CMSC828T
Vision, Planning And Control In Aerial Robotics

Search Techniques for Planning

Search: What and Why?

- Once we have a map, a start point and a goal point, we can “search” through the map on how to get from start to goal.
- Graph-based search methods:
  - Uninformed Search
    - No information obtained from the environment
    - BFS, DFS
  - Informed Search
    - Evaluation function based
    - Efficient
    - May use heuristics (A*, D*)

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Grid-Based Search (Dijkstra, A*)

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A* Solved Example

Node Data
H Value (Heuristic)
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

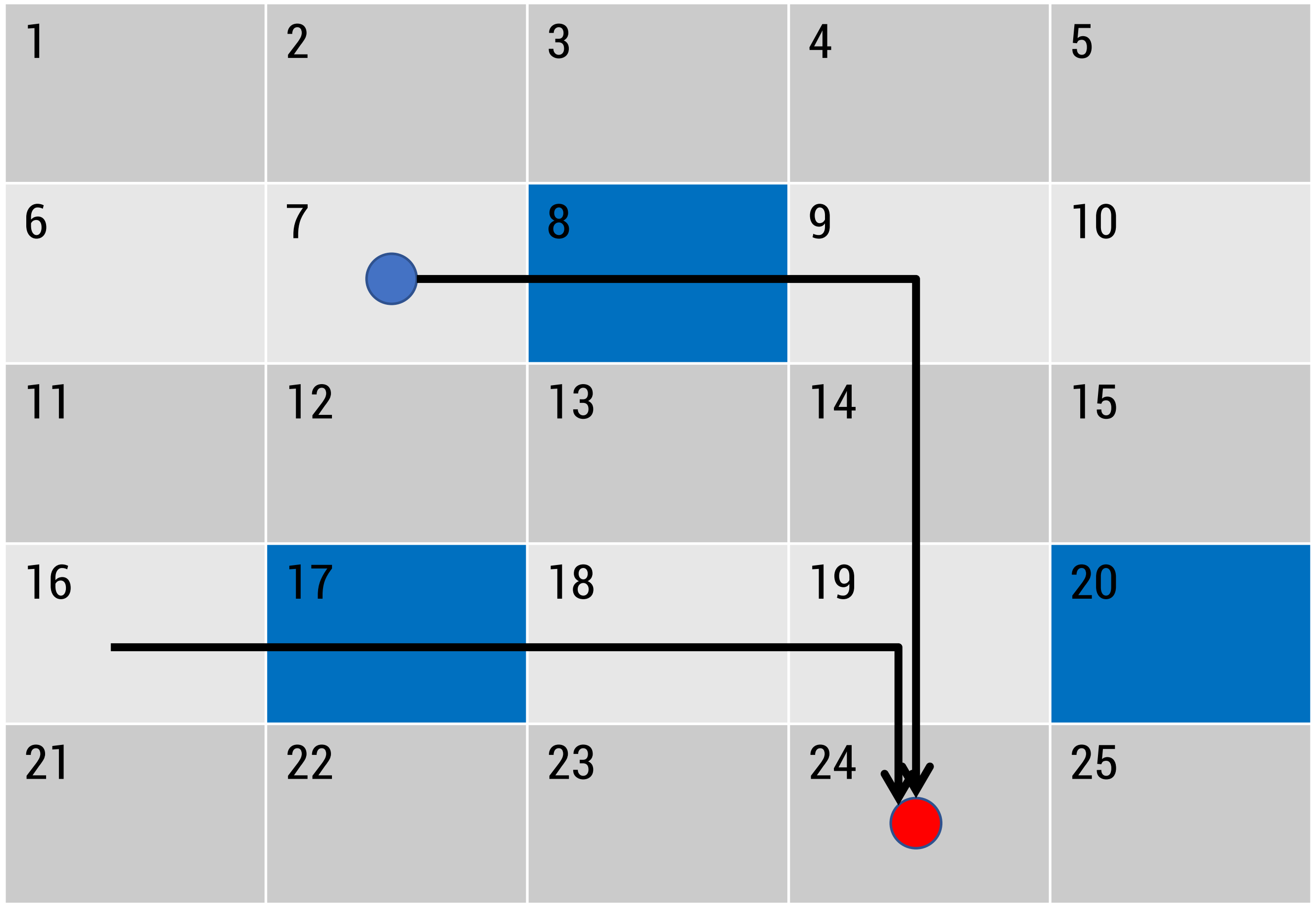
Lists
Open<>
Closed<>

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

Computing Heuristic Values

Node Data
H Value (Heuristic)
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

