

Project Proposal



GENETIC ALGORITHM

Group Members

K180286

M.Fahad Tahir (Sec A)

INTRODUCTION

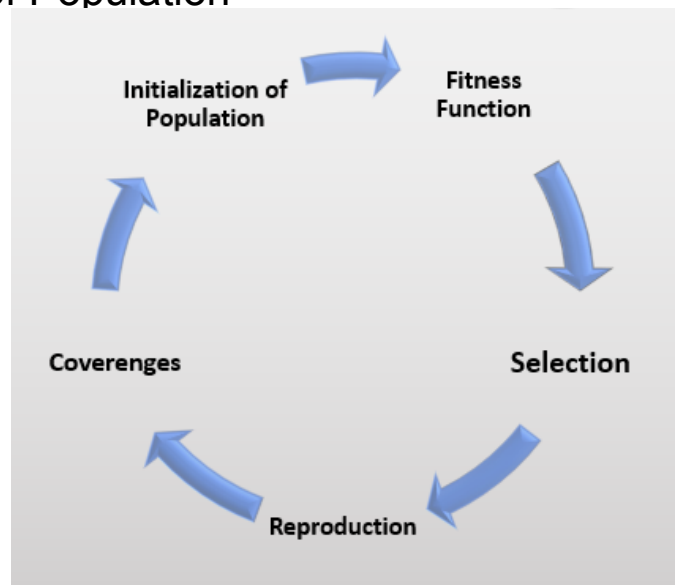
A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation.

EXPLANATION

The process of natural selection starts with the selection of fittest individuals from a population. They produce offspring which inherit the characteristics of the parents and will be added to the next generation. If parents have better fitness, their offspring will be better than parents and have a better chance at surviving. This process keeps on iterating and at the end, a generation with the fittest individuals will be found.

There are 5 phases of the algorithm that perform each step in a serial way on different data each time

Initialization of Population



We take a large number of set of many samples, good and bad, we store it somewhere and start taking the best samples out 1 by 1 and keep repeating till we find desired or we have explored all of the sample items.

Fitness Function

The fitness function determines how fit an individual is (the ability of an individual to compete with other individuals). It gives a fitness score to each individual. The probability that an individual will be selected for reproduction is based on its fitness score.

Selection

The idea of the Selection phase is to select the fittest individuals and let them pass their genes to the next generation. Two pairs of individuals (parents) are selected based on their fitness scores. Individuals with high fitness have more chances to be selected for reproduction.

Reproduction/Crossover

Crossover is the most significant phase in a genetic algorithm. For each pair of parents to be mated, a crossover point is chosen at random from within the genes.

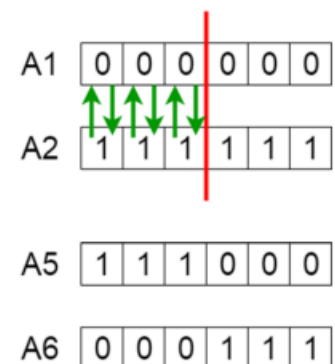
For example, consider the crossover point to be 3 as shown below. Offspring are created by exchanging the genes of parents among themselves until the crossover point is reached. The new offspring are added to the population.

Convergence/Mutation

In certain new offspring formed, some of their genes can be subjected to a mutation with a low random probability. This implies that some of the bits in the bit string can be flipped. Mutation occurs to maintain diversity within the population and prevent premature convergence.

IMPROVEMENTS THROUGH PARALLELISM

What we are trying to accomplish here is that we know each time two parents are used and two children are produced, this method only explore one and keep other one for later if needed i.e also known as “Hill Climbing Approach” and after exploring depth of the chosen one we come to realise that the one we left behind earlier came out to be better one, so here we will use two threads to continue with 3 steps using the “Simulated Annealing” to check weather which one child have better potential to survive later on by checking 3 stages up and down and than decide with whom do we want to continue and than pick different samples from our sample set



CONCLUSION

The algorithm terminates if the population has converged (does not produce offspring which are significantly different from the previous generation). Then it is said that the genetic algorithm has provided a set of solutions to our problem.