Chapter 10

Physical Design Automation

Placement

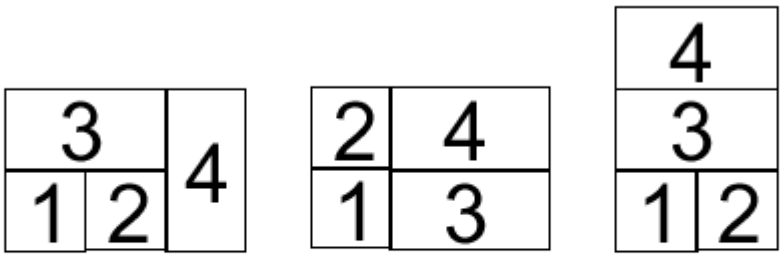


Fig. 10.1 Several feasible placements for four building blocks.

Placement

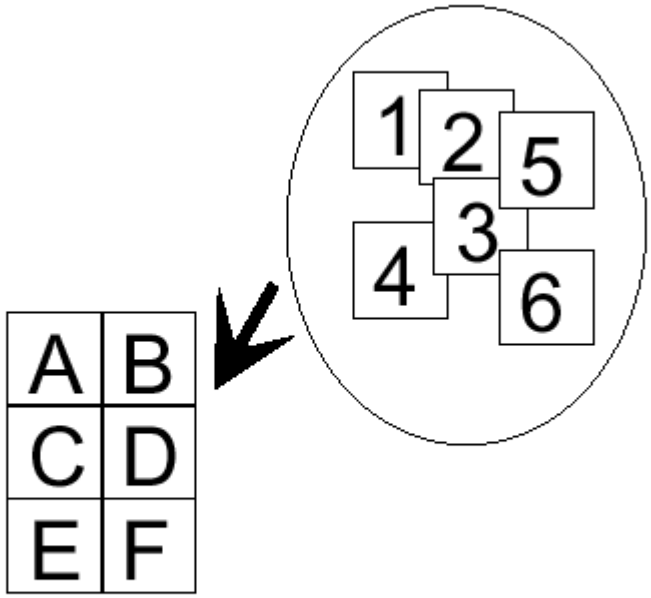


Fig. 10.2 Simple placement problem.

Wire Length Estimate

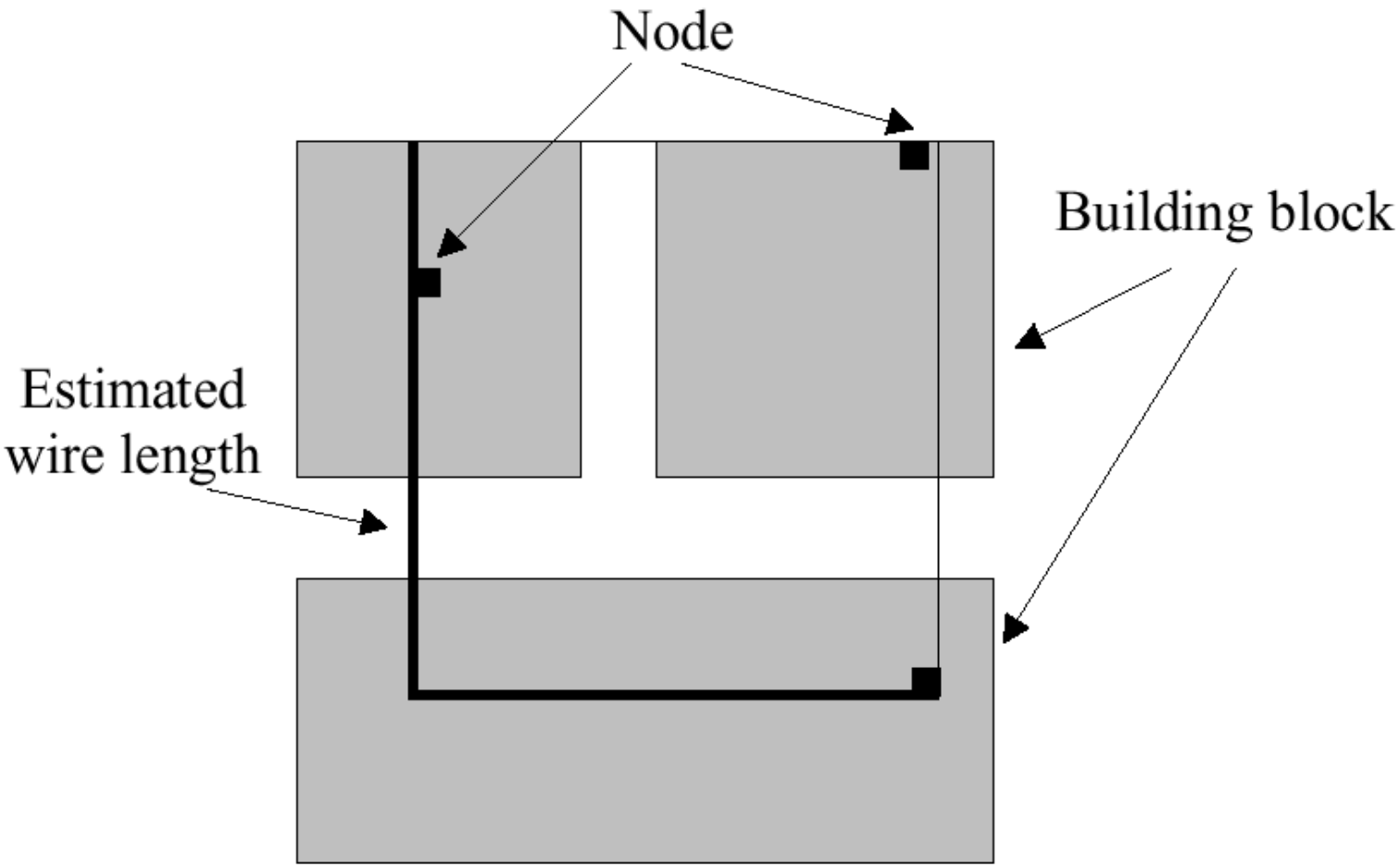


Fig. 10.3 Estimate of wire length.

Floorplanning

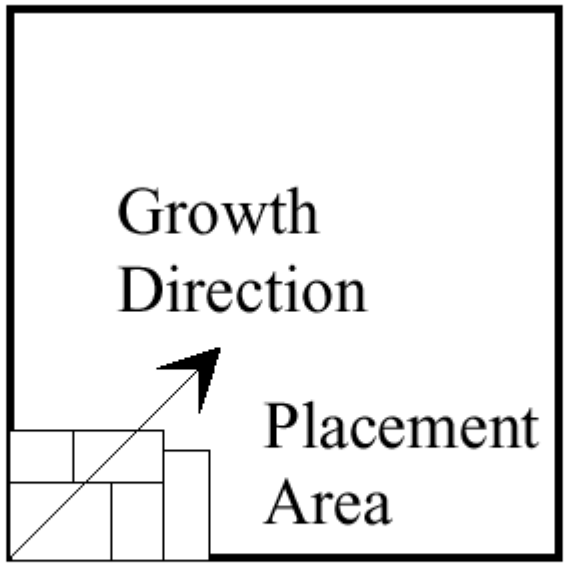


Fig. 10.4 Constructive floorplanning approach.

