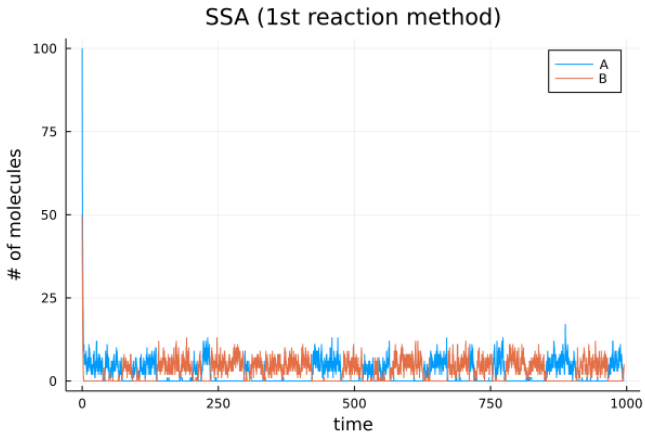
生物系統模擬

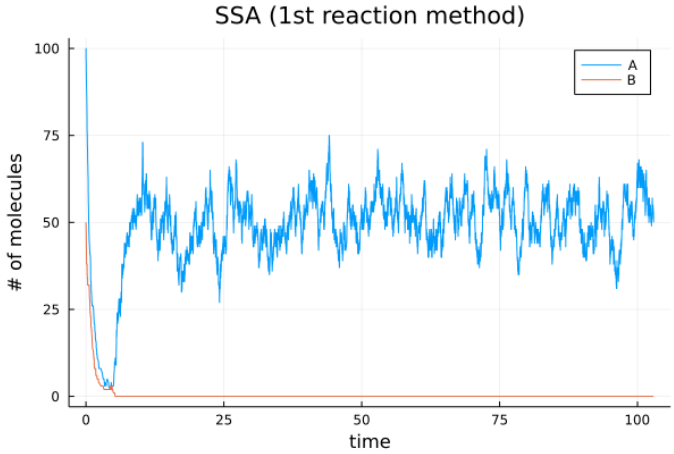
HW5　　R10945061 林宇恆

1.

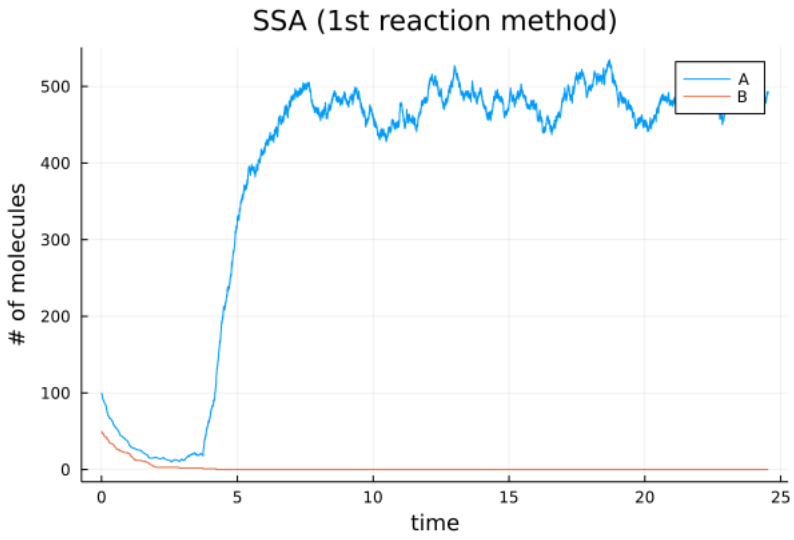
a. condition : first reaction (p1, p2) = (100, 50) α = 5



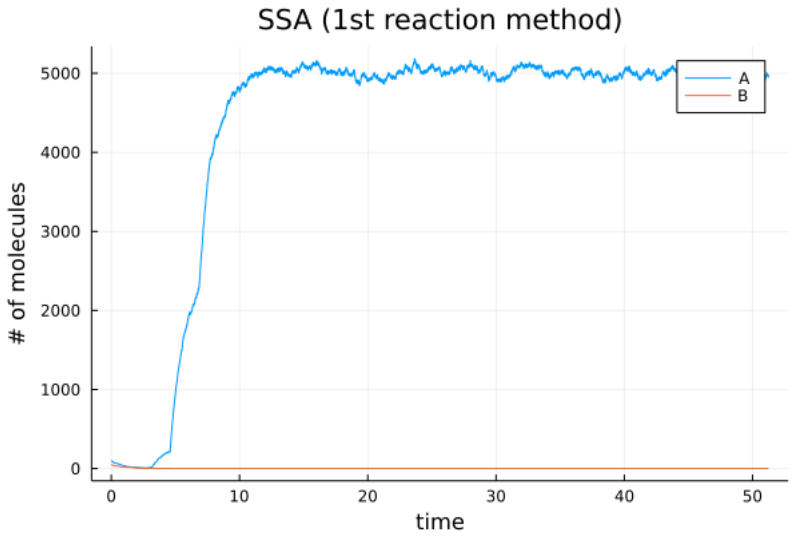
b. condition : first reaction (p1, p2) = (100, 50) α = 50



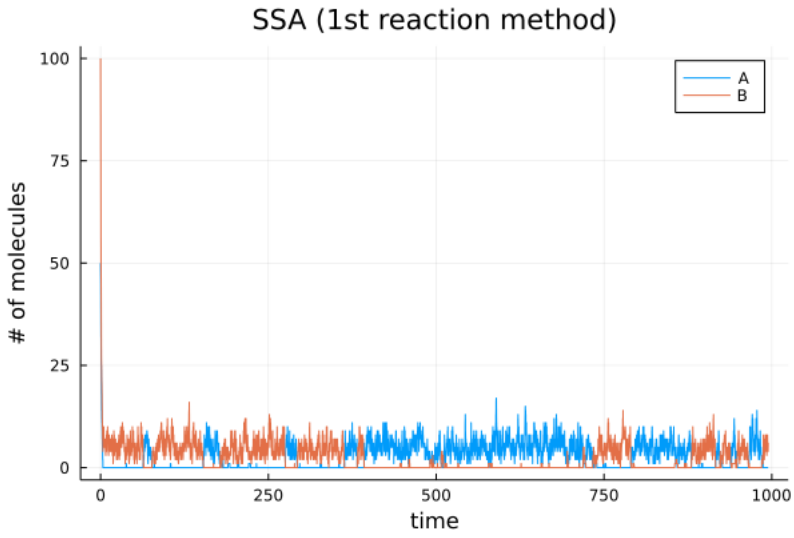
c. condition : first reaction (p1, p2) = (100, 50) α = 500