Lists
Open<>
Closed<>



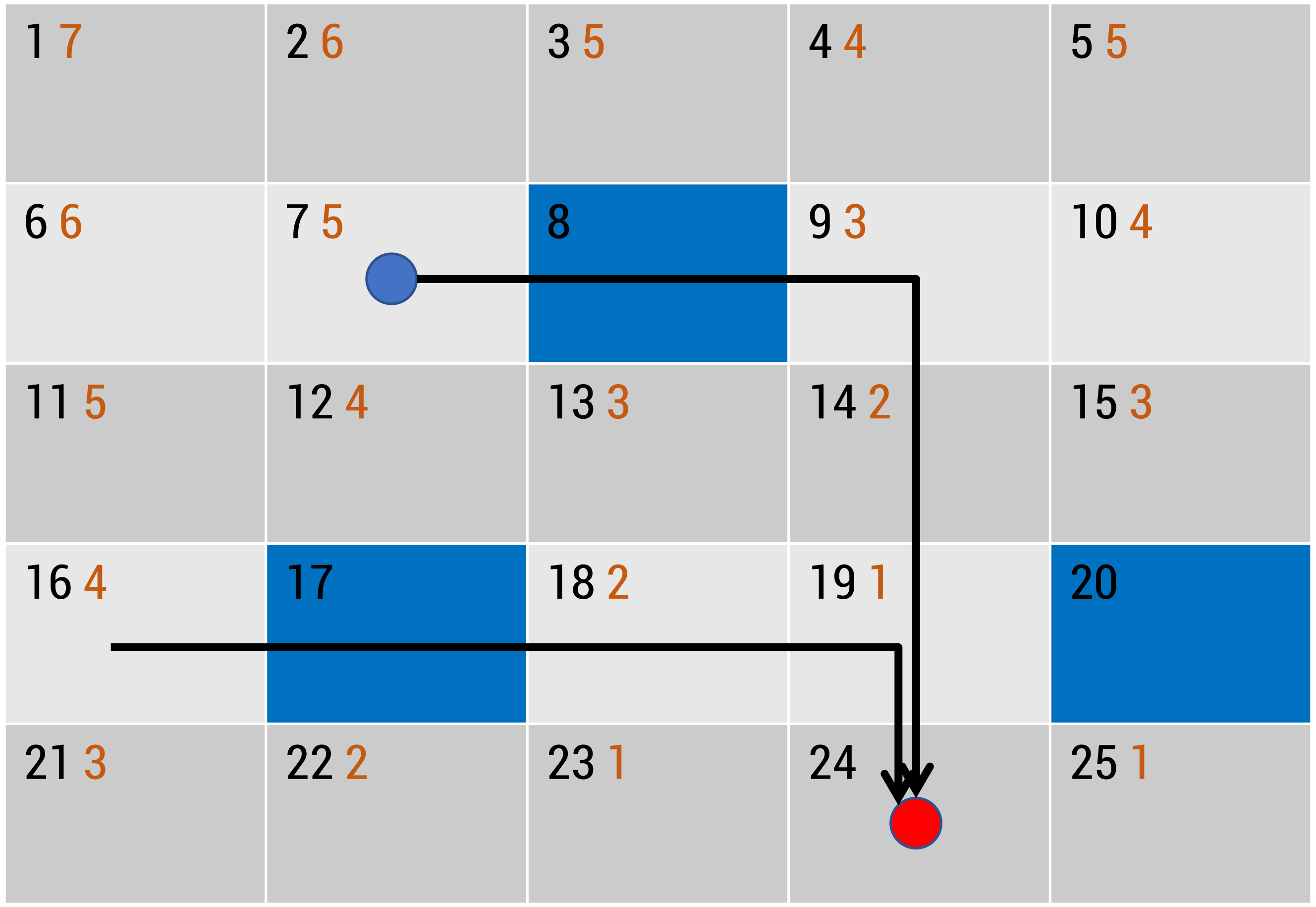
Node Data (7)
H = 5
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