Min-Cut Placement

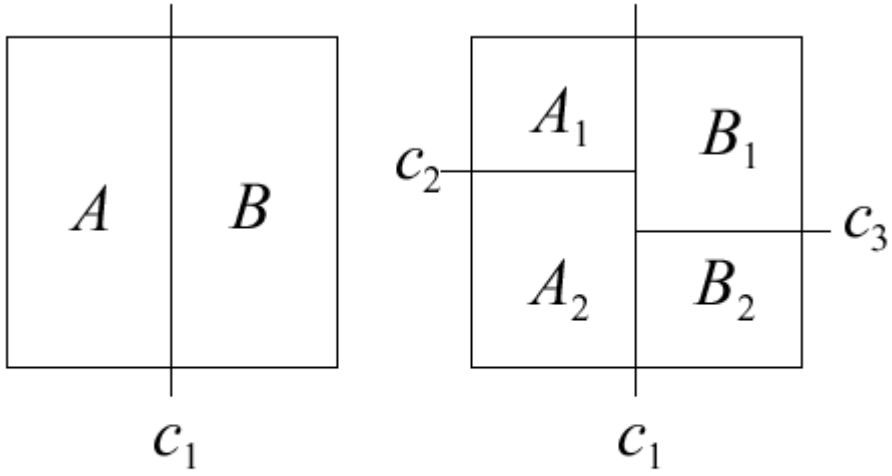


Fig. 10.5 Min-cut placement.

Min-Cut Placement

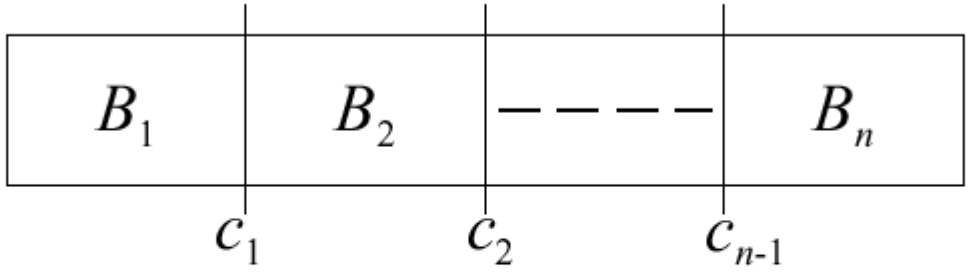


Fig. 10.6 Min-cut linear list for constructive placement.

Simulated Annealing

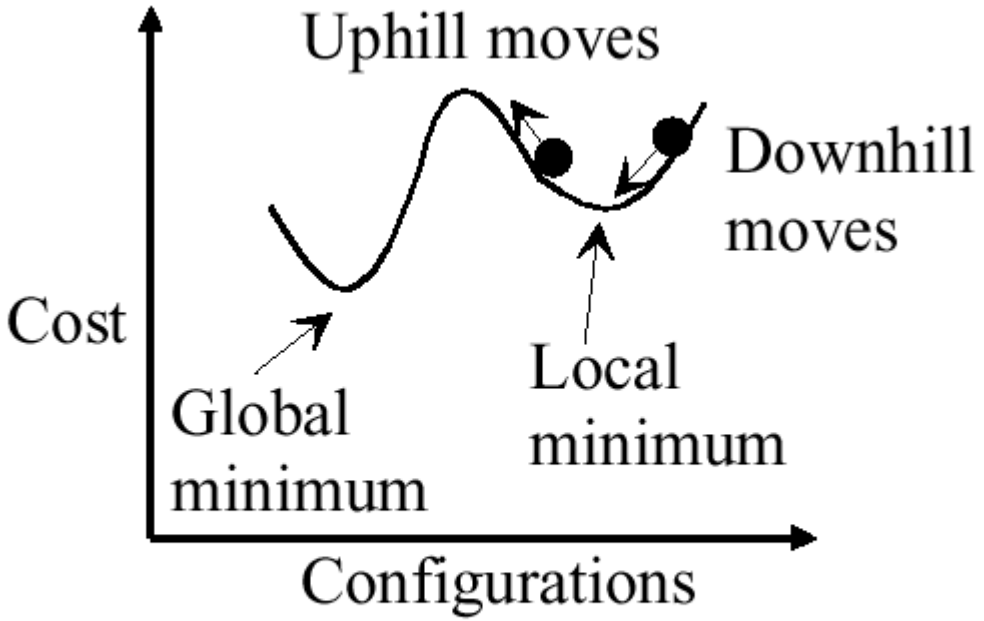


Fig. 10.7 Trapping at a local minimum.

Shortest Path

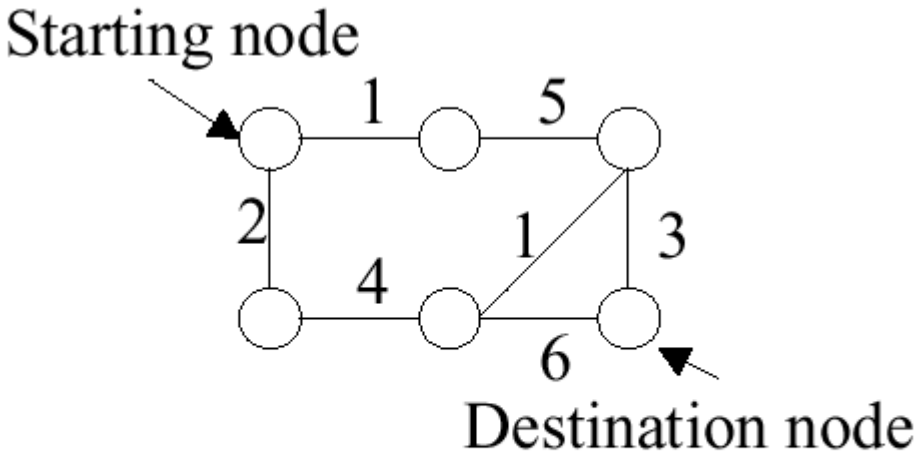


Fig. 10.8 Shortest path problem.