d. condition : first reaction (p1, p2) = (100, 50) α = 5000

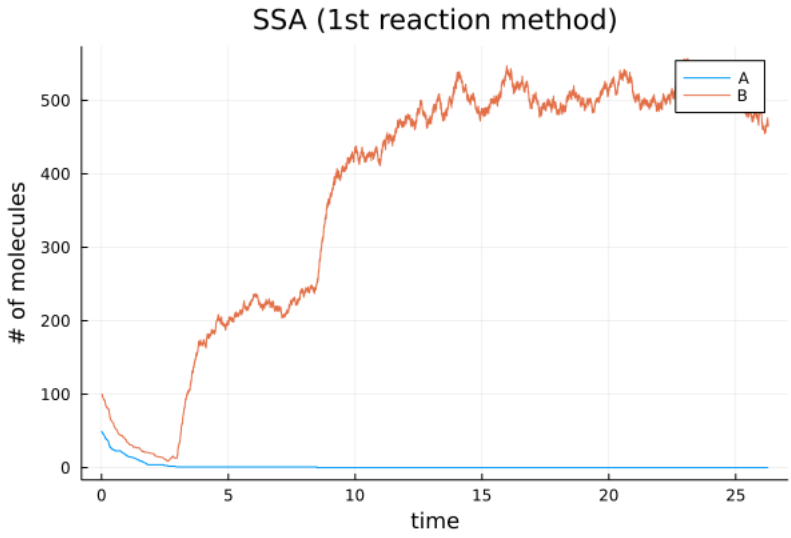


e. condition : first reaction (p1, p2) = (50, 100) α = 5

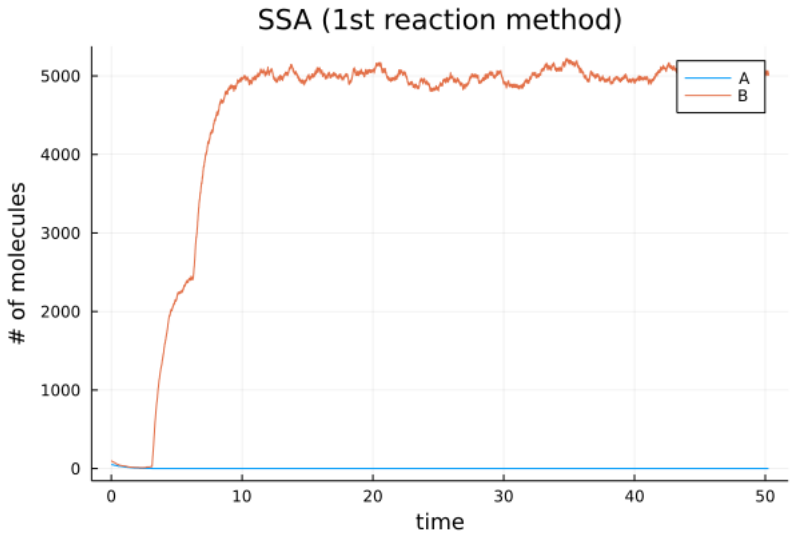


f. condition : first reaction (p1, p2) = (50, 100) α = 50

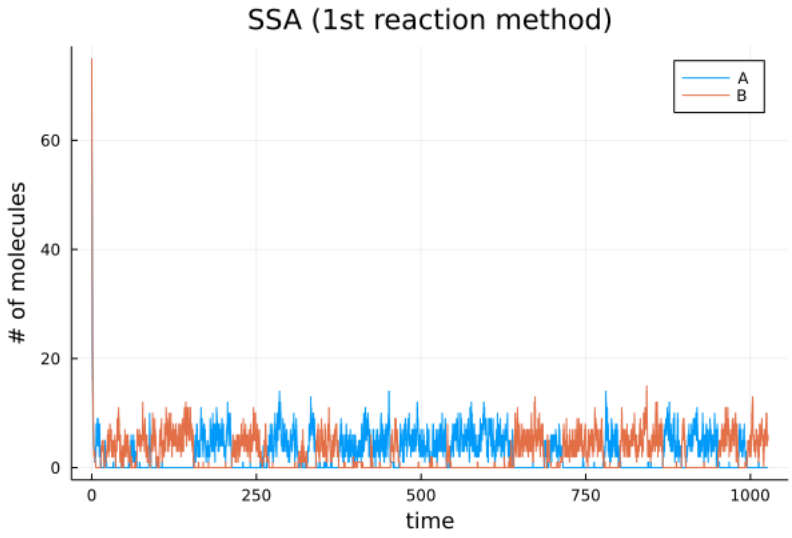
g. condition : first reaction (p1, p2) = (50, 100) α = 500



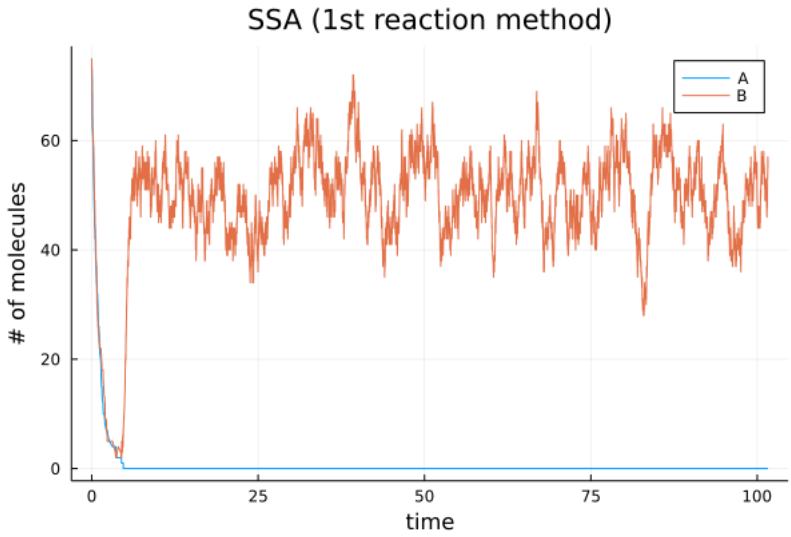
h. condition : first reaction (p1, p2) = (50, 100) α = 5000