Node Data (16)
H = 4
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

Computing Heuristic Values

Node Data
H Value (Heuristic)
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

Lists
Open<>
Closed<>

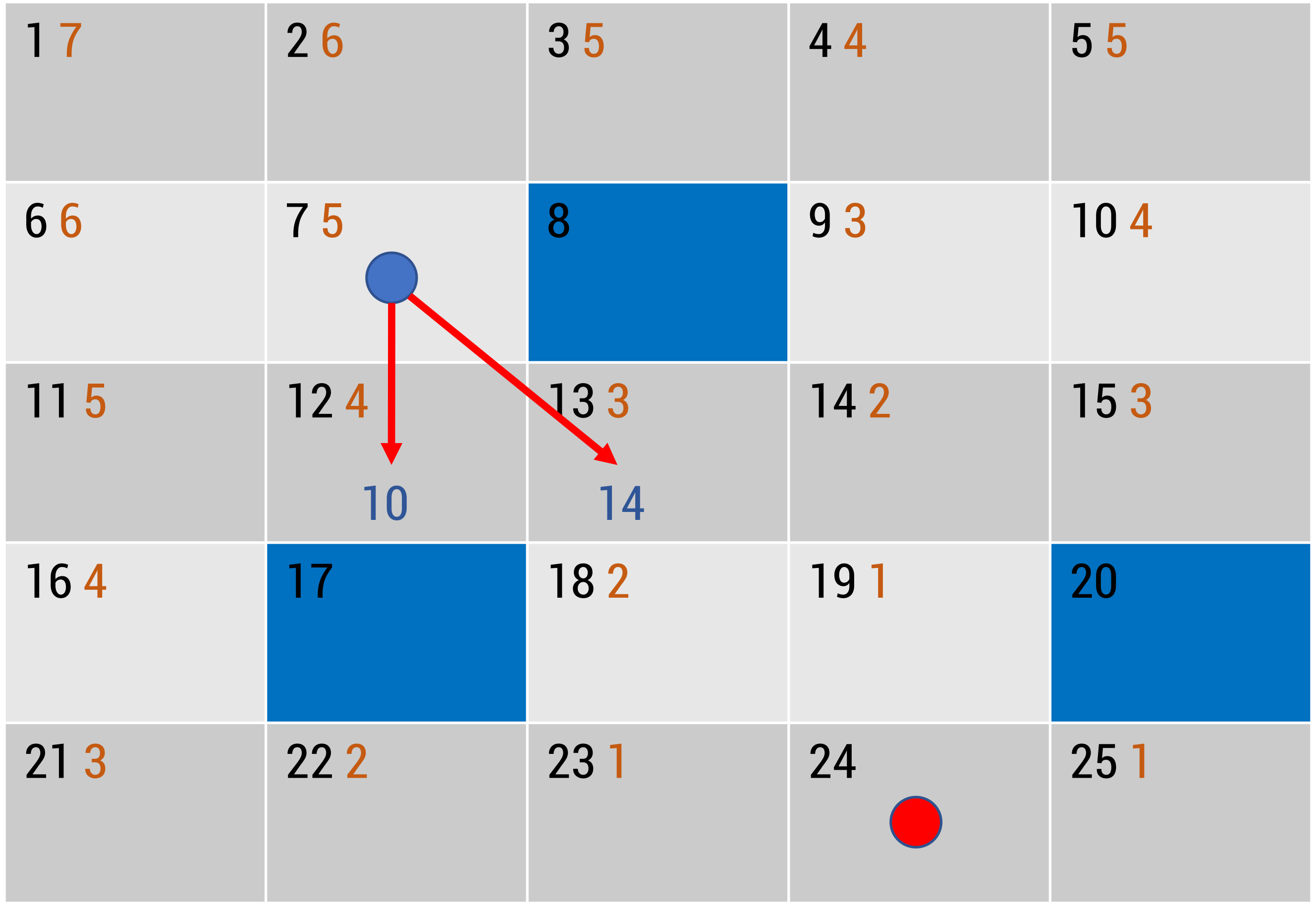


Computing Movement Cost

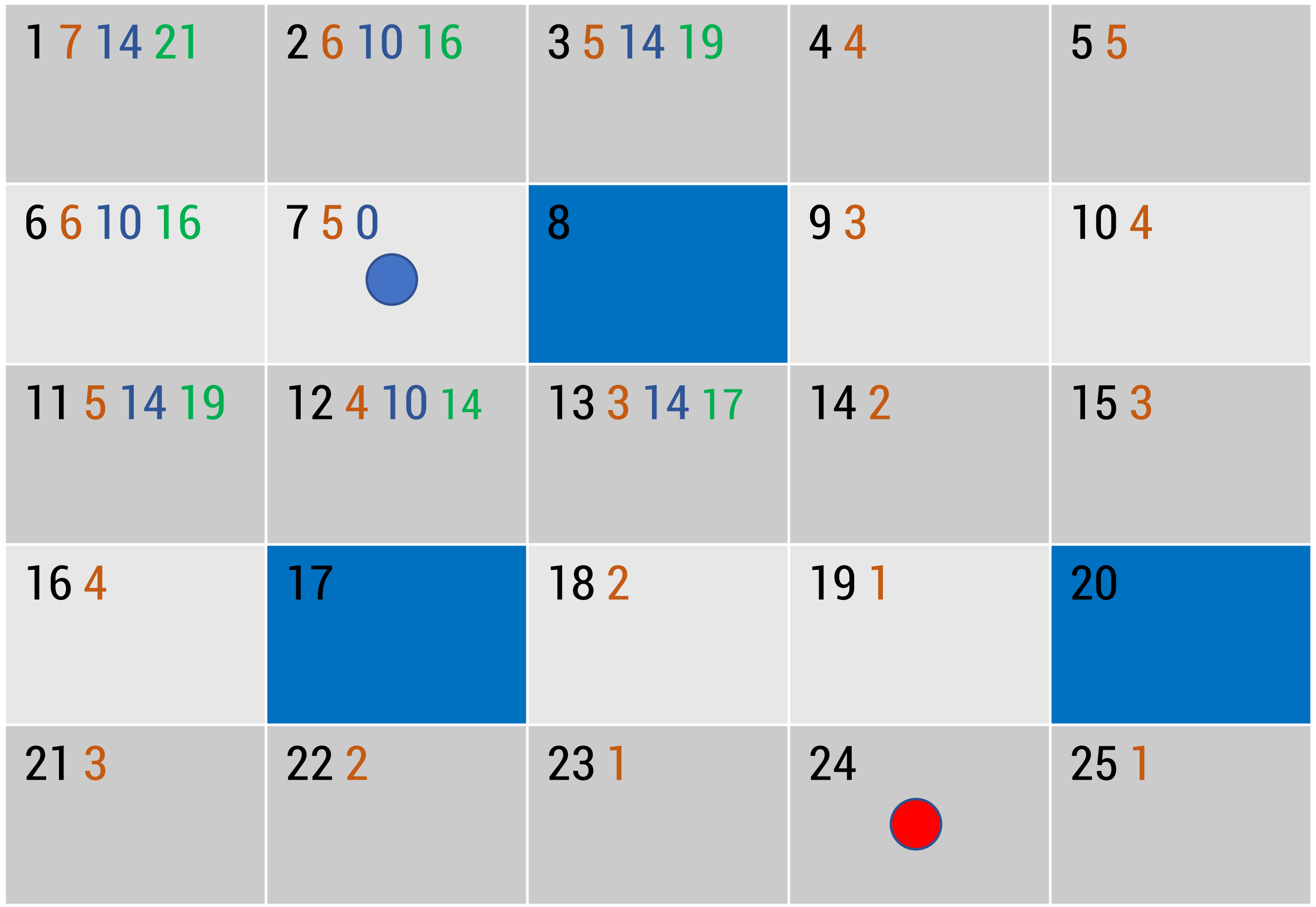
$$G = G_{parent} + MoveCost$$

Node Data
H Value (Heuristic)
G Value (Move Cost)
F Value (G+H)
Parent (Node From)

