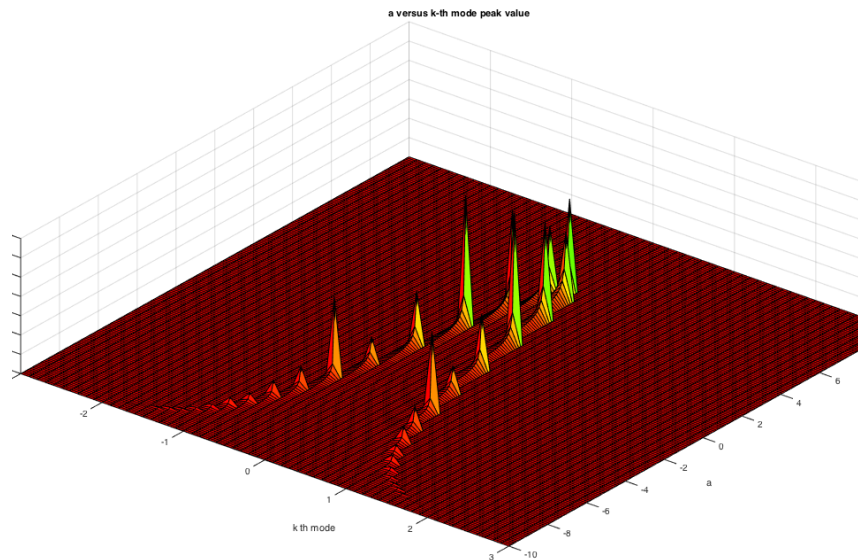
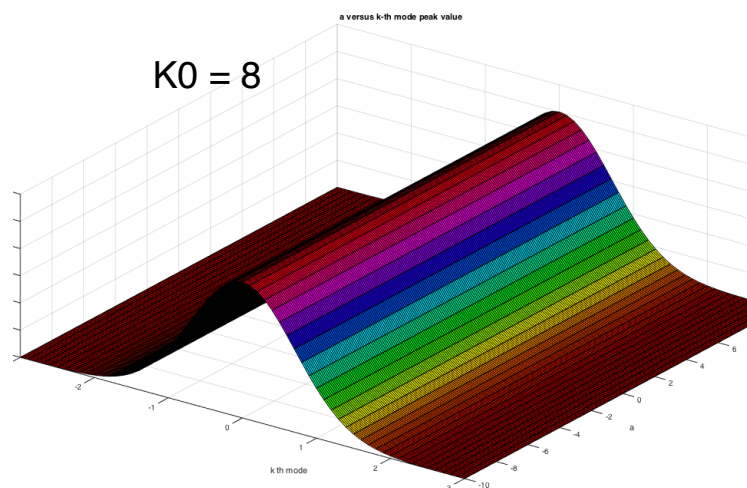


### Q1.3

$K_0 = 4;$



From the above figure we can see the distribution is not very Gaussian since there are peaks when denominator of the weights in k space are close to zero at certain k values, leading to peaked distribution. The larger a, the smaller the denominator, even lead to minus weights.

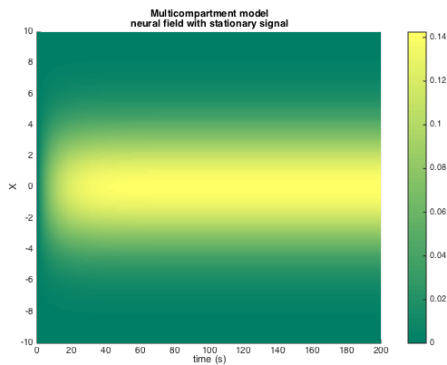


as a approaches 1 the weight distribution of modes in k space becomes more concentrated at  $k=0$ , and becomes stronger. This

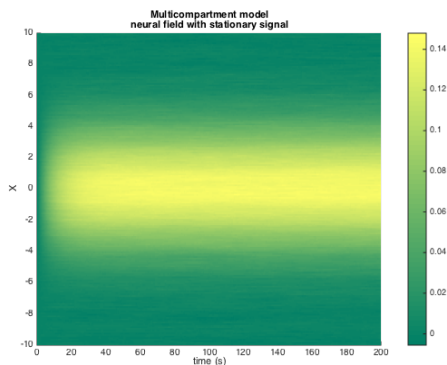
means the larger  $a$ , the larger the stationary value of neuron field potential, and the smaller the frequency in  $x$  space.

