



Experiment Number: 5

Aim:

WAP for A* algorithm using informed search method.

Theory:

An informed search strategy-one that uses problem-specific knowledge-can find solutions more efficiently. A key component of these algorithms is a heuristic function $h(n)$

$h(n)$ = estimated cost of the cheapest path from node n to a goal node.

Admissible /heuristic never over estimated i.e. $h(n) \leq$ Actual cost. For example, Distance between two nodes(cities) \Rightarrow straight line distance and for 8-puzzle problem- Admissible heuristic can be number of misplaced tiles $h(n) = 8$.

A* Search technique

It is informed search technique. It uses additional information beyond problem formulation and tree. Search is based on Evaluation function $f(n)$. Evaluation function is based on both heuristic function $h(n)$ and $g(n)$.

$$f(n) = g(n) + h(n)$$

It uses two queues for its implementation: open, close Queue. Open queue is a priority queue which is arranged in ascending order of $f(n)$.

Algorithm:

1. Create a single member queue comprising of Root node
2. If FIRST member of queue is goal then goto step 5
3. If first member of queue is not goal then remove it from queue and add to close queue.



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4. Consider its children if any, and add them to queue in ascending order of evaluation function $f(n)$.
5. If queue is not empty then goto step 2.
6. If queue is empty then goto step 6
7. Print 'success' and stop
8. Print 'failure' and stop.

Performance Comparison:

- Completeness: yes
- Optimality: yes

Limitation:

- It generate same node again and again
- Large Memory is required

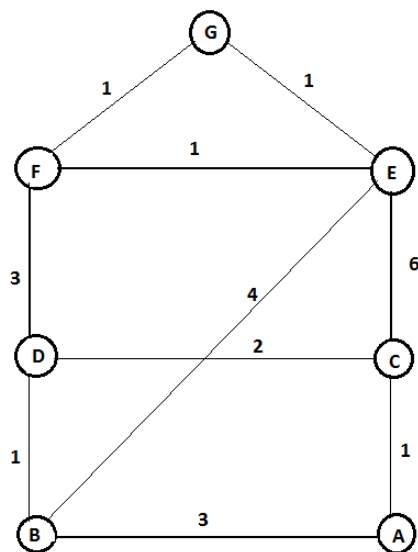


Fig.5.1. Example of A*

OPEN/FRINGE

[A]
[C,B]
[D,B,E,A]

CLOSE

[]
[A]
[A,C]



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[F,E,B,C,A]

[A,C,D]

[G,E,B,C,A,D]

[A,C,D,F]

SUCCESS

Node A:

$$f(B) = g(B) + h(B) = 3 + 5 = 8$$

$$f(C) = g(C) + h(C) = 1 + 6 = 7$$

Node C:

$$f(A) = g(A) + h(A) = 2 + 7 = 10$$

$$f(D) = g(D) + h(D) = 3 + 4 = 7$$

$$f(E) = g(E) + h(E) = 7 + 1 = 8$$

Node D:

$$f(F) = g(F) + h(F) = 6 + 1 = 7$$

$$f(C) = g(C) + h(C) = 5 + 6 = 11$$

$$f(B) = g(B) + h(B) = 4 + 5 = 9$$

Node F:

$$f(E) = g(E) + h(E) = 7 + 1 = 8$$

$$f(D) = g(D) + h(D) = 9 + 4 = 13$$

$$f(G) = g(G) + h(G) = 7 + 0 = 7$$

Final path: A → C → D → F → G

Total cost = 7



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Conclusion: Thus, the program of A*algorithm has been executed successfully