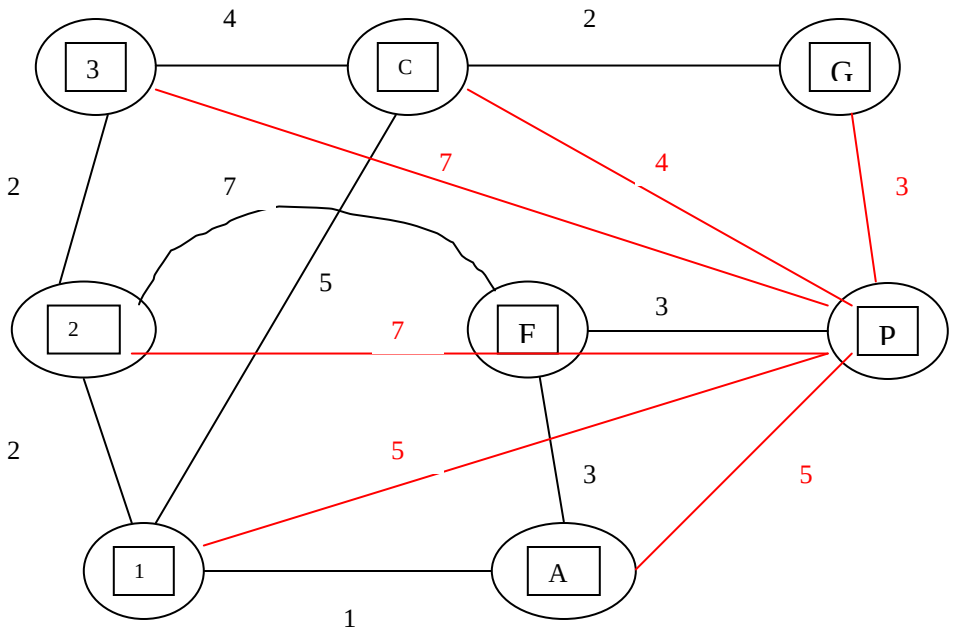
Informed Search



Use knowledge to guide our search to a goal.

General method employed is Best First. When deciding which path (or terminal node) to expand from the queue, use knowledge obtained from some evaluation function, f(n), to pick the path with the lowest value.

The name Best First is not entirely accurate. If the choice were really "best" there would be no search involved and we would go directly to the goal.

How do we incorporate knowledge into search?

Use a special evaluation function called a heuristic, h(n).

h(n) = estimated cost of the cheapest path to the goal.

Use a priority queue to store paths.

Greedy Best First Search (Greedy Search)

Expand the node closest to the goal. Use f(n) = h(n) to decide which node to expand.

Path problem - Use SLD (straight line distance)

[(2 ***7***)]

[(2 F ***3***) (2 1 ***5***) (2 3 ***7***)]

[(2 F P ***0***) (2 F A ***5***) (2 1 ***5***) (2 3 ***7***)]

(2 F P) GOAL Not optimal solution Has a total cost of 10. (2 1 A F P) has a total cost of 9.

- Finds solution quickly
- Does not necessarily find the optimal solution
- Can be susceptible to false starts, may expand a path that does not lead to goal but its nods are close to the goal.
- If we don't test for repeated states, can lead to infinite search

Uniform Cost Search - your book labels this as uninformed search, other texts view it as an informed search . Reason book does not view this as informed. f(n) is not an heuristic estimate of where to move next in the search space. f(n) = current path cost (sometimes denoted g(n).

Expand the path in the queue whose path cost function is smallest

[(2 ***0***)]

[(2 3 ***2***) (2 1 ***2***) (2 F ***7***)]

[(2 1 ***2***) (2 3 C ***6)*** (2 F ***7***)]

[(2 1 A ***3***) (2 3 C ***6)*** (2 1 C ***7***) (2 F ***7***)]

[(2 1 A F ***6***) (2 3 C ***6)*** (2 1 C ***7***) (2 F ***7***)]

[(2 3 C ***6)*** (2 1 C ***7***) (2 F ***7***) (2 1 A F P ***9***)]

[(2 1 C ***7***) (2 F ***7***) (2 3 C G ***8)*** (2 1 A F P ***9***)]

[(2 F ***7***) (2 3 C G ***8)*** (2 1 C G ***9***) (2 1 A F P ***9***)]

[(2 3 C G ***8)*** (2 1 C G ***9***) (2 1 A F P ***9***) (2 F P ***10***)]

[(2 1 C G ***9***) (2 1 A F P ***9***) (2 F P ***10***)]

[(2 1 A F P ***9***) (2 F P ***10***)]

(2 1 A F P) Goal

- First solution found is the cheapest
- can be inefficient. Cost is incurred relative to the number of steps taken. Tends to explore large trees of small steps before exploring paths with large and useful steps.