Shortest Path

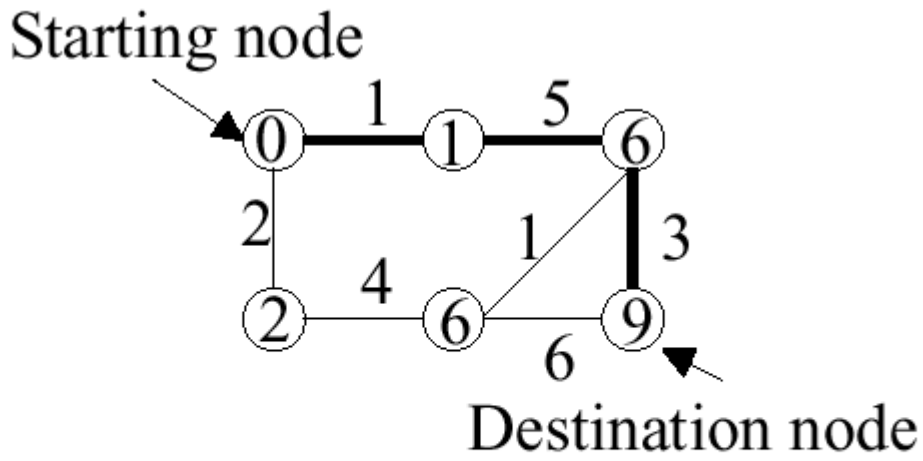
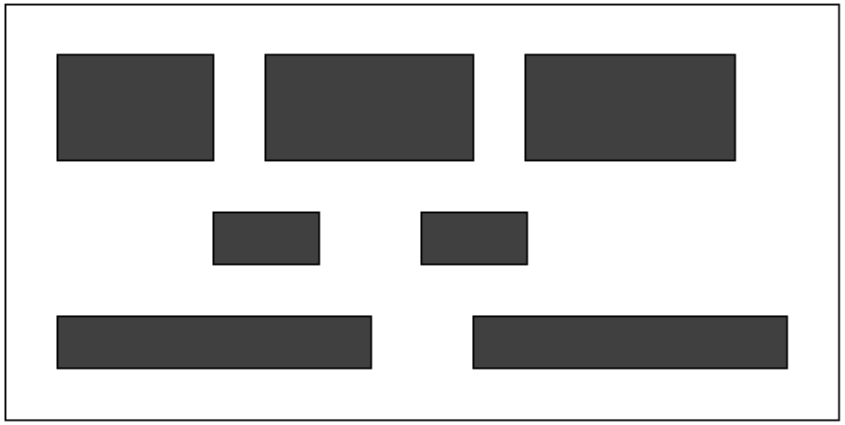
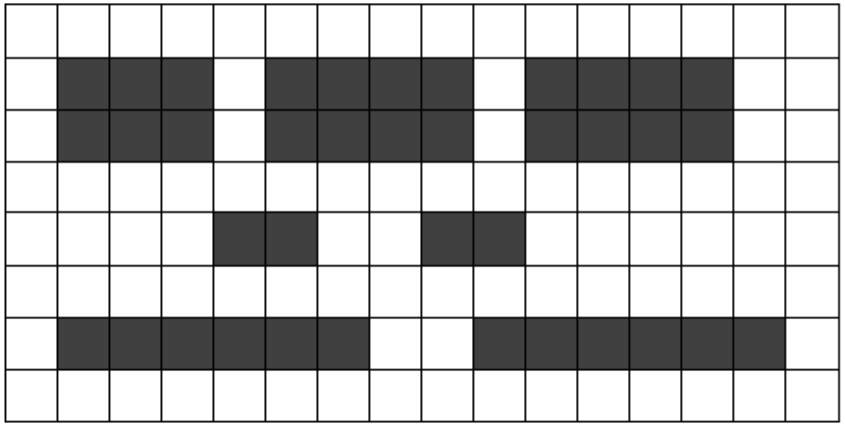


Fig. 10.9 Marking of a shortest path problem.

Maze Routing



(a)



(b)

Fig. 10.10 (a) Routing space; (b) Grid graph model for maze routing.

Lee Algorithm

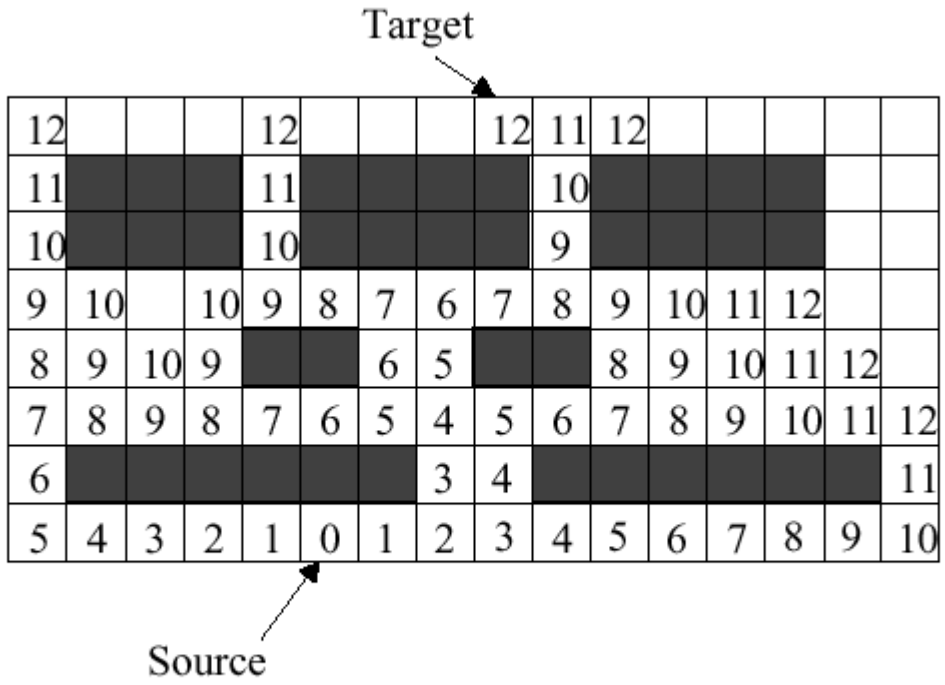


Fig. 10.11 Labeling for the wavefront expansion in the Lee algorithm.

Lee Algorithm

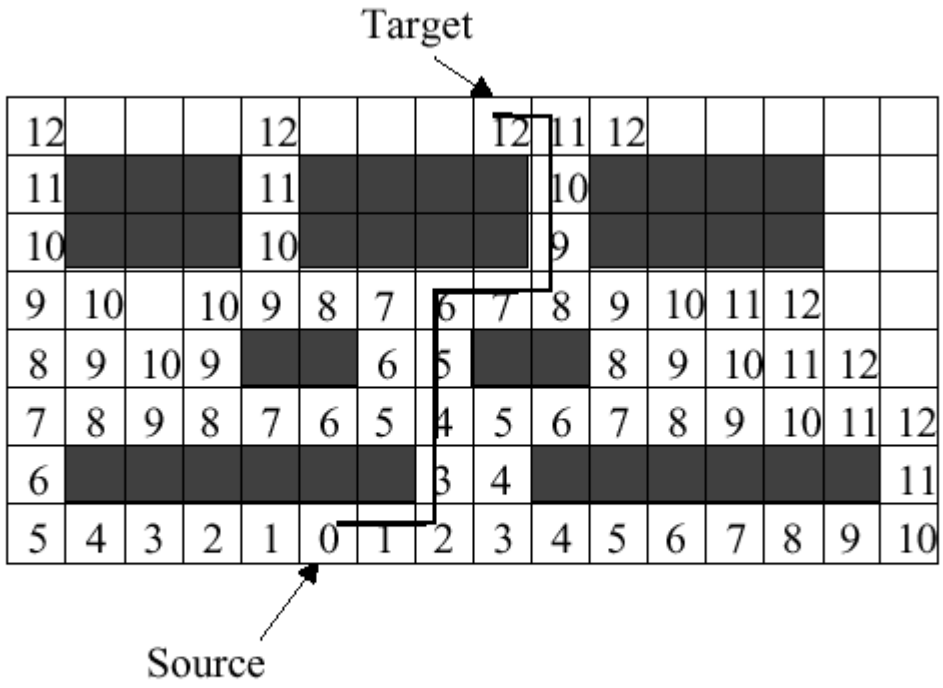


Fig. 10.12 Shortest path found with the Lee algorithm.