Lists
Open<>
Closed<>



Open, Closed List

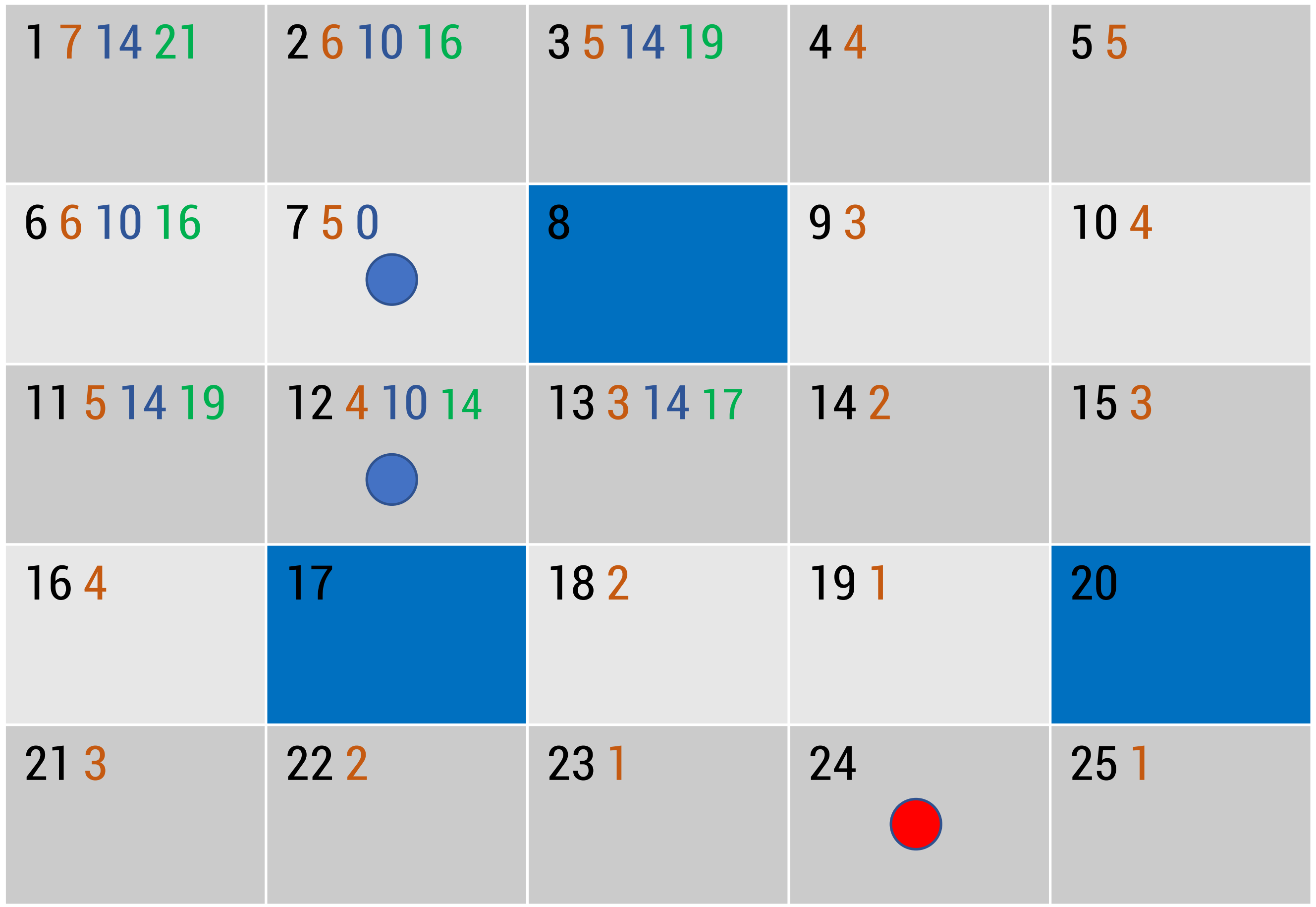


Lists
Open<1,2,3,6,11,12,13>
Closed<7>

Note

Nodes 1,2,3,6,11,12,13 have Node 7 as parent

Open, Closed List



Lists
Open<1,2,3,6,11,13>
Closed<7,12>

Update Rule

- Once at new node, we check adjacent nodes as usual.
- If the G cost of previously parented node is less now, we update parents for that node.
- Otherwise, leave as is.