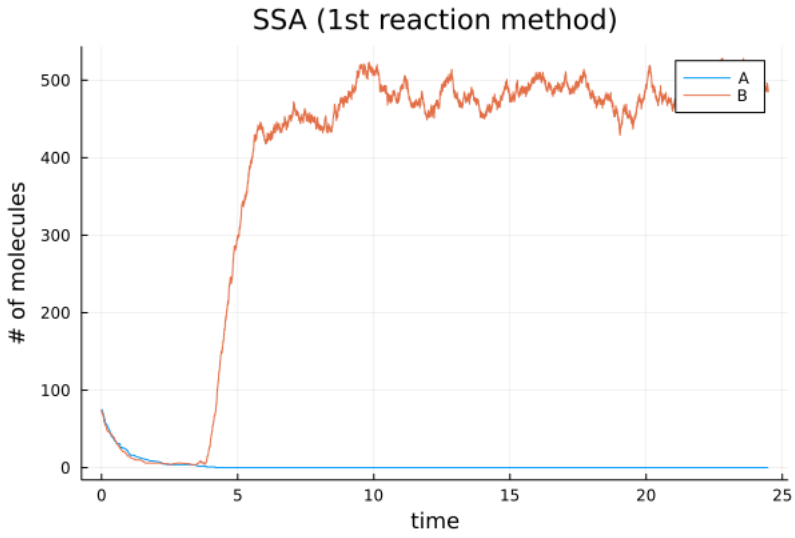
i.condition : first reaction (p1, p2) = (75, 75) α = 5



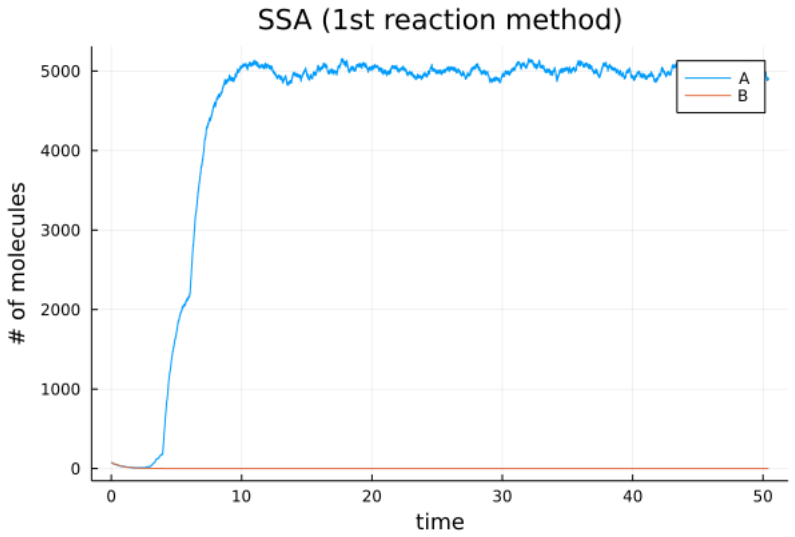
j. condition : first reaction (p1, p2) = (75, 75) α = 50



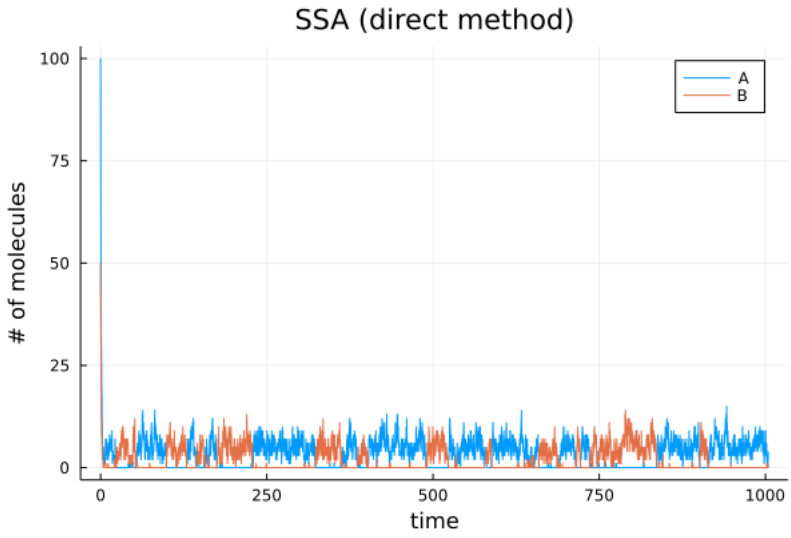
k. condition : first reaction (p1, p2) = (75, 75) α = 500



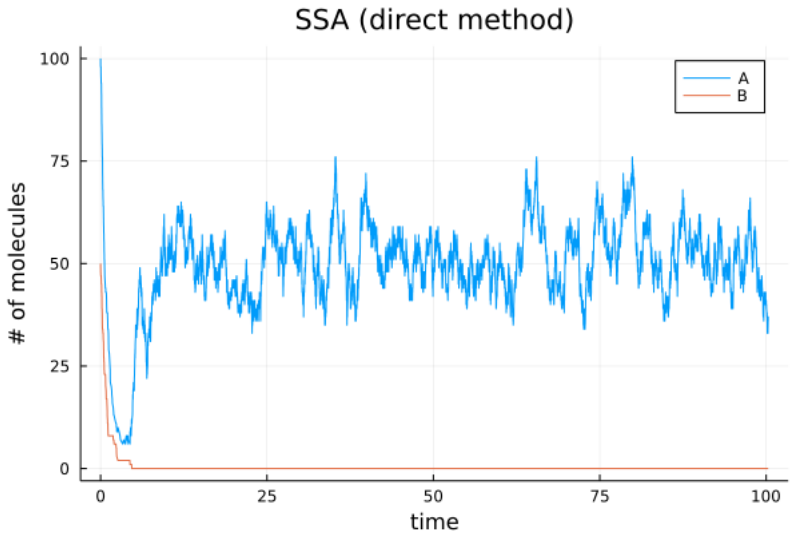
l. condition : first reaction (p1, p2) = (75, 75) α = 5000