Maze Routing

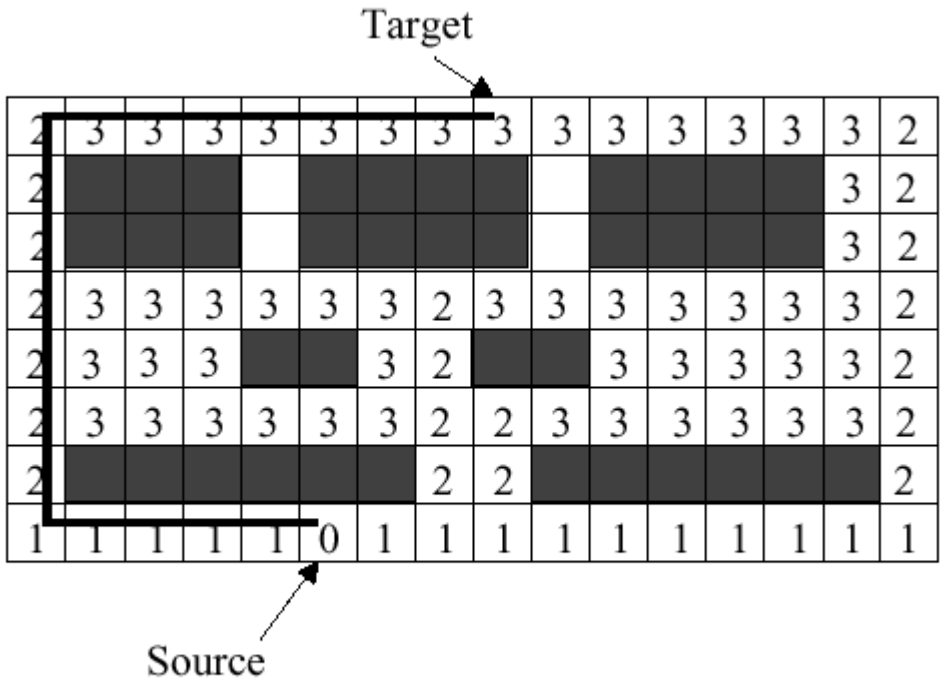


Fig. 10.13 Line-probe maze routing.

Maze Routing

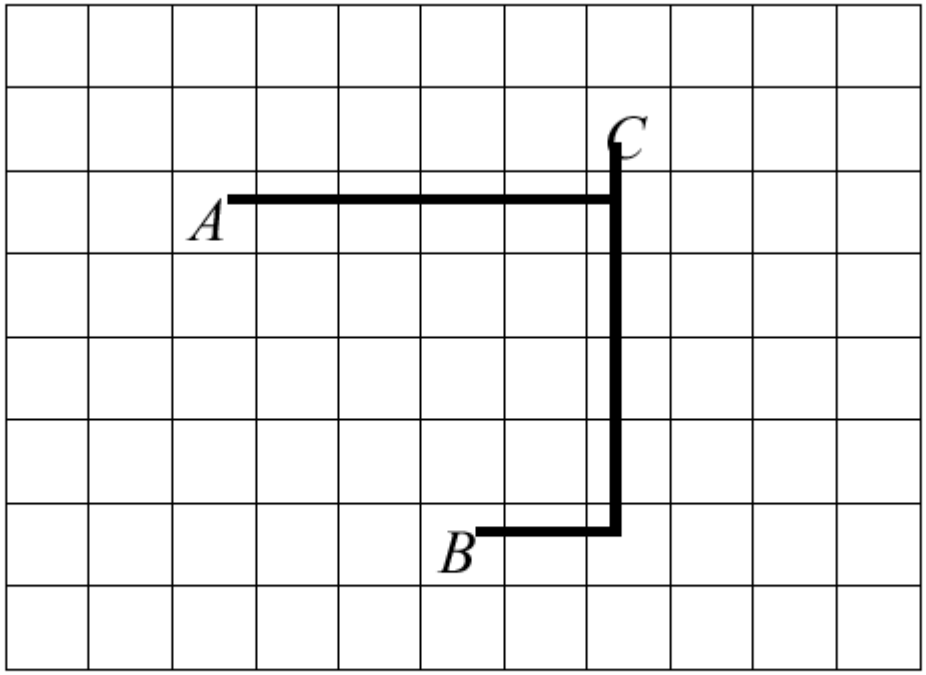


Fig. 10.14 An *n*-terminal net routed by a maze routing algorithm.

Expansion

4	3	2	3	4	5	6				
3	2	1	2	3	4	5	C_6			
2	1	*A*	1	2	3	4	5	6		
3	2	1	2	3	4	5	6			
4	3	2	3	4	5	6				
5	4	3	4	5	6					
6	5	4	5	6	*B*					
	6	5	6							

Fig. 10.15 Expansion from node *A*.

Expansion

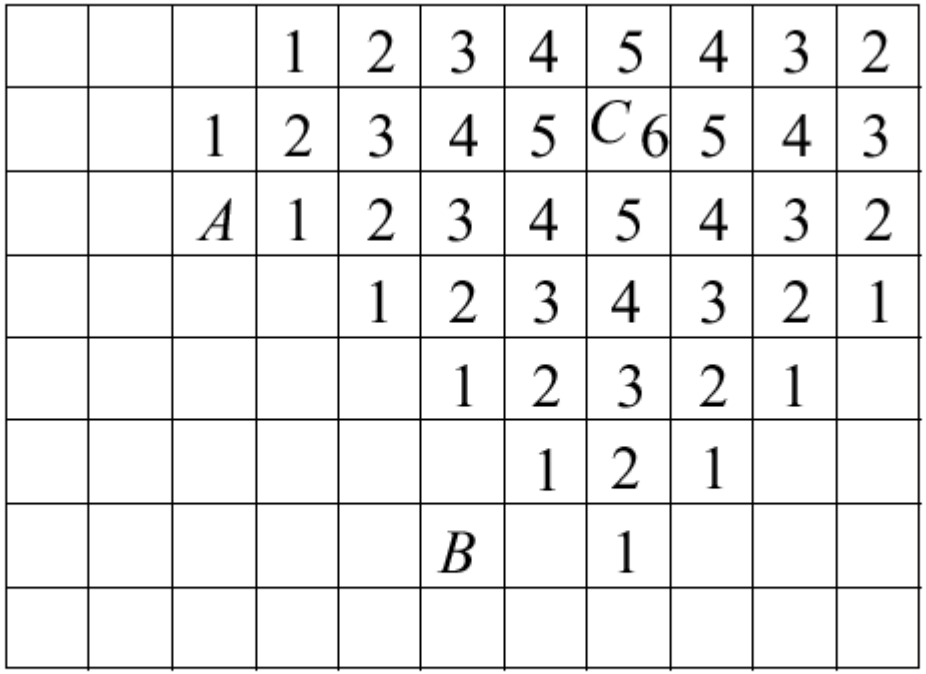


Fig. 10.16 Descending labeling wavefront expansion from node C.

