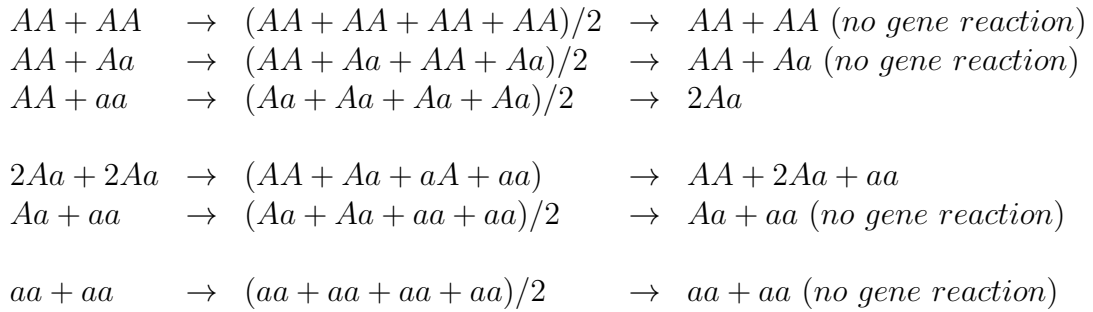


Alleles dynamics

I write the differential equation for the allele in a diploid population, so that I write the alleles dynamic far from Hardy-Weinberg equilibrium

I assume that the differential equation for the allele is like a chemical equations, where the alleles are the chemical substance and the reaction is a male-female mating.

I write the population gene diffusion of two alleles probability, when two parents have two offspring (I use a fixed number of offspring for mating, to simplify the problem):



the discrete equation for the gene variations are:

$$\begin{aligned}
 AA(t+1) &= AA(t) - AA(t) aa(t) + Aa(t)^2/2 \\
 Aa(t+1) &= Aa(t) + 2 AA(t) aa(t) - Aa(t)^2 \\
 aa(t+1) &= aa(t) - AA(t) aa(t) + Aa(t)^2/2
 \end{aligned}$$

there is the invariance of the sum of the alleles $AA(t+1) + Aa(t+1) + aa(t+1) = AA(t) + Aa(t) + aa(t) = 1$, so this is a probability dynamics.

The differential equation for continuous process is:

$$\begin{aligned}
 \frac{d AA}{dt} &= -AA aa + Aa^2/2 \\
 \frac{d Aa}{dt} &= 2 AA aa - Aa^2/2 \\
 \frac{d aa}{dt} &= -AA aa + Aa^2/2
 \end{aligned}$$

I think that can be used to study the alleles dynamics for new genetic diseases far from the equilibrium.