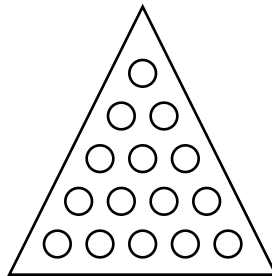


Homework #4

Cracker Barrel

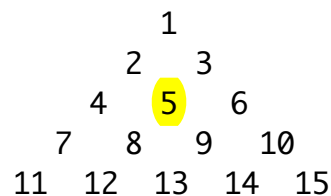
Problem Space Description

At Cracker Barrel restaurants they have a peg-based solitaire game on their tables to help pass the time while waiting for your food. It is a puzzle board with 15 holes arranged in a pyramid shape:



Each of the holes, except one, contains a peg. The goal of the game is to remove as many pegs as possible from the board until no more moves are possible. Each move consists of jumping one peg in a straight line over one other peg and into an empty hole. The peg that was jumped over is then removed.

To represent board states, we will assign a number to each hole, from 1-15:



A board state will be represented by a list of positions containing pegs, in sorted order. For example, an initial state might be:

(1 2 3 4 6 7 8 9 10 11 12 13 14 15)

And a solvable end state from this might be:

(13)

The assignment is divided into three parts. The “Basic Assignment” will exercise the skills that are the primary focus of this assignment - mapping a problem space into Scheme and implementing a fundamental search algorithm. The “Intermediate Assignment” will give you the chance to really hone your Scheme skills and produce something more polished. The “Advanced Assignment” is intended for someone who can’t get enough and wants to do some exploration of topics we might not be able to cover in depth in other assignments.

Basic Assignment

Given a starting state and goal state, use an uninformed search algorithm to determine whether the goal state is reachable. Print out the steps required in forward order.

Intermediate Assignment

In addition to the basic assignment, implement an alternate (non-rectangular) board geometry. You could use, for example, a star-shaped board, a plus-shaped board, or a circular board. Keep in mind that the size of the board will affect runtime.

Advanced Assignment

In addition to the intermediate assignment, implement a bidirectional search. Note that keeping track of two large frontiers in a breadth-first style search can result in a huge amount of memory use, so if necessary you can use a simpler puzzle geometry, 10 pegs organized in a triangle.

Grading

This assignment will be worth 200 points. The basic assignment will have a **maximum** grade of 180 points, an intermediate assignment a **maximum** grade of 200 points, and an advanced assignment more than the full points for the assignment (i.e., extra credit). These options are intended to give you a way to complete the assignment at a level that you find comfortable while still learning the core concepts. Turn in as much as you have completed, partial credit will be given, but make sure you complete the basic assignment before attempting the intermediate or advanced portions.

Submission

Email me a copy of your program.

Due Date

27 April 2015, at 4pm.