Expansion

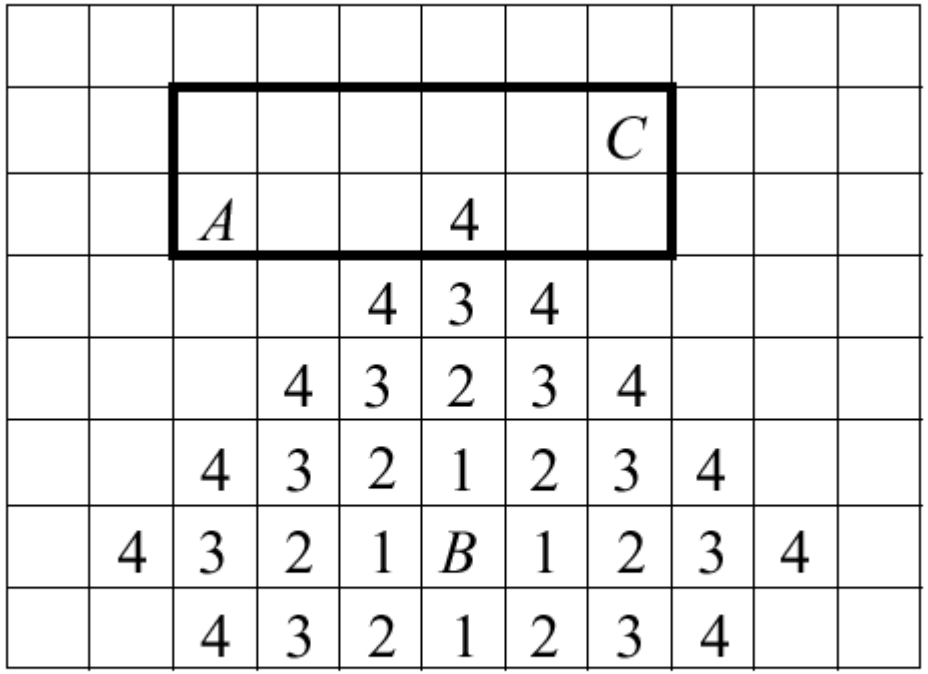


Fig. 10.17 Expansion from node *B*.

Steiner Tree Routing

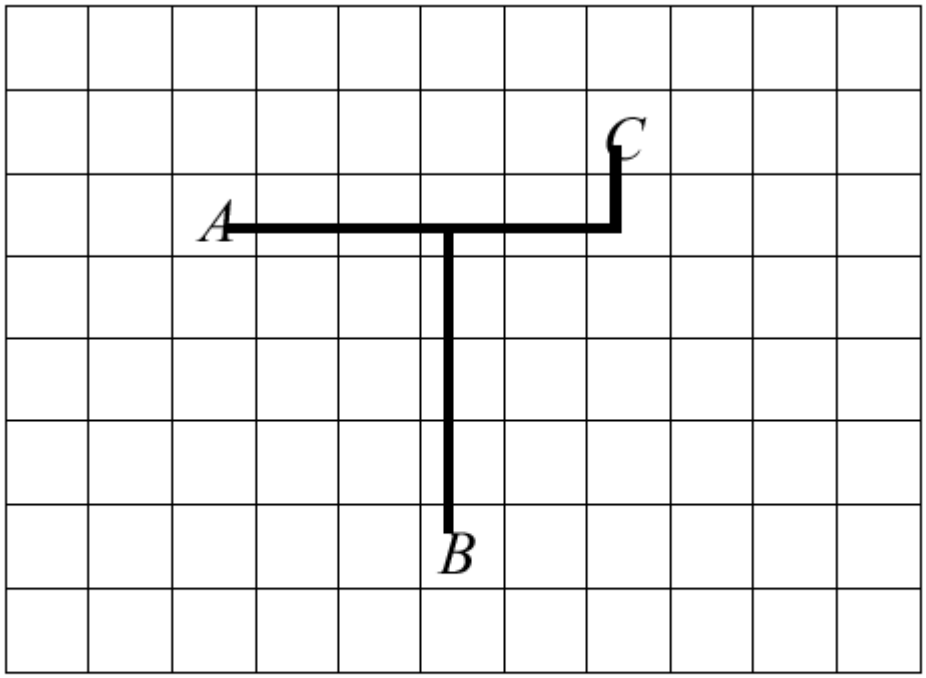


Fig. 10.18 Steiner tree routing path.

Routing Channel

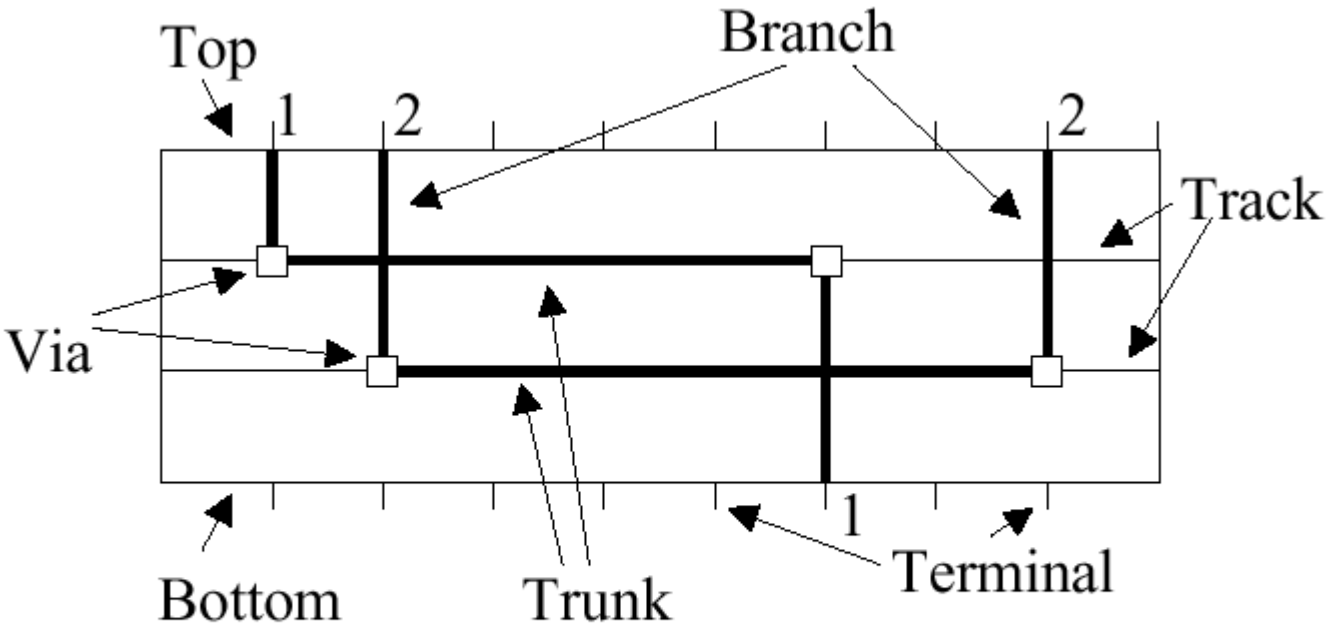


Fig. 10.19 Elements of a routing channel.

