

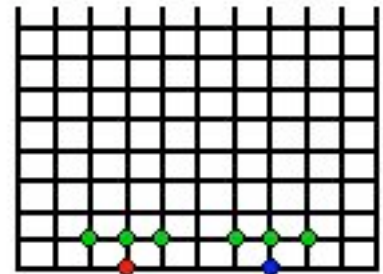
## Car Race Simulation Game

The following simulation game I first saw in Scientific American about 20 years ago. It intrigued me because there are really only two rules, but yet it simulates how a car behaves really well. In fact, when I am driving around a curve, I always think of this game where it has taught me the best way to approach a curve.

The game is played using graph paper and a race track is laid out on the grid in anyway that you want. In fact, if you want a really long game, then join up two or three sheets of graph paper and make a larger race track. See the next page for a sample that you can print out. I like to start out with a long stretch just to watch the collisions!

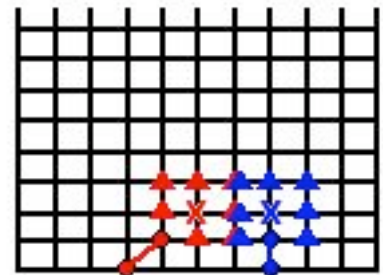
Here are the two rules: (1) Repeat your last move and choose either that grid intersection or any of the legal 8 grid intersections that surround you, and (2) If an opponent is already there, you must choose another grid intersection. So the cars go from grid intersection to grid intersection.

Here is an example of a start: On the picture on the right, the red car can move to any of the green circles in front of it, and the blue car can move to any of the green circle in front of it.



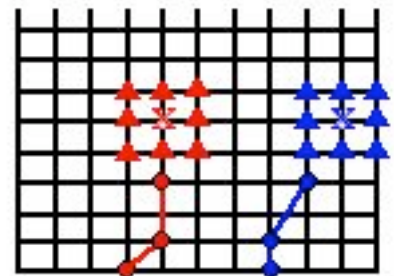
In the diagram to the right now, we have the second move:

The red car has moved one to the right and one up, which could be recorded as  $(+1, +1)$  if you so desire. The blue car has moved just one directly up, which could be recorded as  $(0, +1)$ . Repeating that move takes each car to the grid intersection labeled with a red "X" or a blue "X". The second move for the red car could then be to the red X, or any of the 8 red triangles around it. The second move for the blue car could then be to the blue X, or any of the 8 blue triangles around it. This is equivalent to saying you can only change your coordinates of your last move by a factor of 1. So red could go to  $(+1, +1)$  or  $(0, +1)$  or  $(+2, +1)$  or  $(+1, 0)$  or  $(+1, +2)$  or  $(+2, 0)$  or  $(+2, +2)$  or  $(0, +2)$  or  $(0, 0)$ . This is how Scientific American originally worded rule 1.

