Part 1: Populations and Probabilities

Given an initial genome population:

$$G=\{n_g \geq x \geq 1 | g_1, g_2, g_3, \ldots, g_x, \ldots, g_{n_g-1}, g_{n_g}\}$$

Where g_x is the x^{th} genome in the population G, and n_g is the number of genomes present in the population.

We define:

$$M=\{n_m \geq x \geq 1 | m_1, m_2, \ldots, m_x, \ldots, m_{n_m-1}, m_{n_m}\}$$

Where m_x is the x^{th} genome in the population of mutated offspring M of parents G, and n_m is the number of offspring produced by G and included in M.

We further define n_e as the number of individuals expected to survive from M and produce further offspring, and $P_s(m_x)$ as the chance of survival of individual m_x undergoing the selective pressure that will reduce the population M from n_m to n_e .

The sum total of all the probabilities for M will thus equal n_e , or:

$$\sum P_s(M)=n_e$$

And the average chance of survival, (or the chance of survival for an individual with an average genome,) will thus be:

$$P_s(m_{avg})=\frac{\sum P_s(M)}{n_m}=\frac{n_e}{n_m}$$

$$\boxed{P_s(m_{avg})=\frac{n_e}{n_m}}$$