What is Mutation?

Mutation:

Mutation (Genetic modification) is the periodic introduction of new features into the solution strings of the population pool to maintain variety in the population. Even though crossover has the main responsibility to search for the great solution, mutation is also used for this purpose. The probability of conversion is often kept low for a good combination. A high degree of probability of conversion can be searched here and there as a random search process. Genetic modification involves changing one chromosome from 0 to 1 or vice versa. This is done under a barrier, the so-called mutation probability (ProM) parameter. For example if ProM is 0.10 (10%) of the complete gene of chromosomes will be included by genetic modification. The concept of genetic modification is based on the natural notion that diversity of species is possible only through genetic variation. After this activation quality of the new chromosomes may be higher or lower than the old ones. In the event of new chromosomes being poor and then old ones are removed during the selection process. The motive for the change is to recover the lost species and to recover the species. For example, randomly mutate chromosome at position 4.

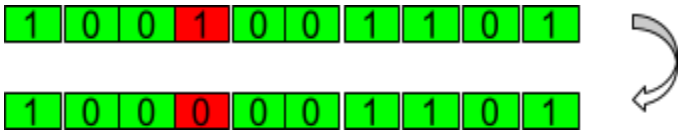


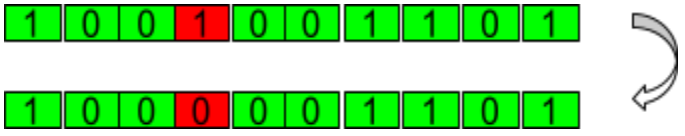
Fig. Mutation Process

Types of Mutation:

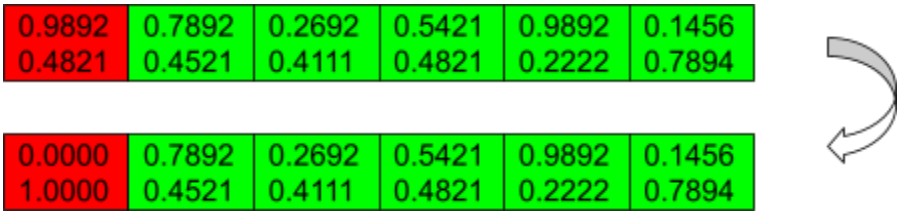
1. Bit flip
2. Boundary
3. Non-Uniform
4. Uniform

Bit flip:

Select one or more random bits and flip them. This is used for binary encoded genetic algorithms.



Boundary:
A mutation operator that replaces the value of the chosen gene with either the upper or lower bound for that gene (chosen randomly). This mutation operator can only be used for Integer and double genes.



Non-Uniform:
A mutation operator that increases the probability that the amount of the mutation will be close to 0 as the generation number increases. This mutation operator keeps the population from stagnating in the early stages of the evolution, then allows the genetic algorithm to fine tune the solution in the later stages of evolution.

Uniform:
This operator replaces the value of the chosen gene with a uniform random value selected between the user-specified upper and lower bounds for that gene. This mutation operator can only be used for integer and float genes. Choose a certain percentage of genes, say 1%, at random and set them to random values, and do this at the same rate throughout the program.

The main aim of the mutation process in GAs is to introduce variety into the sampled solutions. Mutation parameters are used in an attempt to avoid similar sampled solutions.