

## B 551 Elements of Artificial Intelligence

### HW 6 – Anudhriti Reddy Katanguri

Running a few trails of the run function with my genetic algorithm, I found that for easy world upper bound is 15 and lower bound is 13 and the optimal solution is 15. I am getting the solution is 1 or 2 years. There seems to be no effect on the convergence rate and solution quality. I chose large population with smaller number of generations as we are initially randomizing the chromosome. This was done so that we can have high chances of getting the best chromosome in the initial population itself.

Considering the harder worlds, it's better to choose large population with larger number of generations unlike the easier world where we chose smaller number of generations. By doing so we have a better chance of finding the chromosome as we would be doing mutation over the years. This is also eliminating the dependence of initial population. But this method has a problem. It generates either a good chromosome or a bad chromosome. This was the result of using the roulette wheel method for random selection for parents of a new generation chromosome. The solution quality is not as such for the genetic algorithm. Implementing the elitism assured that the next generation always had a good set of chromosomes which was based on the fitness values. Choosing higher mutation probability led to the better high scores.

For medium world, I found the optimal solutions between 124-163. The optimal solution was found to be 163.

For hard world I found the optimal solutions in the range of 11000 – 17000. The higher the population size, better the solutions were.

Popsize	Max_year	Mutation_probability
10	1	0
Best year for difficulty sanity_check is 0 with high score 100.0 and chromosome [ 1 0 0]		
Best year for difficulty easy is 0 with high score 10.0 and chromosome [ 1 0 0 0 0]		
Best year for difficulty medium is 0 with high score 124.0 and chromosome [ 0 1 1 1 1 1 0 1 1 0 1 1 0 1 0 0 1 0 0 1 1]		
Best year for difficulty hard is 0 with high score 11064.0938784 and chromosome [ 1 1 1 1 1 0 1 0 0 1 1 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 0 0 1 1 0 0 1 1 1 0 1 0 1 1 1 0 0 0 1 0 1 0 1 1 0 1 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0]		

Popsize	Max_year	Mutation_probability
10	10	0.2
Best year for difficulty sanity_check is 0 with high score 100.0 and chromosome [ 1 0 0]		
Best year for difficulty easy is 0 with high score 15.0 and chromosome [ 0 1 1 0 0]		
Best year for difficulty medium is 0 with high score 134.0 and chromosome [ 1 1 0 1 0 0 0 1 0 0 0 1 1 0 0 0 1 0 0 1 1]		
Best year for difficulty hard is 0 with high score 10518.8841329 and chromosome [ 1 0 0 0 1 1 0 1 1 1 1 1 1 0 1 0 0 0 1 1 0 1 0 0 0 1 1 1 1 0 1 0 1 0 1 1 0 0 1 1 0 0 0 1 1 1 0 0 1 1 0 0 1 1 1 1 0 0 0 1 0 1 1]		

Popsi	Max_year	Mutation_probability
20	20	0.3
Best year for difficulty sanity_check is 0 with high score 100.0 and chromosome [ 1 0 0]		
Best year for difficulty easy is 4 with high score 15.0 and chromosome [ 0 1 1 0 0]		
Best year for difficulty medium is 2 with high score 139.0 and chromosome [ 0 0 0 1 0 1 0 0 0 1 1 0 0 0 1 1 0 1 0 1 1]		
Best year for difficulty hard is 0 with high score 13270.2019974 and chromosome [ 1 0 1 1 0 1 1 1 0 1 1 1 0 1 1 1 0 0 0 1 0 0 0 1 1 1 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 0 0 1 0 0 1 0 1 0 0 1 1 1 1 0 0 1 1 1 1 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 0 1 1 0 1 1 1 0 1]		

Popsi	Max_year	Mutation_probability
50	30	0.8
Best year for difficulty sanity_check is 0 with high score 100.0 and chromosome [ 1 0 0]		
Best year for difficulty easy is 1 with high score 15.0 and chromosome [ 0 1 1 0 0]		
Best year for difficulty medium is 2 with high score 148.0 and chromosome [ 1 0 0 1 1 0 0 1 0 0 0 0 0 0 1 0 0 1 0 1 1]		
Best year for difficulty hard is 16 with high score 11853.3392327 and chromosome [ 1 1 0 1 1 1 1 1 1 1 1 1 1 1 0 1 0 0 0 0 1 1 1 0 1 0 1 1 0 1 1 0 1 0 0 0 1 1 0 0 0 1 1 0 0 0 0 1 1 0 1 0 0 1 1 0 1 0 1 1 0 1 0 1 1 1 0 0 1 1 1 0 0 0 1 1 1 0 0 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 1 0 1 1 1 0 0]		

Popsi	Max_year	Mutation_probability
100	50	1
Best year for difficulty sanity_check is 0 with high score 100.0 and chromosome [ 1 0 0]		
Best year for difficulty easy is 0 with high score 15.0 and chromosome [ 0 1 1 0 0]		
Best year for difficulty medium is 3 with high score 153.0 and chromosome [ 1 0 0 1 1 0 0 1 0 0 1 0 1 0 0 0 0 1 0 1 1]		
Best year for difficulty hard is 0 with high score 13206.3654944 and chromosome [ 1 0 0 1 0 1 1 1 1 0 1 1 1 1 0 0 0 0 1 1 0 1 0 0 0 1 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 0 0 1 1 1 1 1]		