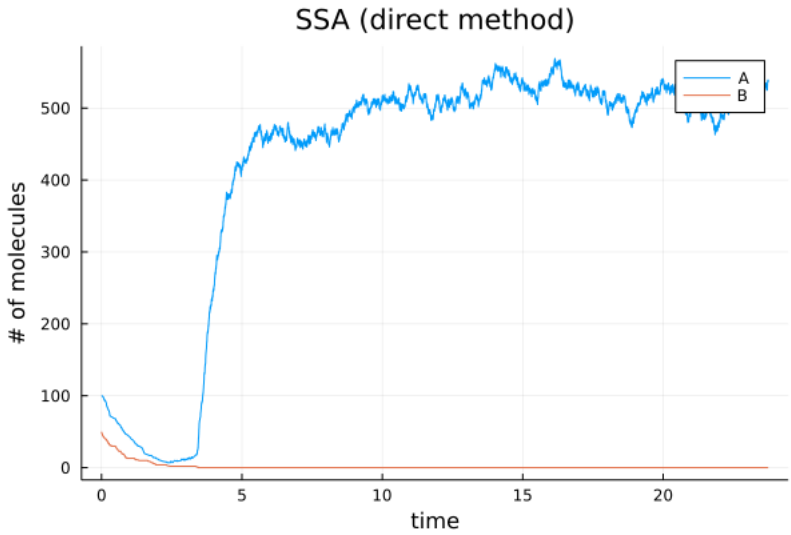
m. condition : direct reaction (p1, p2) = (100, 50) α = 5



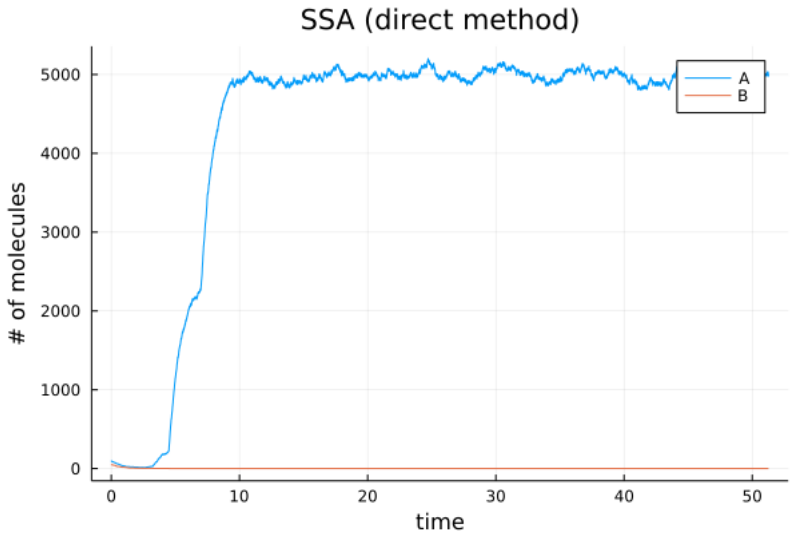
n. condition : direct reaction (p1, p2) = (100, 50) α = 50



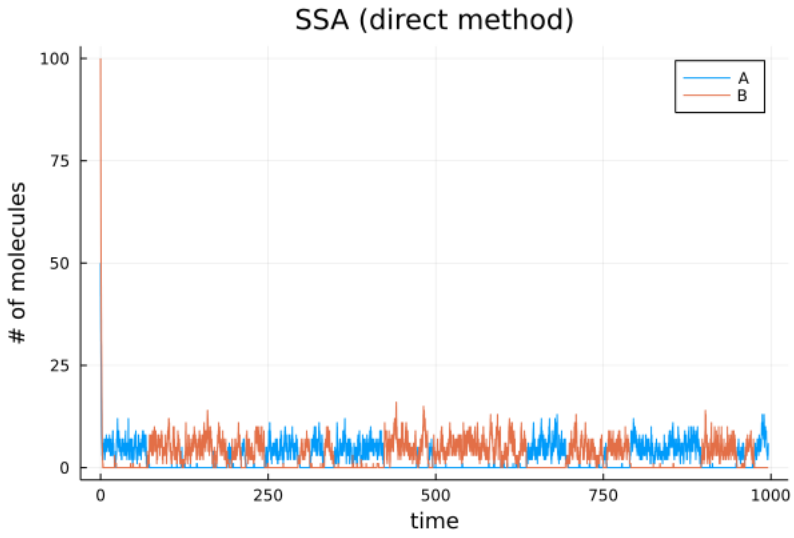
o. condition : direct reaction (p1, p2) = (100, 50) α = 500



