8 S L I D I N G T I L E P U Z Z L E P R O B L E M

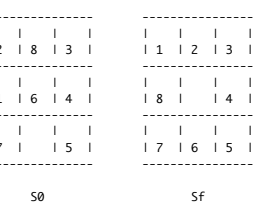
The aim of this task is to implement a program to solve the 8
sliding tile puzzle, while the A* algorithm is employed in
your program.

Generally, in the A* algorithm, a numberical value
f(S) is assigned to each state S of the search space,
consisting of two terms:

f(S)=g(S)+h(S)

where g(S) is the known cost in reaching S from the initial state
S0 and h(S) is a heuristic function that estimates the cost
of reaching the solution from S by the best possible of
sequence of actions. Thus, f(S) is an estimate of the cost
of any solution that, from S0, passes through S.

Consider the famous puzzle devised by Sam Loyd -
the sliding tile puzzle: eight square tiles
numbered 1 to 8 are held in a 3x3 frame,
leaving one square empty, any of the neighbouring tiles
can be slid horizontally or vertically into the
empty square, so creating a new space.
The problem is to go from a given
initial configuration S0 to a given final
configuration SF (eg. as shown in the following
figure) in the least number of such moves.



S0 Sf

Task

Write a program to solve the sliding tile puzzle.
Your program should be able to accept any initial
configuration S0 and the final configuration SF, and print out
the solution (a sequence of configurations from S0 to SF).

Note that you need first to define your heuristic function h.
Since f(S)=g(S)+h(S), where g(S) gives the path cost from the start
node to node S, and h(S) is the estimated cost of the
cheapest path from S to SF, f(S) is in fact an estimated cost
of the cheapest solution through S. In this problem, g(S)
can be defined as the number of moves taken in going from
S0 to S. Therefore, it is important that you define a good
h function that will find a minimal-move sequence with much less
search. It is most important that your h heuristic should be as accurate
as possible so as to limit the search but it must be
guaranteed never to overestimate (hint: read Russell and Norvig's book,
pp 101-104).

Note: Use file "8puzzle.testsample" provided.