2,1,2)(1,1,2)(1,1,3)

Sample Test Case 3



Limitations

- The program works on only two metal layers
- Time and Space Complexity
- Issues visualizing layers with large dimensions

Conclusions

Thank you!