p.condition : direct reaction (p1, p2) = (100, 50) α = 5000

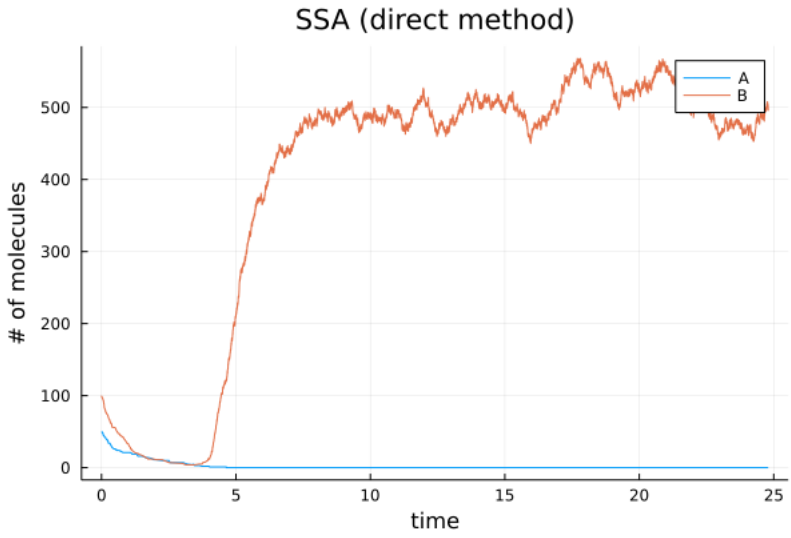


q. condition : direct reaction (p1, p2) = (50, 100) α = 5

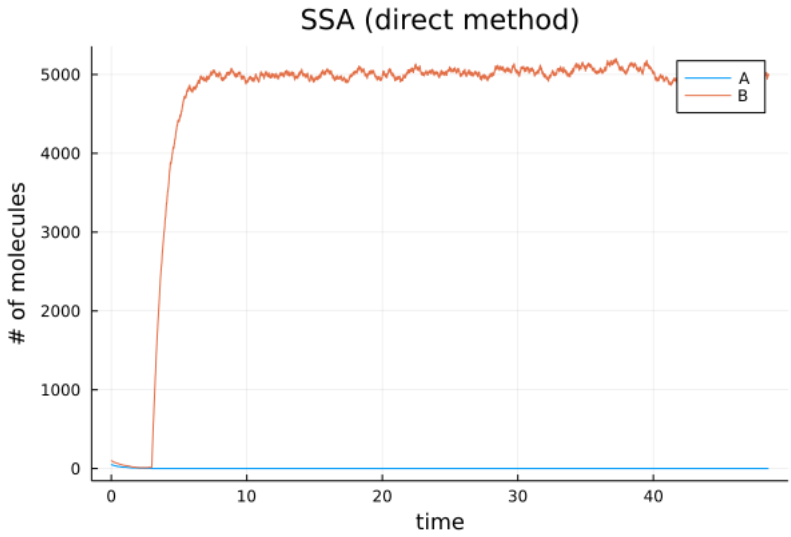


r. condition : direct reaction (p1, p2) = (50, 100) α = 50

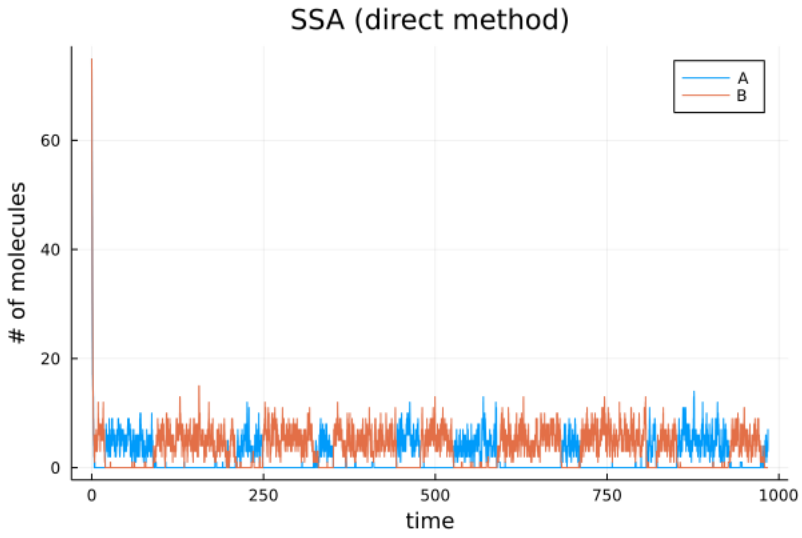
s. condition : direct reaction (p1, p2) = (50, 100) α = 500



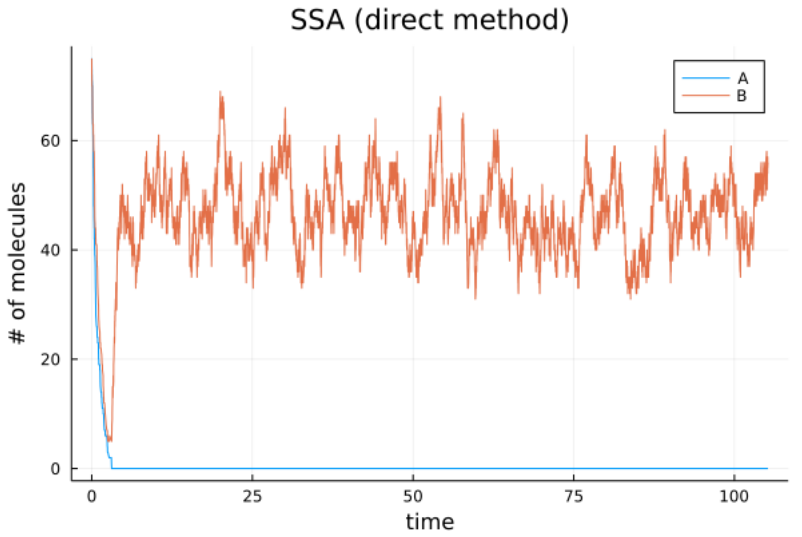
t. condition : direct reaction (p1, p2) = (50, 100)α = 5000



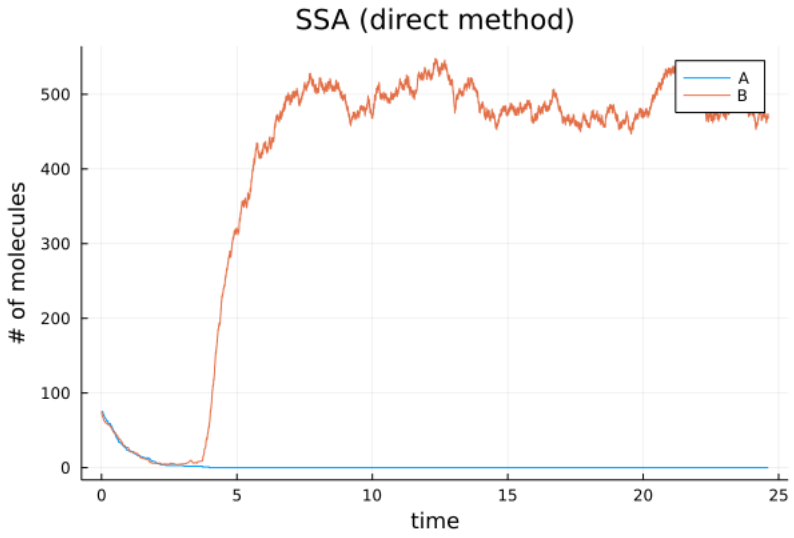
u. condition : direct reaction (p1, p2) = (75, 75) α = 5



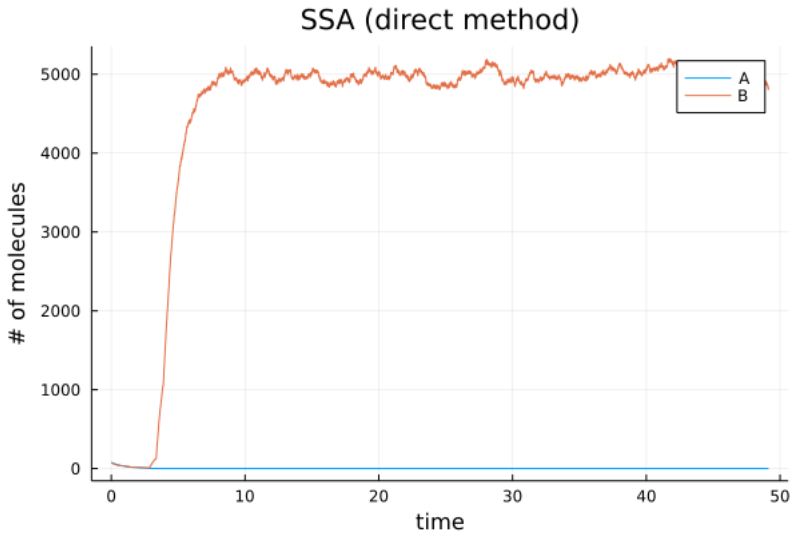
v. condition : direct reaction (p1, p2) = (75, 75) α = 50