Channel Routing

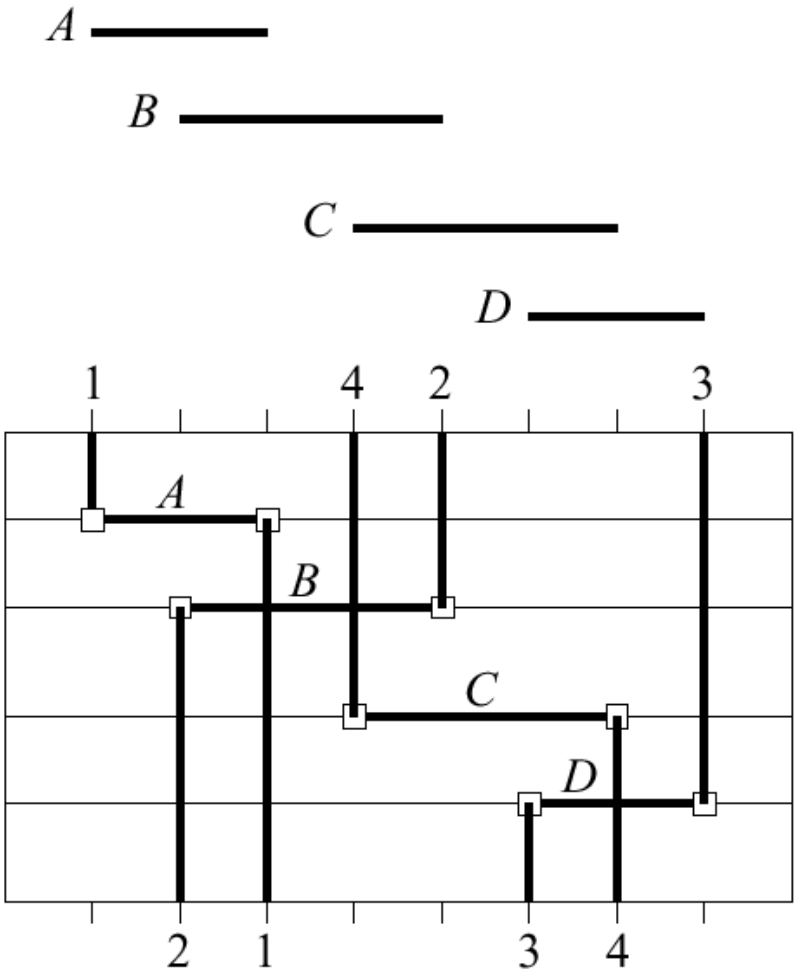


Fig. 10.20 Basic left-edge channel routing.

Channel Routing

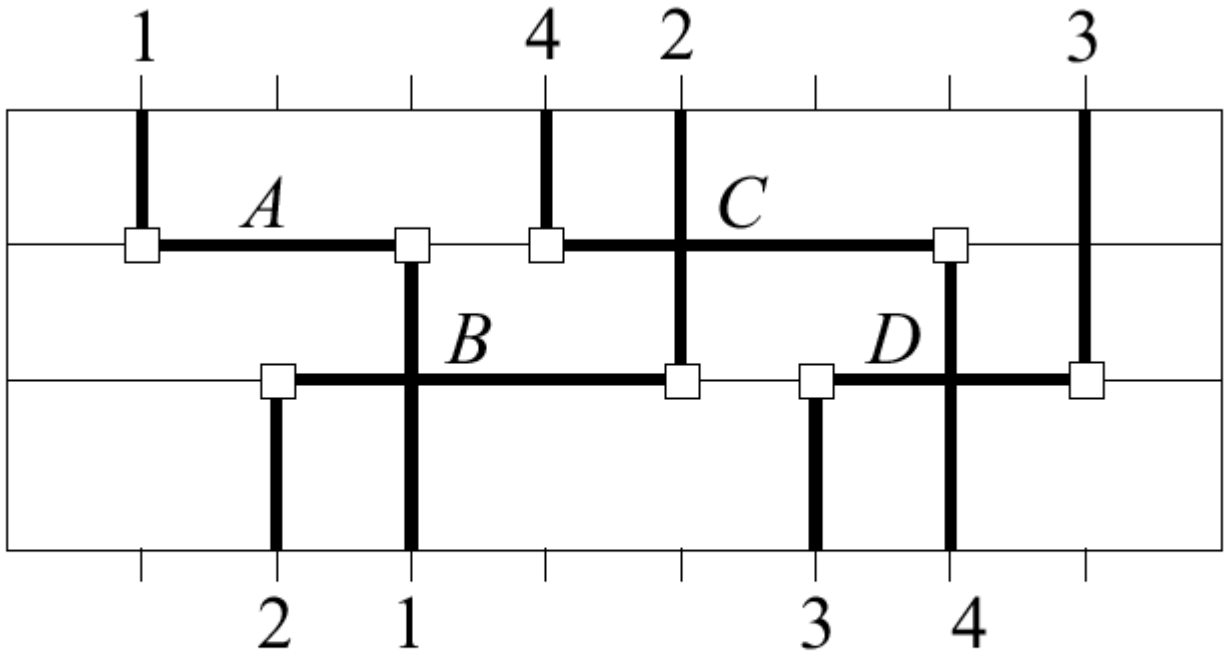


Fig. 10.21 Improved left-edge channel routing.

Vertical Constraints

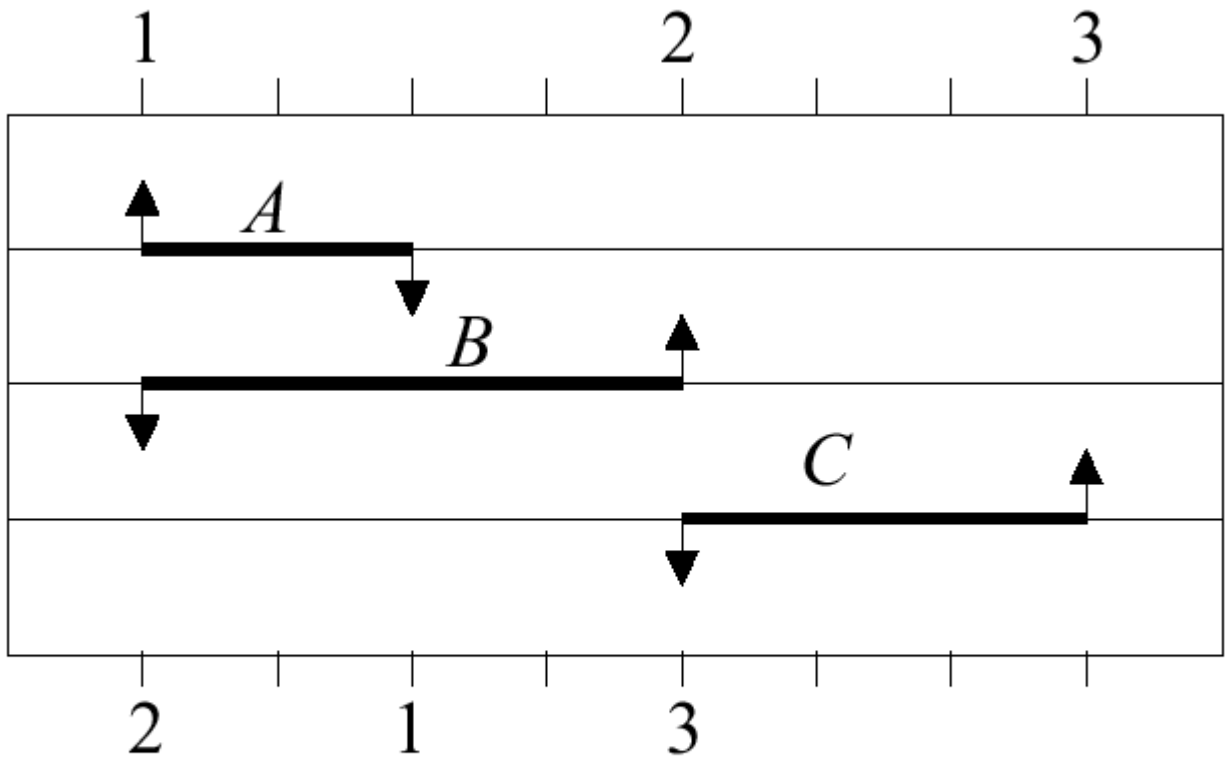


Fig. 10.22 Vertical constraints.

