

# Game AI: Project 6 Write-up

By: Josue Uriarte, Modesto Amador, Ben Tingley

## **What you changed from the template and why, especially related to your selection strategies, fitness functions, crossover and mutation operators, etc.**

The first thing we added into ga.py was a selection strategy. After looking up the various different strategies we thought that tournament would be the easiest because all you do is randomly pick a bunch of parents and then choose the two winners with the best fitness. After implementing tournament selection we then went with roulette selection as the second selection strategy. It was pretty hard to implement and we had to work with multiple lists and dictionaries but we got it working in the end. For our crossover function, we implemented crossing at random points (and so a random number of them) as we copied through each complete column. A column taken from a parent is preserved, to maintain the ability to traverse through the level, and the function switches parents to take from at random, one in every hundred times. So on average it will look like both of the parents combined into 3 groups of columns in between the random crossover points. For our mutation function we have it implemented to randomly mutate blocks on our level based on their y-axis and based on what type of block it is. On our ground floor we didn't want giant empty space that is unplayable so we told mutate to not change blocks on the ground floor to empty space as frequently (10%). We continued the same logic to other y-axis parts of a level to get rid of any undesirable blocks.

## **Something about each of your two favorite levels: Why do you like them? How many generations did it take and how many seconds to generate these levels?**

Our first favorite level was a level that took about 36 generations to complete with a net time of 279.5 seconds. It started off really challenging by placing mario on a single block with a small gap right in front of him. It was a flat-ish level with coins to collect. Some coins were only obtainable by doing a running jump. Near the end there was a challenging jump that had a question mark blocking the gap you had to clear. It felt really satisfying when all you had to do was run and jump right before the block to clear the gap. The end looked almost like the end of every mario level with a huge staircase leading up to the goal.

Our second favorite level was one that took 10 generations to complete with a net time of 55.49 seconds. It was our favorite because it had a really challenging and precise jump you had to make. Near the middle of the level there is a big gap with only 1 block in the middle. There was also an enemy near the jump which made it a bit harder as well. Besides that the level was a bit barren with huge stairs to parkour upwards and some coins to collect. It made sense though since it was only created in 10 generations.

**P.s.** We do not plan to enter the competition