w. condition : direct reaction (p1, p2) = (75, 75) α = 500



x. condition : direct reaction (p1, p2) = (75, 75) α = 5000



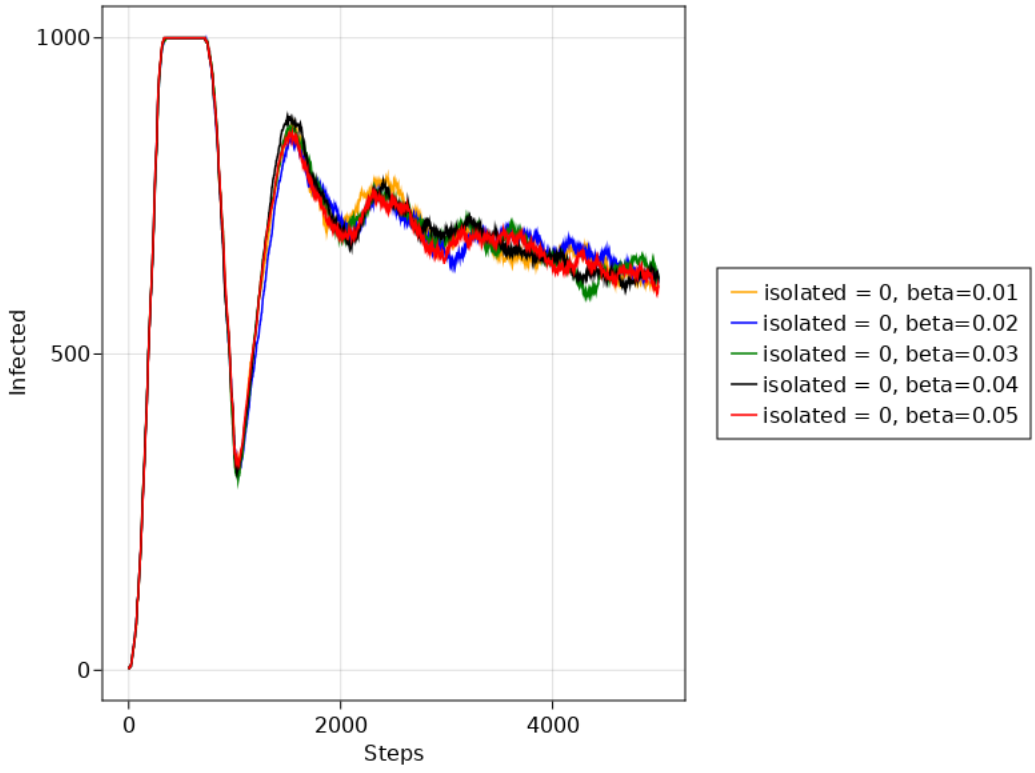
在 α = 5 時，很明顯可以看到呈現 noisy 的狀態，而在 5000 時可以看到兩條線皆呈現穩定的狀態，當 α = 50 以及 500 時，可以發現不會再出現橘藍線相間的情況，但 α = 50 時的振幅還是比較不穩定，相對於 50，α = 500 的振幅就相對穩定多了。

2.

a. isolated = 0 :

感染者最大值皆為 1000。

```
data_1 = data1[:,2] | 5001-element Vector{Int64}:
maximum(data_1) | 1000
data_2 = data2[:,2] | 5001-element Vector{Int64}:
maximum(data_2) | 1000
data_3 = data3[:,2] | 5001-element Vector{Int64}:
maximum(data_3) | 1000
data_4 = data4[:,2] | 5001-element Vector{Int64}:
maximum(data_4) | 1000
data_5 = data5[:,2] | 5001-element Vector{Int64}:
maximum(data_5) | 1000
```

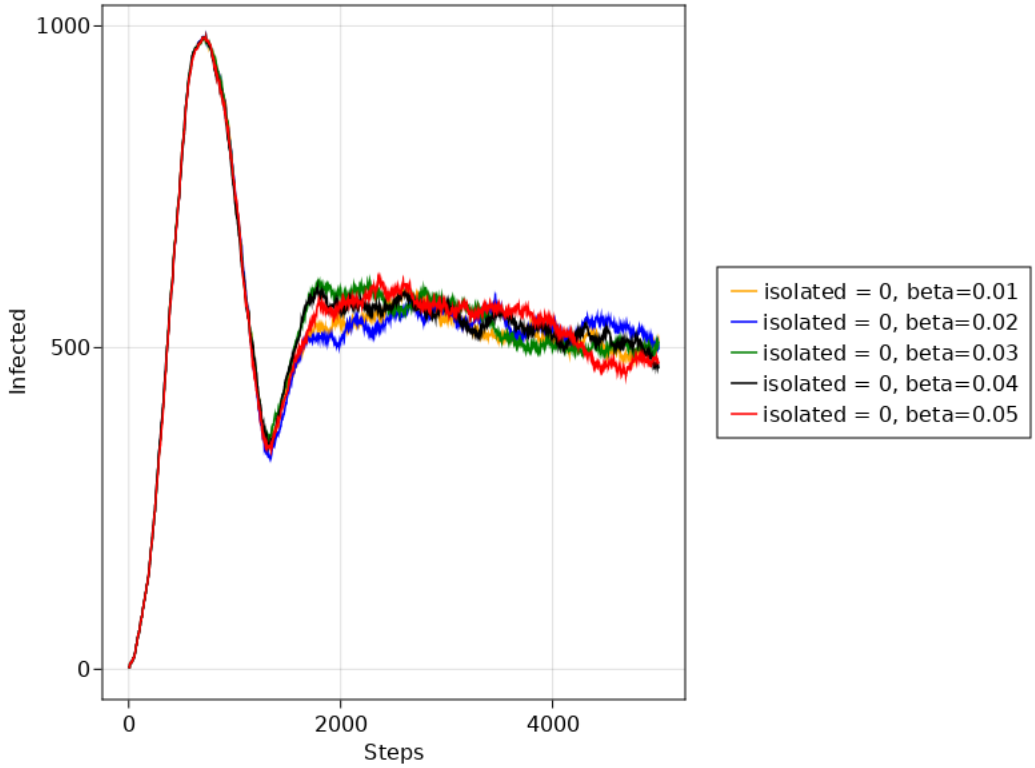


b. isolated = 0.5 :

