Assignement 1

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Let us consider frequency of A to be x.

$$\dot{x} = -u1 \times x + u2 \times (1 - x) \tag{1}$$

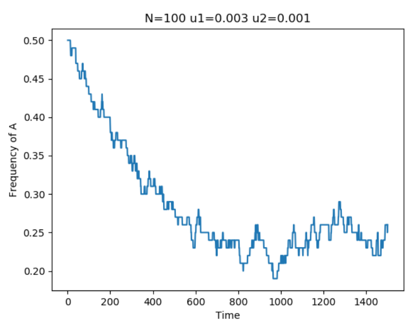
At stability $\dot{x}$ should be 0. Thus, the stable frequency of variant A is,

$$x_A^* = \frac{u2}{u1 + u2} \tag{2}$$

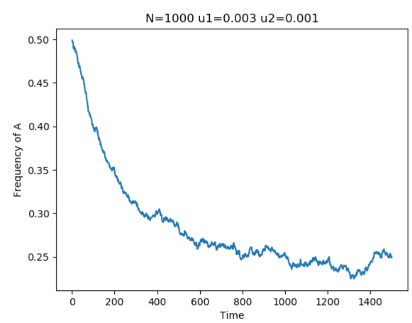
And the stable frequency of variant B is,

$$x_B^* = \frac{u1}{u1 + u2} \tag{3}$$

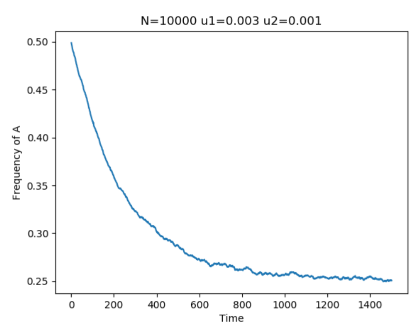
Answer1] The theoretical value for the given mutation rate is 0.25. Thus the numerical values obtained are close to the theoretical result.



(a) Population size 100; x_A=0.23 at T=1500



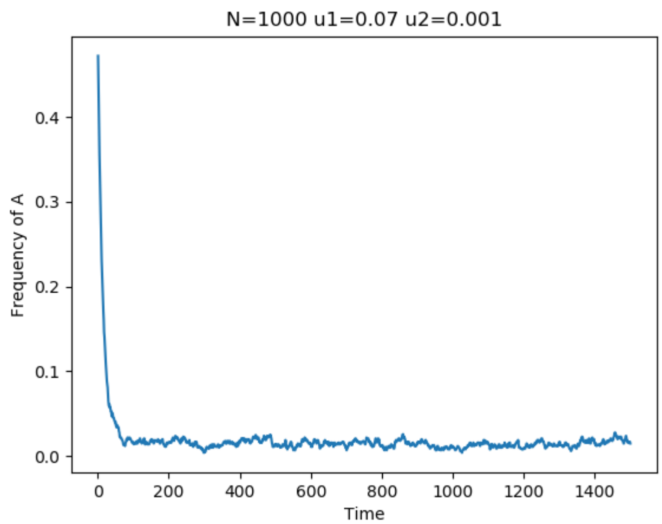
(b) Population size 1000; x_A=0.242 at T=1500



(c) Population size 10000; x_A=0.2473 at T=1500

Figure 1: The mutation rates in the graphs are u1 = 0.003 and u2 = 0.001

Answer2] As u2<<u1, thus, B dominates over A. The equilibrium frequency of A is 0.014, which is close to the numerical value.



(a) Population size 1000, u1=0.07, u2=0.001. Final frequency of A is 0.019.

The noise is present because the mutation is a random process and is modelled with random numbers.