Vertical Constraints

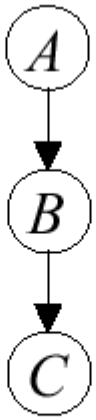


Fig. 10.23 Graphical representation of the vertical constraints in Fig. 10.22.

Dogleg

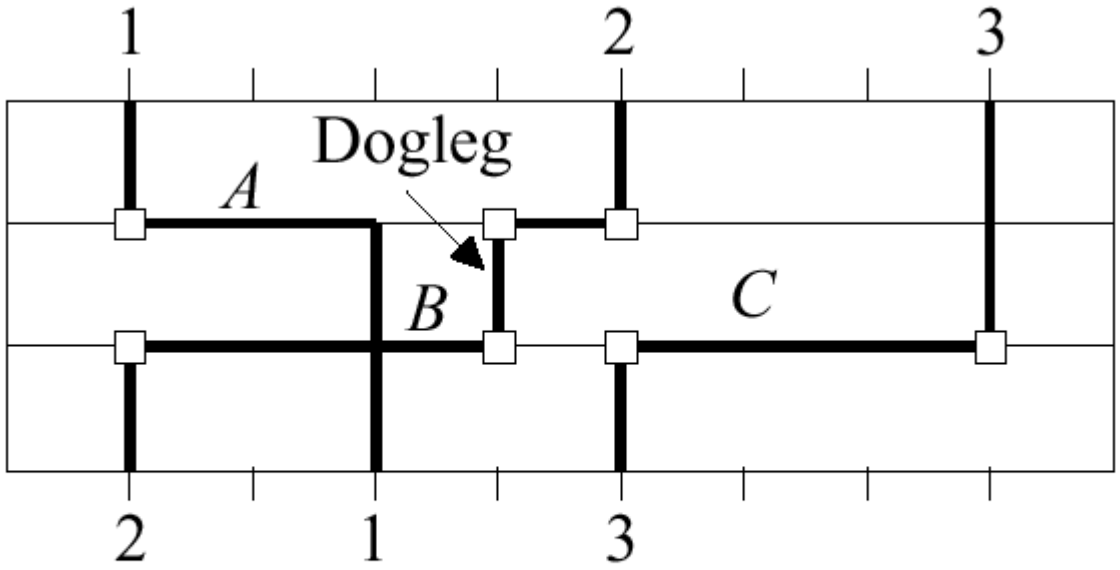


Fig. 10.24 Application of a dogleg.

Dogleg

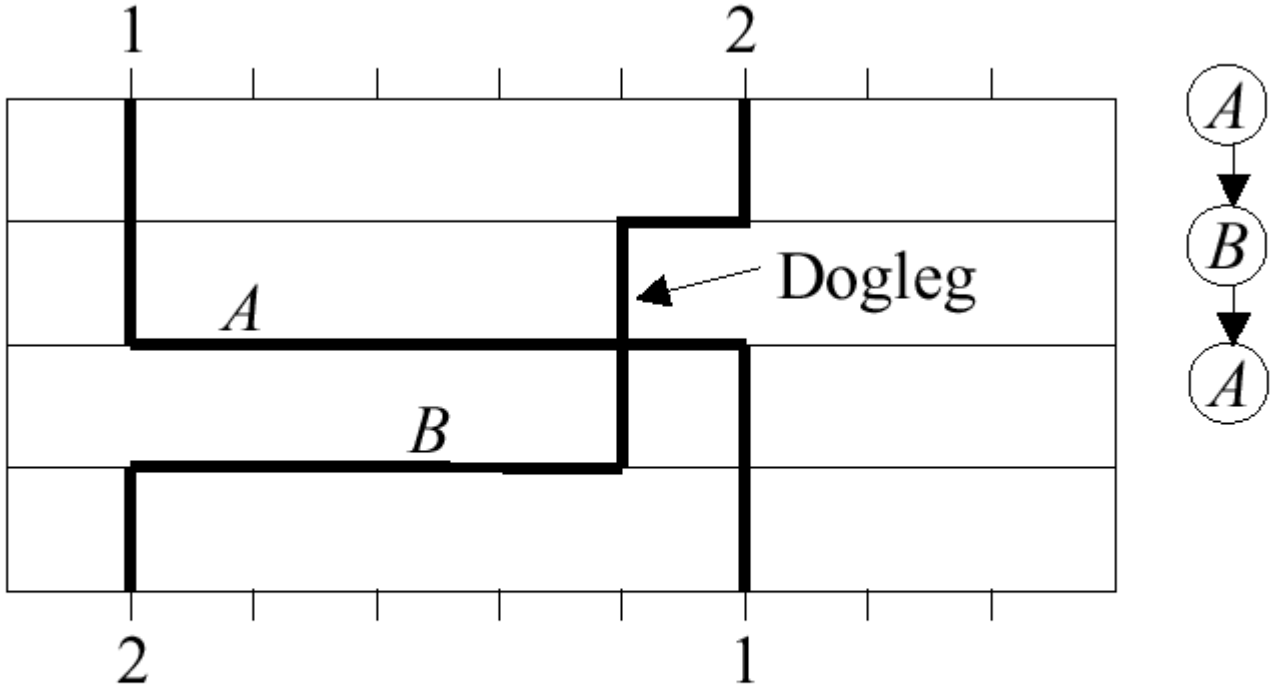


Fig. 10.25 Circular vertical constraints resolved by a dogleg.

Step 1

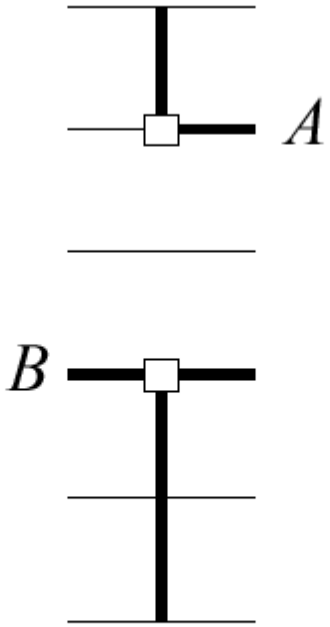


Fig. 10.26 Bringing terminals to the trunks (step 1).

Step 2

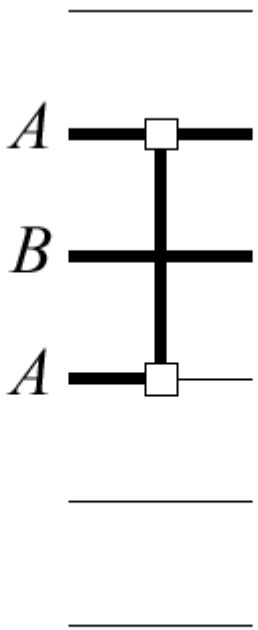


Fig. 10.27 Collapsing split nets (step 2).

