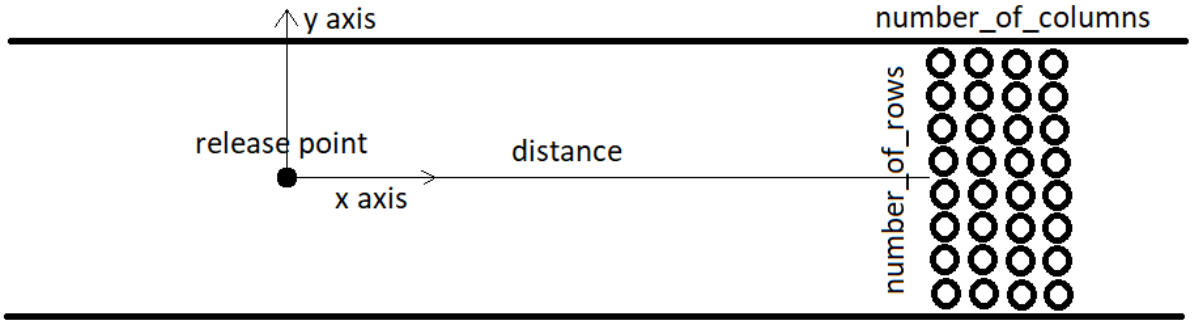
Nanonetworking Homework

Halil Umut Özdemir 2016400168

Designing the Simulation:



In this simulation, there is a release point in fronth of a group of cells. This cell group has circle shaped cells and this cells are located as a rectengular area. This area has parametric number of rows and number of columns. I assume molecules which are difused from release point cannot exceed the limits at the y axis.

For calcium signalling, I use a probabilistic model. The cells which are in excited state by molecules has a probability of signalling which is probability_of_signal variable. This cell tries to get its neighbors excited. In every time step if all of its neighbors are not in excited state, its signalling probability increases by probability_increase. In every signal, the receiver cell gets a probability_decrease less signal probability than the transmitter receiver.

I assumed that if a cell is in excited state, any signal doesn't affect it. Also if a molecule is absorbed then this molecule is removed from system.

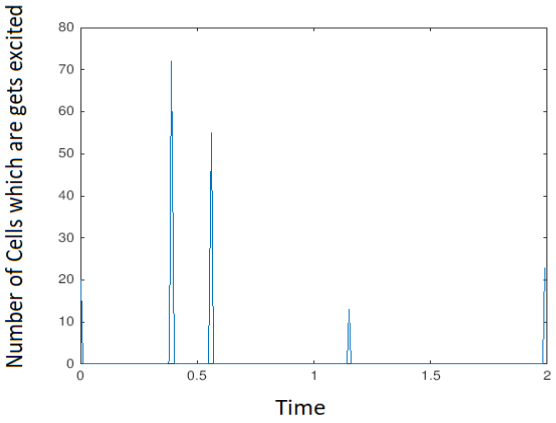
Simulation Parameters:

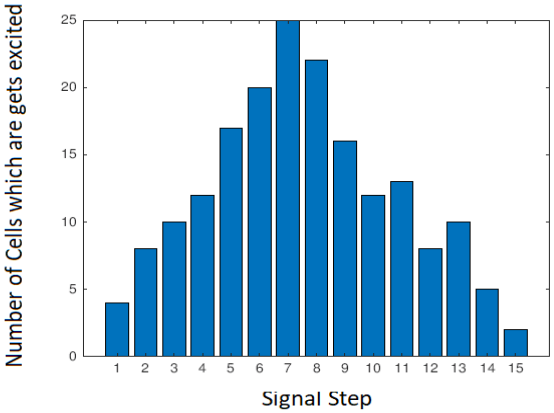
Parameter	**Value**
Distance between RP and Cell Group	48 micrometer
Simulation time step	0.0001 seconds
Symbol duration	2 seconds
Number of relased molecules	10000
Maximum number of Calcium Signal steps	Infinity
Number of Columns (Cell Group)	500
Number of Rows (Cell Group)	{100,500,**1000**}
Calcium Signal Probability (If absorbs molecule)	{0.4,0.55,**0.7**}
Calcium Signal Probability Decrease	{0.03,**0.05**,0.1}
Calcium Signal Probability Increase	0.03

- The bold ones are constant values for other tries.

