

1. Dynamical system model

- The probability distribution of the next population
- The expected next population
- The long-term behaviour of the population

2. The Space of Possible Population

p : a fraction of the total population

$$p_k = \frac{a_k}{r}, \quad a_k: \text{number of each solutions, } r: \text{the population size}$$

ex) $p = (0.2, 0.1, 0.5, 0.2)$

Simplex (See Fig. 1) : infinite population model

3. Proportionate Selection

the probability of selecting z_k

$$\frac{f(z_k)p_k}{\bar{f}(p)}$$

Selection matrix: S (a diagonal matrix)

$$S_{k,k} = f(z_k)$$

Deterministical way!

genetic drift!

4. Mutation

The probability of ending up with z_i after selection and mutation

$$\sum_{j=0}^{s-1} U_{i,j} a_j$$

$U_{i,j}$: the probability that z_j mutate to form z_i where $i \neq j$, when $i = j$ it is the probability that z_i survives mutation

U : mutation matrix

Eigen vector, Eigen value!

GA converges to leading Eigen value!