Step 3

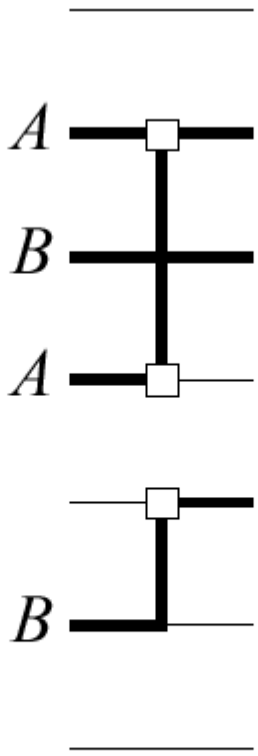


Fig. 10.28 Reducing range of split nets (step 3).

Step 4

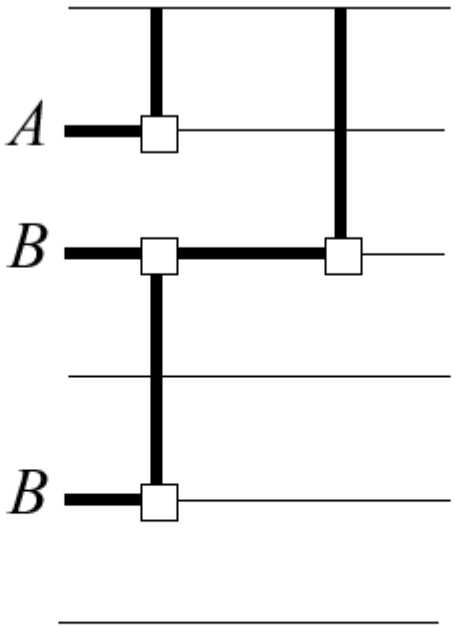


Fig. 10.29 Bringing a net closer to its destination (step 4).

Global Routing

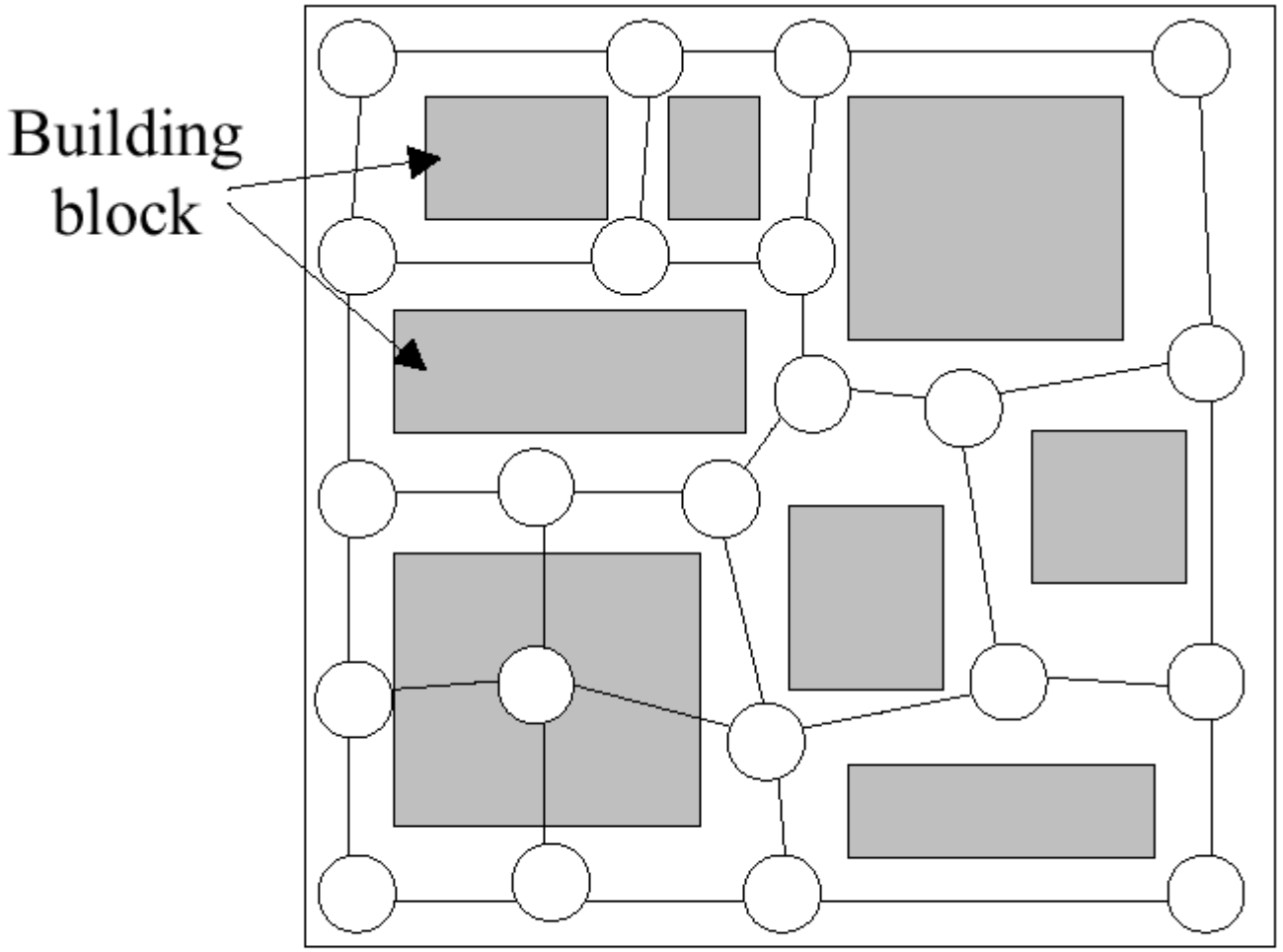


Fig. 10.30 Global routing graph.

Problem 10.1

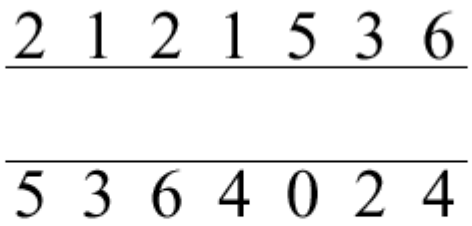


Fig. 10.31 Channel routing problem for Problem 10.1.

Problem 10.3

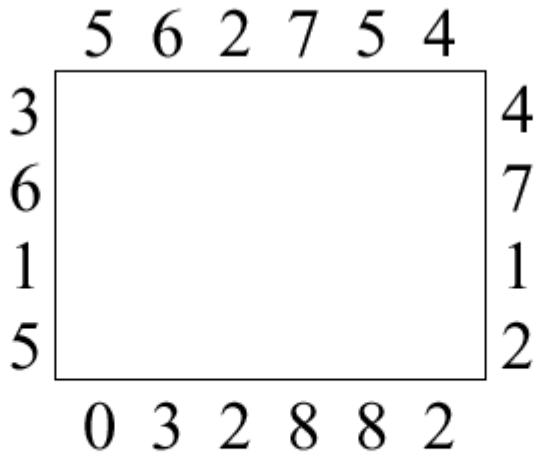


Fig. 10.32 Switchbox routing problem for Problem 10.3.