Q .Compare and contrast between the results of the two algorithms (i.e. BFS and

A\*) for the two heuristics as mentioned above, and state the reasons in a

document file ‘Why one search technique is better than the other one?’.

While explaining, please comment on the optimality, time complexity etc.

Two algorithms were applied on the 8-puzzle problem , namely Best First search and A\* search. The cost function( f(n) ) used for BFS was h(n) and for A\* search was g(n) + h(n).

where, g(n) is the least cost from source state to current state so far.

h(n) is the heuristic applied.

Two different heuristics were used :

* h1(n) -> number of tiles displaced from their destined position.
* h2(n) -> sum of Manhattan distance of each tile from the goal

position.

Comparing BFS and A\* search on the following heads:

1. Optimality :

BFS is not optimal where as A\* guarantees optimality.

1. Completeness :

BFS is not complete and can get stuck in loops (until closed list is used).

A\* is complete (unless there are infinitely many nodes with f ≤ f(G) ).

1. Time complexity :

For BFS time complexity is O(bd).

For A\* time complexity is exponential (for most heuristic functions in practice).

1. Space complexity :

For BFS space complexity is O(bd).

A\* keeps all the generated nodes in memory (exponential number of nodes).

Our Observations :

1. For unsolvable 8 puzzle :

Time taken by DFS (with a closed list) to exhaust all the states (9!/2 = 181440 states in total ) is very less as compared to A\* search .

1. For solvable 8 puzzle:

The number of states explored by A\* for reaching goal state is lesser as

compared to BFS.

1. Heuristic h2(n) is better than h1(n) for both BFS and A\* search.