感染者人數隨著 beta 值依序為

981,983,981,983,982。

```
data_1 = data1[:,2] | 5001-element Vector{Int64}:
maximum(data_1) | 981
data_2 = data2[:,2] | 5001-element Vector{Int64}:
maximum(data_2) | 983
data_3 = data3[:,2] | 5001-element Vector{Int64}:
maximum(data_3) | 981
data_4 = data4[:,2] | 5001-element Vector{Int64}:
maximum(data_4) | 983
data_5 = data5[:,2] | 5001-element Vector{Int64}:
maximum(data_5) | 982
```

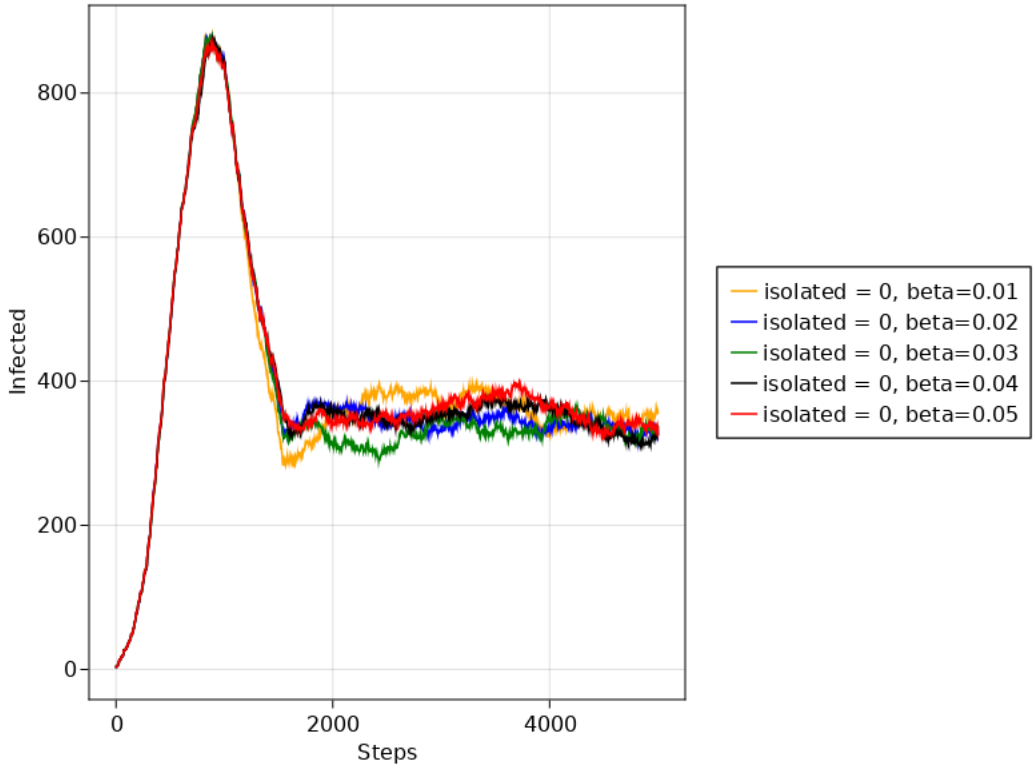


c. isolated = 0.7 :

感染者人數隨著 beta 值依序為

878,875,875,872,868。

```
data_1 = data1[:,2] | 5001-element Vector{Int64}:
maximum(data_1) | 878
data_2 = data2[:,2] | 5001-element Vector{Int64}:
maximum(data_2) | 875
data_3 = data3[:,2] | 5001-element Vector{Int64}:
maximum(data_3) | 875
data_4 = data4[:,2] | 5001-element Vector{Int64}:
maximum(data_4) | 872
data_5 = data5[:,2] | 5001-element Vector{Int64}:
maximum(data_5) | 868
```

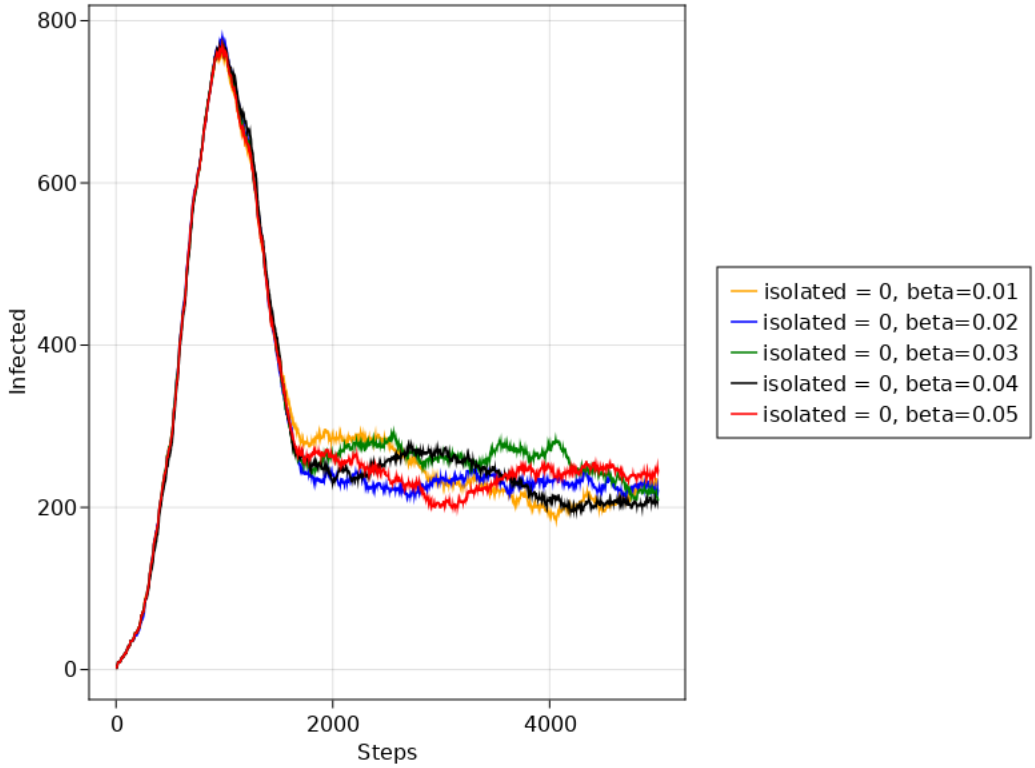


d. isolated = 0.8 :