As  $k_0 = 8$ , the whole denominator is close to 1, since the product of  $a$  and sum of exponential is very small inside interval  $|k| < k_0$ , making the weight distribution determined by nominator, which is a Gaussian distribution.

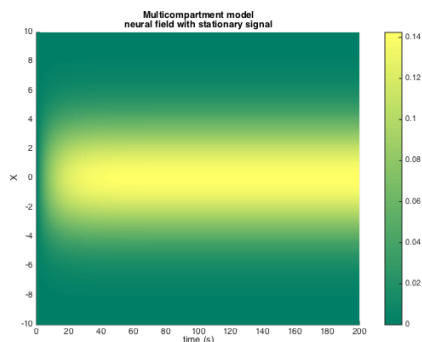
## Q1.4



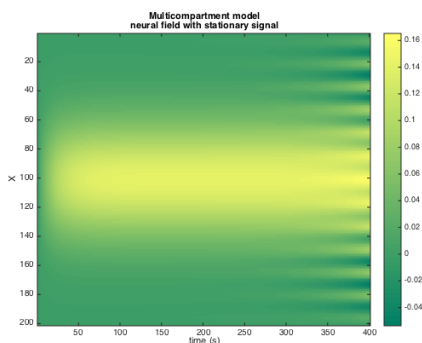
Initial conditions are stationary points.  $a = 1$ ,  $k_0 = 4$



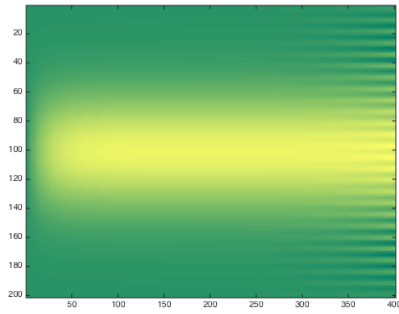
With White noise.  $a = 1$ ,  $k_0 = 4$ , initial condition is the same as above, while the noise is filtered out since the weight distribution in  $k$  space is centralized at small  $k$ . Therefore, the output has no difference from the noise free one.



$a = 0.7$ ,  $k_0 = 4$ , smaller  $a$ , weaker stationary field



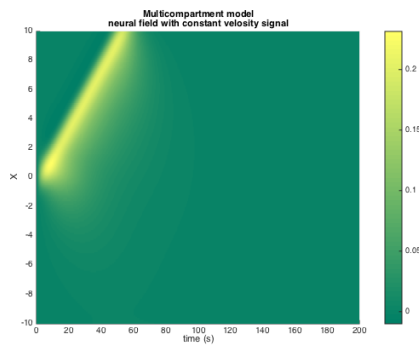
$a = 1.5$ ,  $k_0 = 4$  stronger stationary field  
 $a = 1$ ,



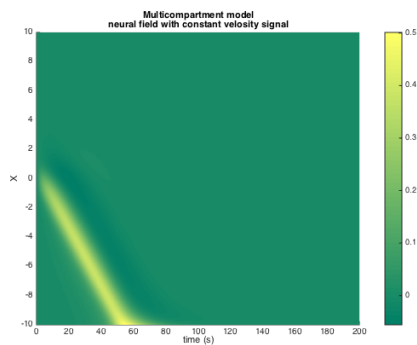
**Q2.1**

$a = 1.5$ ,  $k_0=8$ , larger coefficient in  $k$  space, wider distribution, and stronger stationary field.

**Q1.6**



when the wave packet stimulus has positive velocity, amplitude= 0.2

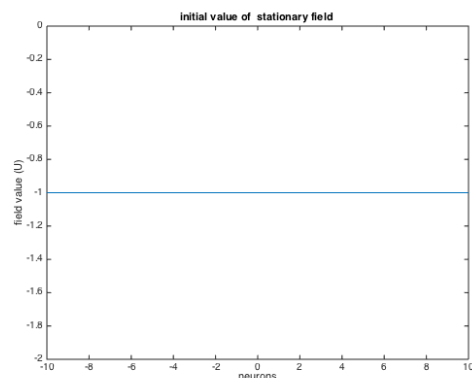
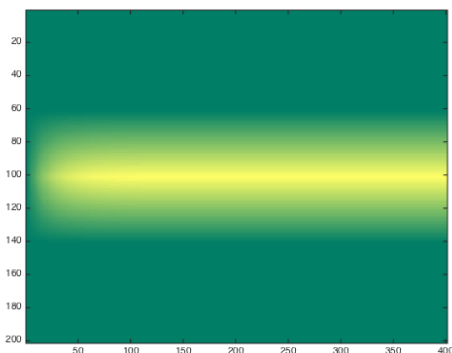


