

## GENETIC OPERATORS

Genetic Operators are used to apply to existing population of solutions to create a new set of population. There are many types of operators as follow.

### Crossover

Crossover is used to accelerate the search process. It is applied to pairs of individuals selected for mating. There are many crossover algorithms to be chose. First, two individuals are selected from the population to be the parents. Then, the crossover algorithm is applied. For example:

For one-point crossover, the selected pair are cut at random position to create two “heads” and two “tails.”. The tails are then swap to create a new solution.

For two-point crossover, chromosomes are regarded as loops by joining ends together, then two positions are selected to be cut. The strings from the beginning of chromosome to the first crossover point and the strings from the second crossover point to the end are copied from the first parent. The rest is copied from the second parent.

For n-point crossover, n positions are cut and glue together alternating between parents.

For Uniform crossover, a crossover mask is generated randomly. When there is a 1 in the crossover mask, a chromosome is copied from the first parent. If there is a 0 in the mask, the string is copied from the second one. The crossover mask is regenerated for each pair of parents.

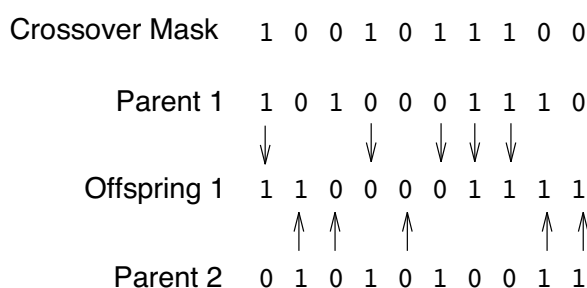


Figure 2: Uniform Crossover

<http://www.obitko.com/tutorials/genetic-algorithms/crossover-mutation.php>

An Overview of Genetic Algorithm Part 1 and Part 2

### Mutation

Mutation is applied to individual child to create random modifications.

### Inversion

Inversion works by selecting two random positions and then reverse the order of the chromosome. The purpose is to find orderings which have better evolutionary potential.

### Selection

Selection is the process that decides which solution will live on to be the next populations and which ones does not. It allow good individuals to pass on their genes to the next generation without modification. The goodness of the individual is judge by the fitness function. There are many selection algorithms, such as, Roulette wheel selection, Rank selection, etc.

<http://www.obitko.com/tutorials/genetic-algorithms/selection.php>

<http://kal-el.ugr.es/GAGS/gags-tutorial/node3.html>

## **Effects of Genetic Operators**

- Using selection alone will tend to fill the population with copies of the best individual from the population
- Using selection and crossover operators will tend to cause the algorithms to converge on a good but sub-optimal solution
- Using mutation alone induces a random walk through the search space.
- Using selection and mutation creates a parrallel, noise-tolerant, hill climbing algorithm

[http://www.doc.ic.ac.uk/~nd/surprise\\_96/journal/vol1/hmw/article1.html](http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol1/hmw/article1.html)