Hippocampal Network Analysis Using a Multi-electrode Array (MEA)
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Outline
• Goal: To create a neuron level map of the dissociated hippocampal network
• Take correlations between stimulated neurons and all other neurons; Use result to assign unidirectional connection strength
• Will use spike sorting to connect electrode level to neuron level
• First lets see if this correlation makes sense by applying it to an artificial network
• Possible applications
  – Integrating man and machine
  – Understanding and repairing diseases/damages

Toy Network – Step I
• 9 Neurons with first order connections, the magnitude of these connections is specified
  – Any pair of neurons can be connected
• Model includes parameters for
  – Synaptic delay
  – Refractory Period Length
• Benefit of model is infinite signal to noise ratio
• Program generates nine “data” sets, each one corresponding to the “stimulation” of one of the neurons

Toy Network – Step II

Toy Network – Step III

Toy Network
Spike Sorting

- Goal is to connect level of electrodes to the level of individual neurons
- Idea is to attribute spikes to individual neurons by performing convolutions and then look at the correlations between the spike trains of neurons
- Method requires the assumption no two neurons at one electrode spike with the same shape
- This requires a low neuron density as well as ten different spike shapes randomly distributed among in the culture.
Works Cited