when the wave packet stimulus has negative velocity, amplitude= 0.5

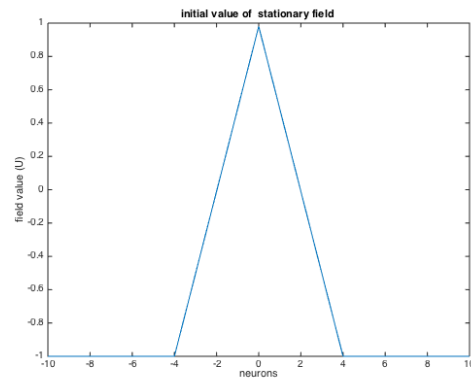
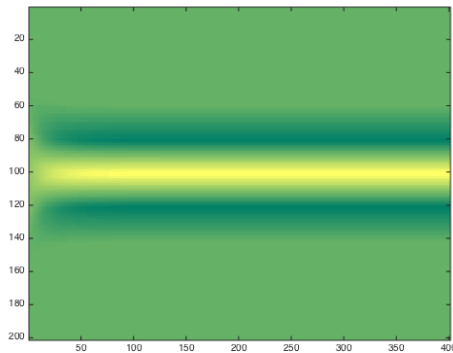
The kernel shows directional preference.

**Q2\_1**

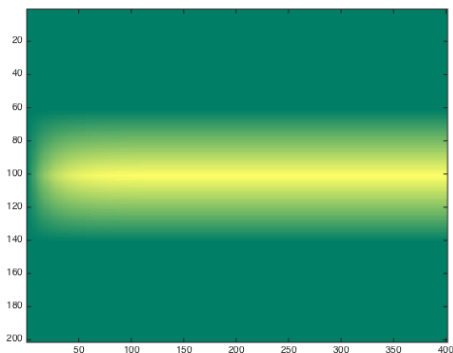
Initial condition1



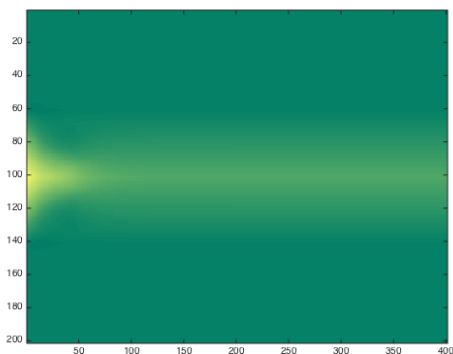
## Initial condition2



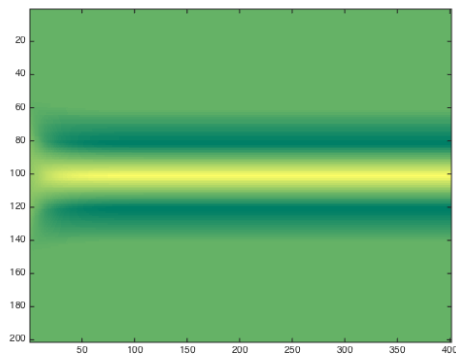
Above shows that, with the same stimulus, initial condition decides which state to reside. In terms of Psychology, you can think of it as 'Prior effect', or first impression. With excited initial condition at the region be stimulated, the band narrows down during stimulating, exhibit expectation strengthening behavior.



Adjust kernel to 1/10 of its previous strength. For the  $h=-1$  initial state, the weakened kernel shows the same behavior.

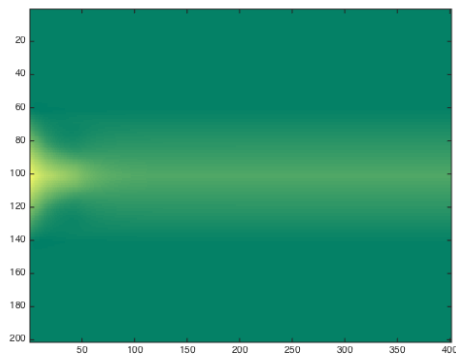


However, for the excited initial condition, the kernel now is not strong enough to sustain it in the 'expectation' stable state, regardless constant stimulus. The system falls to the stable state of lower energy( or resting state), showing no selectivity to its initial state.



## Q2.4

Set stimulus to 0. The initial state stays at excited state, indicating the initial state has surpassed a certain, meaning the model is at least by stable.



The system loses its bistable property when reducing its kernel to 1/10.

