

# COMS3008: Parallel Computing Assignment

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## Introduction

The game of peg solitaire is a one player game that involves jumping pegs over other pegs, in a manner similiar to checkers but on a cross shaped board. The rules are as follows:

1. A move consists of jumping a peg over an orthoganal neighbour pegs into an empty space. The peg that was jumped over is then removed from the board.
2. Pegs can only jump onto an empty space.
3. The game is won if the final peg is in the centre space.
4. If no pegs can legally move or the final peg is not in the centre the game is lost.

Below is an example of a valid sequence of moves:

Traditionally a game starts with only the centre space empty but for the purpose of this analysis many other valid start states were considered.

## Algorithmic Analysis

### Serial Algorithm

Recursive backtracking using depth first search was chosen as the method for state space exploration. The standard depth first algorithm would be as follows:

### Parallel Algorithm

## Results

**input** : An initial, valid board state  
**output**: A sequence of moves to get from the initial state to the winning state

$moves \leftarrow$  A list of all the legal moves for the current board;  
 $state \leftarrow$  The current state;  
**foreach**  $move$  in  $moves$  **do**  
     $state \leftarrow$  The state achieved by performing move;  
    **if**  $state$  is winning state **then**  
        return move;  
    **else if**  $state$  has no legal moves **then**  
        return *Null*;  
    **else**  
        return BacktrackingDFS( $state$ );  
    **end**  
**end**

**Algorithm 1:** A standard recursive backtracking using DFS