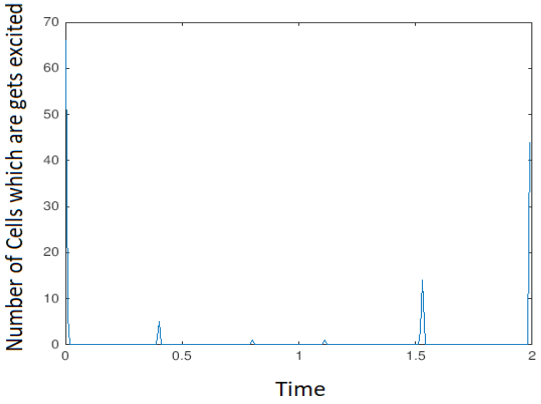
Analyze the Results:

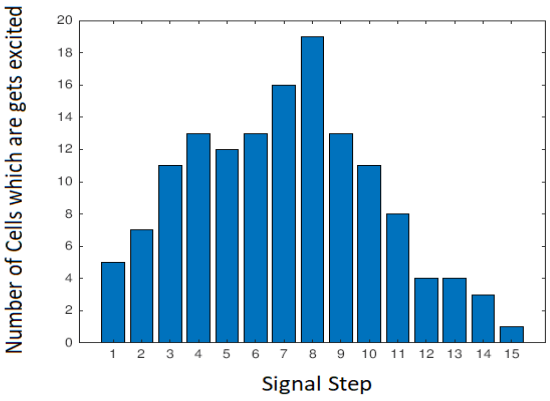
- When Number of Rows is Changed:



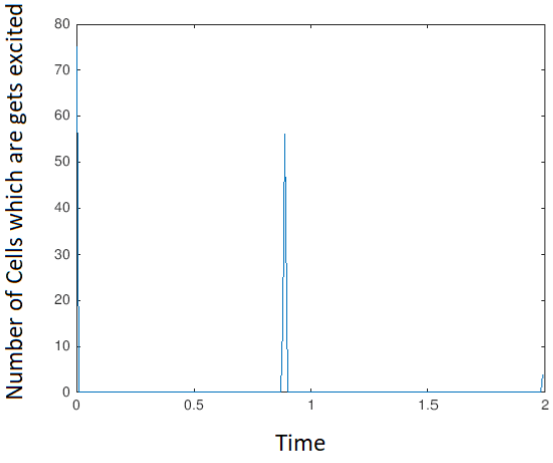


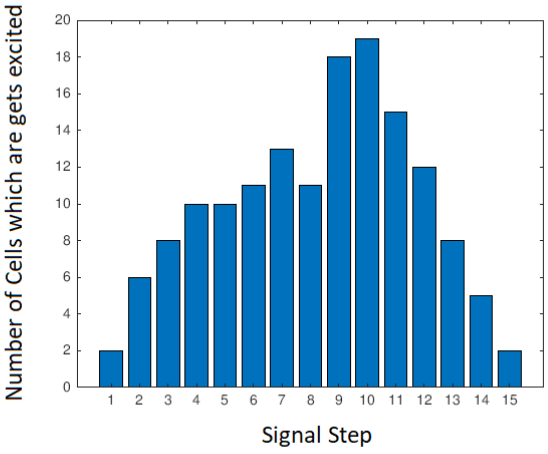
1000 Rows





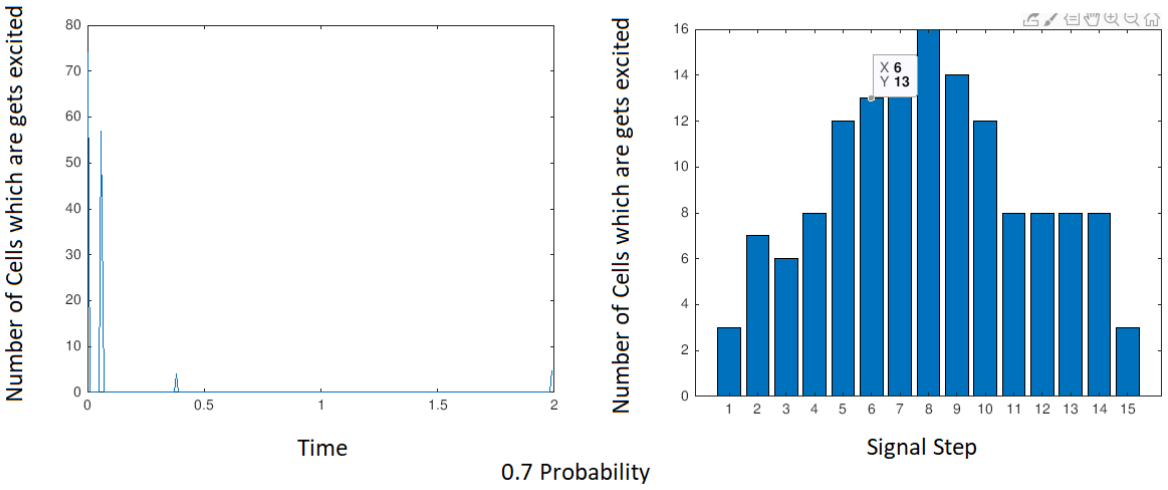
500 Rows