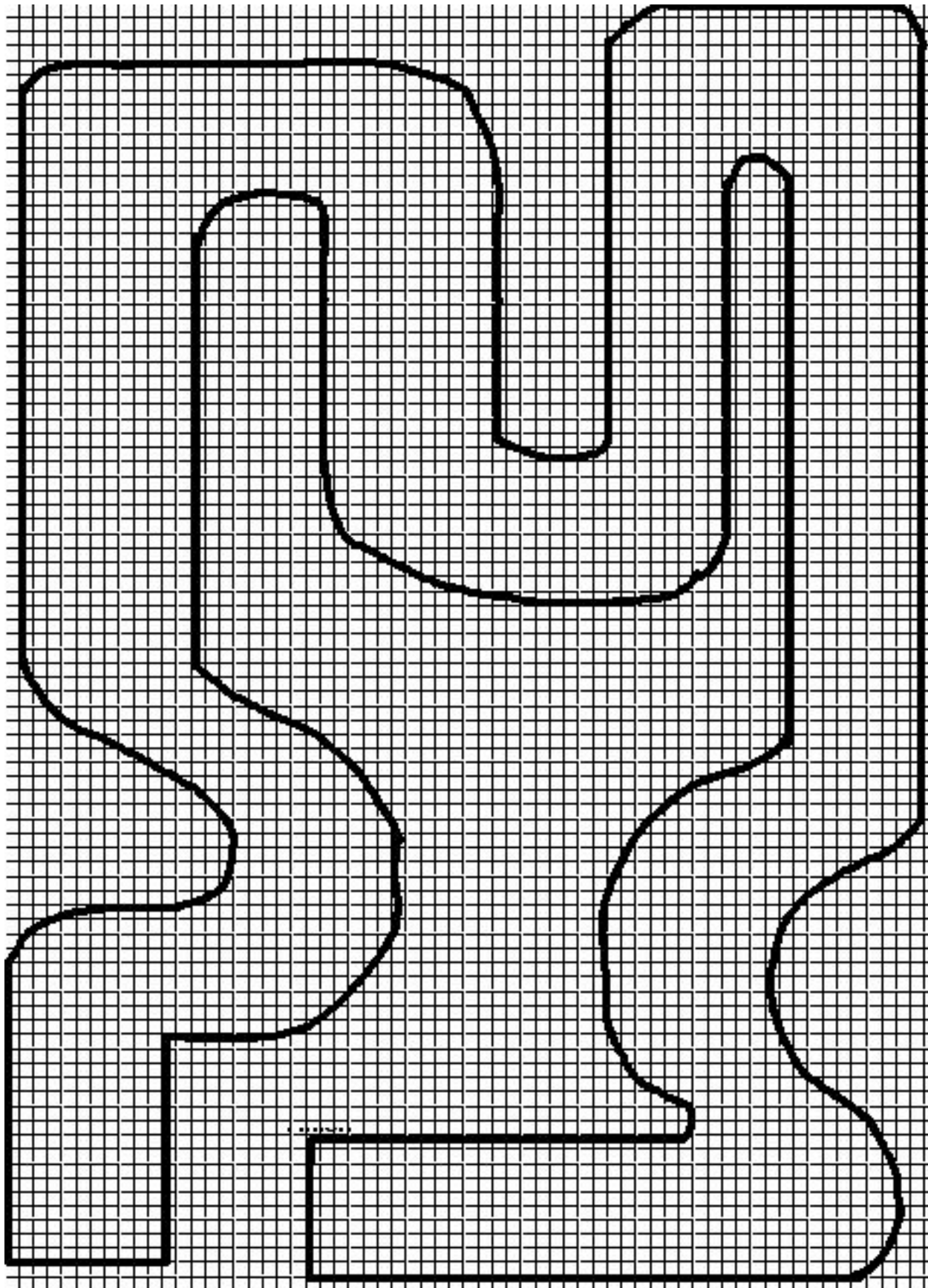


In the diagram to the right now, we have the third move:

Red has gone sideways none and up two, so repeating this move you get to the red "X". Now your third move could be to there, or to any of the 8 red triangles around it. Blue has gone to the right one and up two, so repeating this move you get to the blue "X". Now your third move could be to there, or to any of the 8 blue triangles around it.



If all of your grid intersections that you can legally choose (the "X" or the 8 triangles) fall on or outside of the race track boundary, you have crashed. Move along the path to the closest grid intersection near the boundary and stop there and miss a turn. You are not "out of it", for when it is your turn next you carry on from a "last move" of  $(0, 0)$ . So you could now go to  $(0, 0)$  or  $(0, -1)$  or  $(0, +1)$  or  $(+1, 0)$  or  $(+1, +1)$  or  $(+1, -1)$  or  $(-1, 0)$  or  $(-1, -1)$  or  $(0, +1)$ . Sometimes this gets you going in the opposite direction really fast. Remember, you can't jump a coordinate from going  $+2$  to  $-2$  right away (cars don't move that way). You have to go from  $+2$  to  $+1$ , to  $0$ , to  $-1$  to  $-2$ . This simulates a car slowing down in the "up or +" direction to zero in the "up" direction, to gradually gaining speed in the "down or -" direction. See the how the final finish works, look after the diagram of the car racing track on the next page.



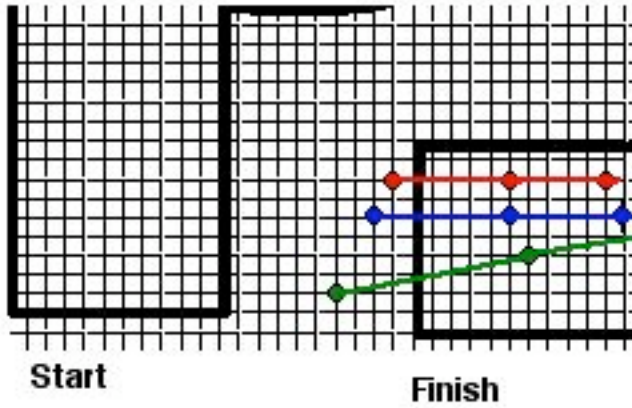
Start

Finish

# Car Race Simulation

The winner is the car that finishes further through the finish line after each player has had the same number of turns. You could play with 1, or 2 or 3 or more players. I used to play this solo, and count how many turns it took me to complete the race. I would then try to do the race in as few turns as possible. If you join the finish line to the start line, then you could have a race with two or more “laps”.

Below you will see the end of a race between three cars:



## Car Race Simulation

The green car has gone further through the finish line, so it wins.

Have fun!