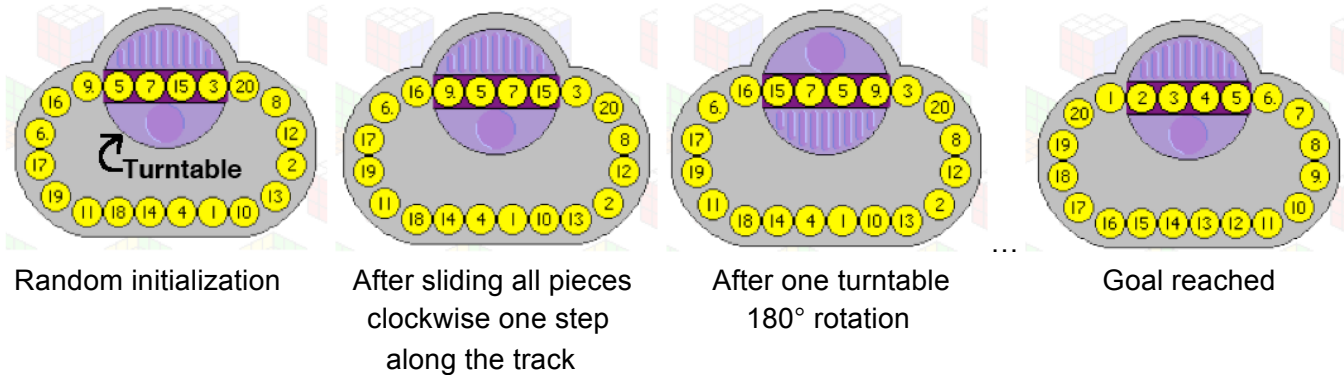


5. [20%] Heuristic design for the topspin game [20%]

The TopSpin puzzle game consists of 20 numbered round pieces in one long looped track. You can slide all the pieces along the loop, either clockwise or counter-clockwise. There is also a turntable in the loop which can rotate any four adjacent pieces by 180° so that they will end up in reverse order. This in effect swaps two adjacent pieces and the two pieces on either side of them. The aim is to place the pieces in numerical order. Here we explore how to use the A* search algorithm to solve the TopSpin puzzle.

Example (source: <http://www.jaapsch.net/puzzles/topspin.htm>):



A. [2%] Describe a possible state representation for this game.

B. [3%] Describe the operators to be used during search for a solution in this game.

C. [4%] What is the size of the state space, as a simple numerical formula?

D. [1%] What kind of goal test will our search algorithm use?

E. [10%] Provide two admissible heuristics (other than $h(n)=0$ for all n) that can be used to guide A* search in the TopSpin game. Briefly explain why each heuristic is admissible [each heuristic formulation: 2%; each explanation: 3%].