感染者人數隨著 beta 值依序為

762,780,770,768,770。

```
data_1 = data1[:,2] | 5001-element Vector{Int64}:
maximum(data_1) | 762
data_2 = data2[:,2] | 5001-element Vector{Int64}:
maximum(data_2) | 780
data_3 = data3[:,2] | 5001-element Vector{Int64}:
maximum(data_3) | 770
data_4 = data4[:,2] | 5001-element Vector{Int64}:
maximum(data_4) | 768
data_5 = data5[:,2] | 5001-element Vector{Int64}:
maximum(data_5) | 770
```

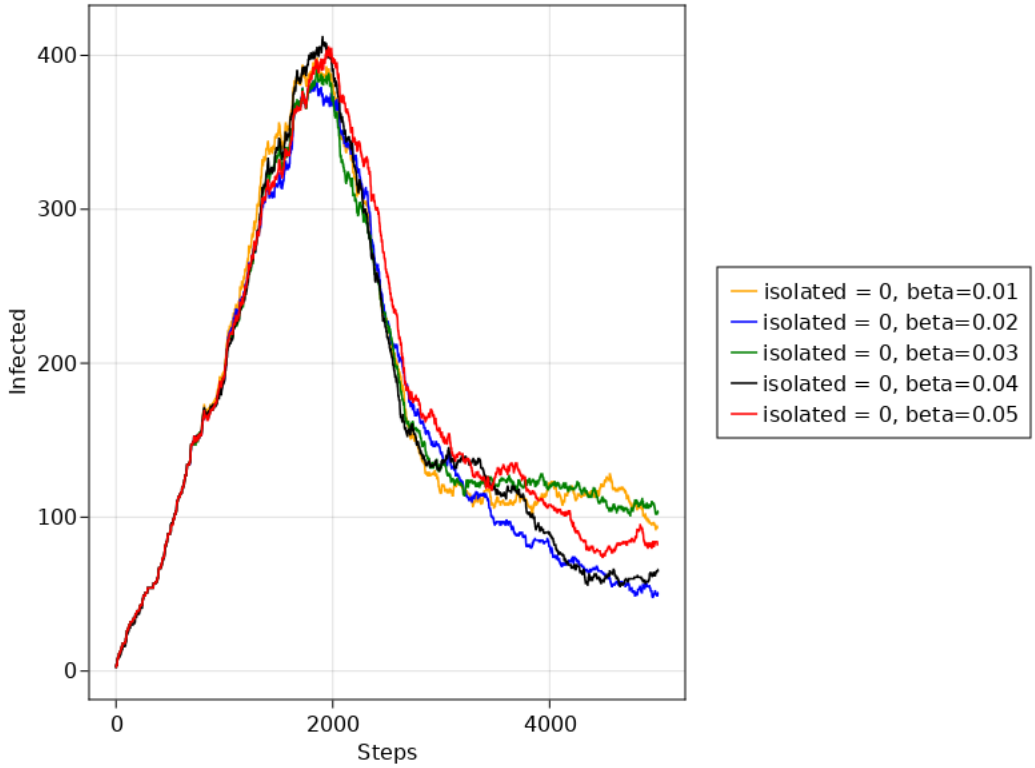


e. isolated = 0.9 :

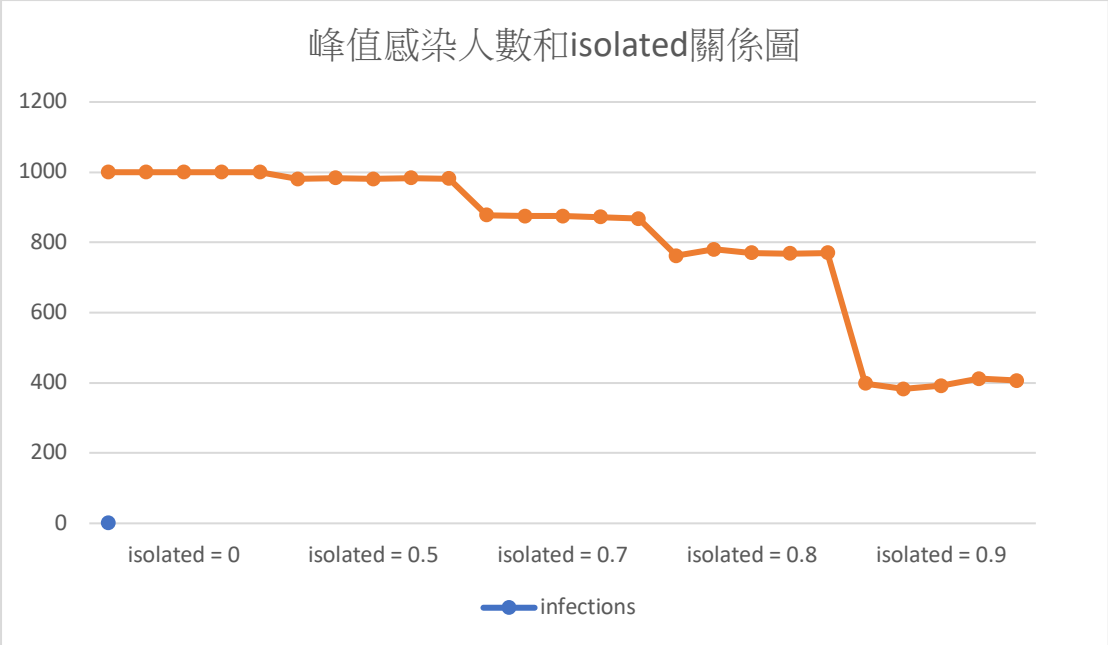
感染者人數隨著 beta 值依序為

398,383,392,412,406。

```
data_1 = data1[:,2] | 5001-element Vector{Int64}:
maximum(data_1) | 398
data_2 = data2[:,2] | 5001-element Vector{Int64}:
maximum(data_2) | 383
data_3 = data3[:,2] | 5001-element Vector{Int64}:
maximum(data_3) | 392
data_4 = data4[:,2] | 5001-element Vector{Int64}:
maximum(data_4) | 412
data_5 = data5[:,2] | 5001-element Vector{Int64}:
maximum(data_5) | 406
```



峰值感染人數和 isolated 關係圖：



1. 可以得到在峰值感染人數圖中，當 isolated = 0.9 以及 beta_max = 0.5 時對人數的銳減最有效。
2. 相比 beta_max 值以及 isolated 值的效果來看，同樣條件下，beta_max 從 0.1 到 0.5 最多銳減了 29 人（當 isolated = 0.9 時）而同樣條件下改變 isolated 值從 0 到 0.9 最多銳減了 602 人（當 beta_max = 0.01），因此得到的結論為增加 isolated 值比降低 beta_max 值來的更有效率。