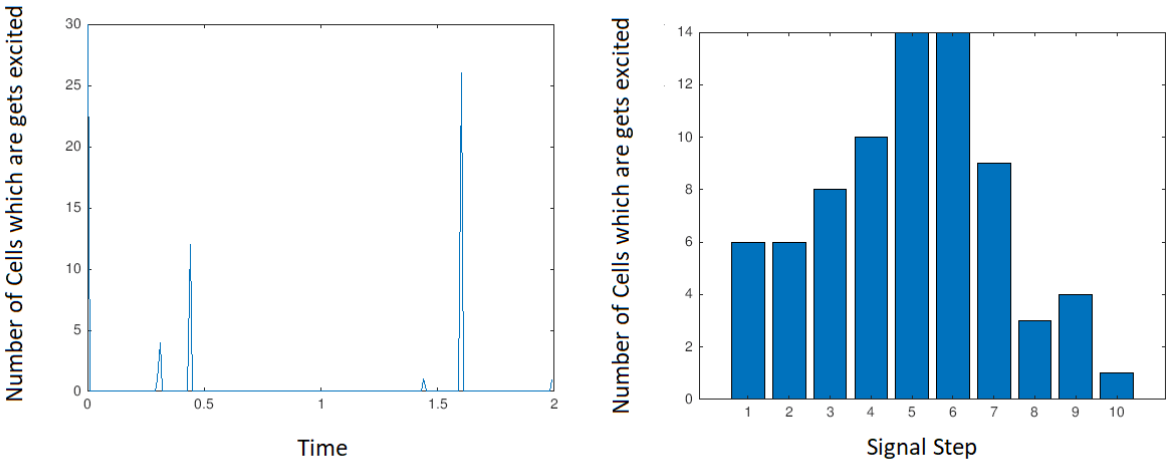


100 Rows

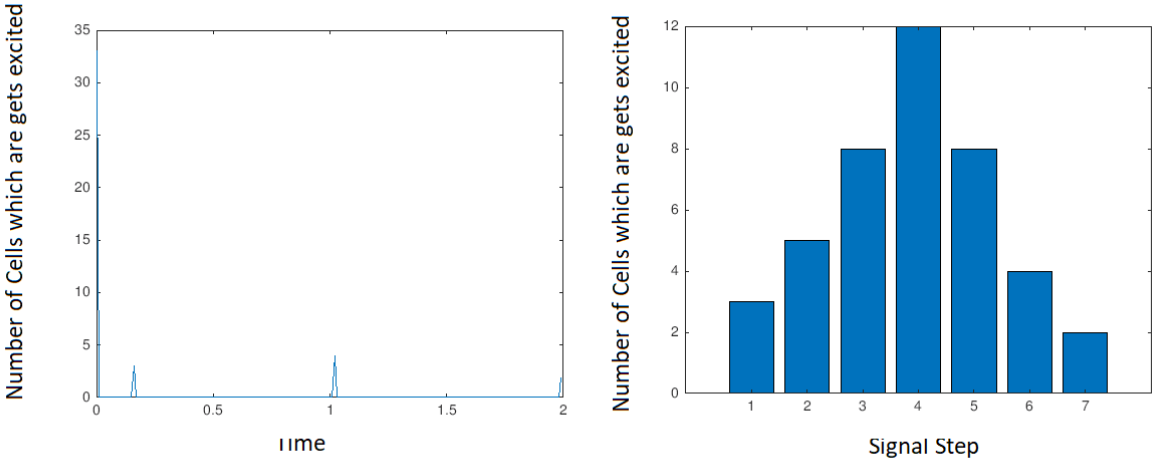
- When Calcium Signalling Probability is Changed:



0.7 Probability

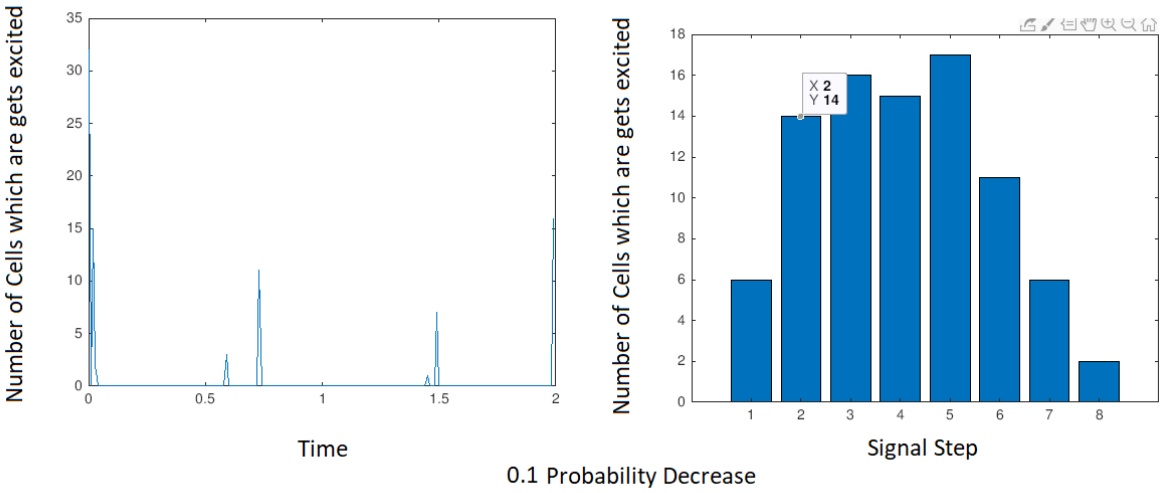


0.55 Probability

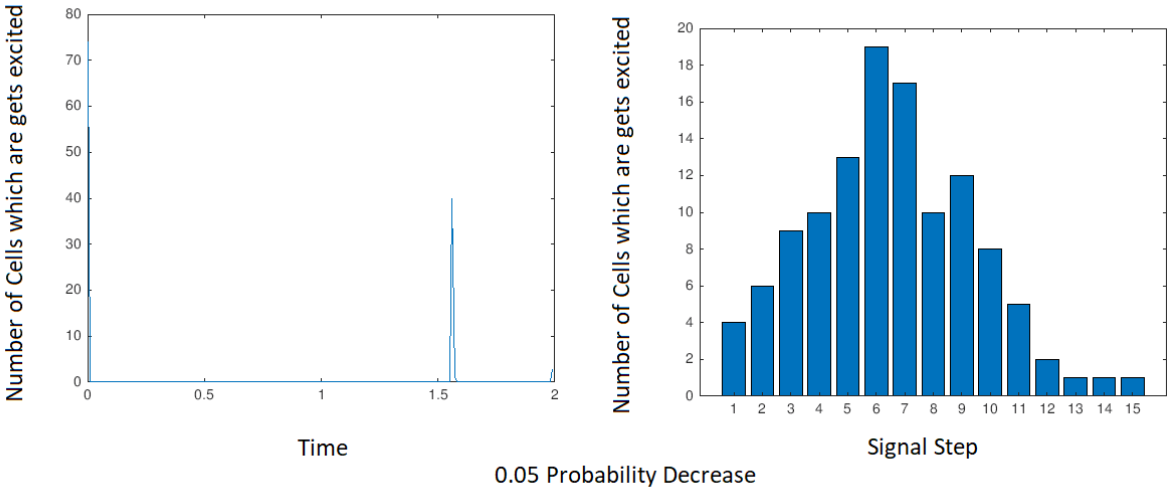


0.4 Probability

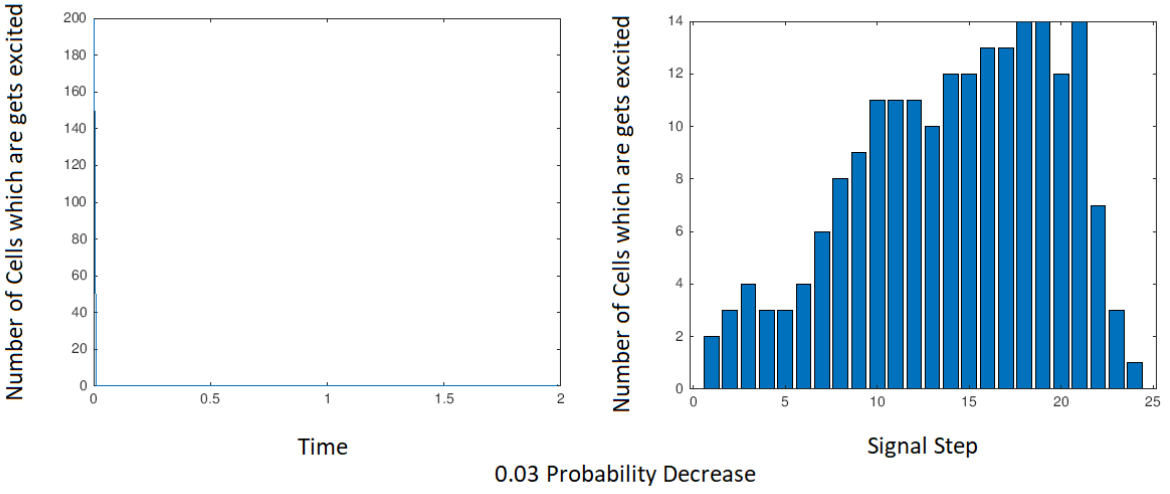
- When Calcium Signal Probability Decrease is Changed:



0.1 Probability Decrease



0.05 Probability Decrease



0.03 Probability Decrease

Results:

The change of number of rows doesn’t change the maximum number of signal steps. But the maximum valued step is decreases when number of rows increases. When number of rows increase the number of peaks is increased in the time graph.

The signal probability values affects the simulation very much. Small changes in the probability values affects the signal step plots very much. But the peak-like shape in the signal step plot doesn’t change in all simulations.