

AC 7x3.

1. Consider the following puzzle:

There are 8 sticks lined up as in figure 1. By moving exactly 4 sticks, you are to achieve the configuration depicted in figure 2. Each move consists of picking up a stick and jumping over exactly two other sticks and then setting it down onto a fourth stick. For example, in figure 3, stick d could be moved onto stick a or g passing over sticks c & b or e & f, respectively. It could not be moved anywhere else. In fig 4 stick d cannot be moved at all.

Fig 1: 

Fig 2: 


 represents two sticks crossed]

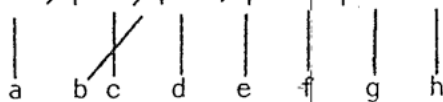
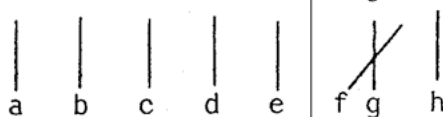
Fig 3: 

Fig 4: 

Fig 5: 

Use state space search to solve this problem:

- Decide on a notation for representing states. [2]
- Using this notation, show
 - the initial state
 - a goal state (is there more than one?) [2]
- Give the details of all the operators. For each:
 - describe its preconditions
 - give an example (i.e. apply the operator to a state and give the new state). [5]
- Describe how the search space can be generated. Illustrate your answer by drawing part of the search space. Include all moves at level one. Expand one of these moves to level two. Label each arc with the operator being used. You should not duplicate states which are essentially identical due to symmetry. For example, figures 3 and 5 represent essentially the same state. [6]
- Give one heuristic evaluation function which might be helpful in solving this problem. Illustrate your function by evaluating two example states. Explain why the heuristic is likely to be helpful and discuss its shortcomings. [6]
- Unless your heuristic is extremely effective, or you are quite lucky, solving this problem by hand, is painful. It turns out to be quite easy if you search backwards from the goal state. Why? Hint: Solve the problem, observe what happens. [4]