UNIVERSITY
OF OSLO

MES
Mikro Elektroniske Systemer

Neuromorphic Electronics

Neurons and Neuronal Models

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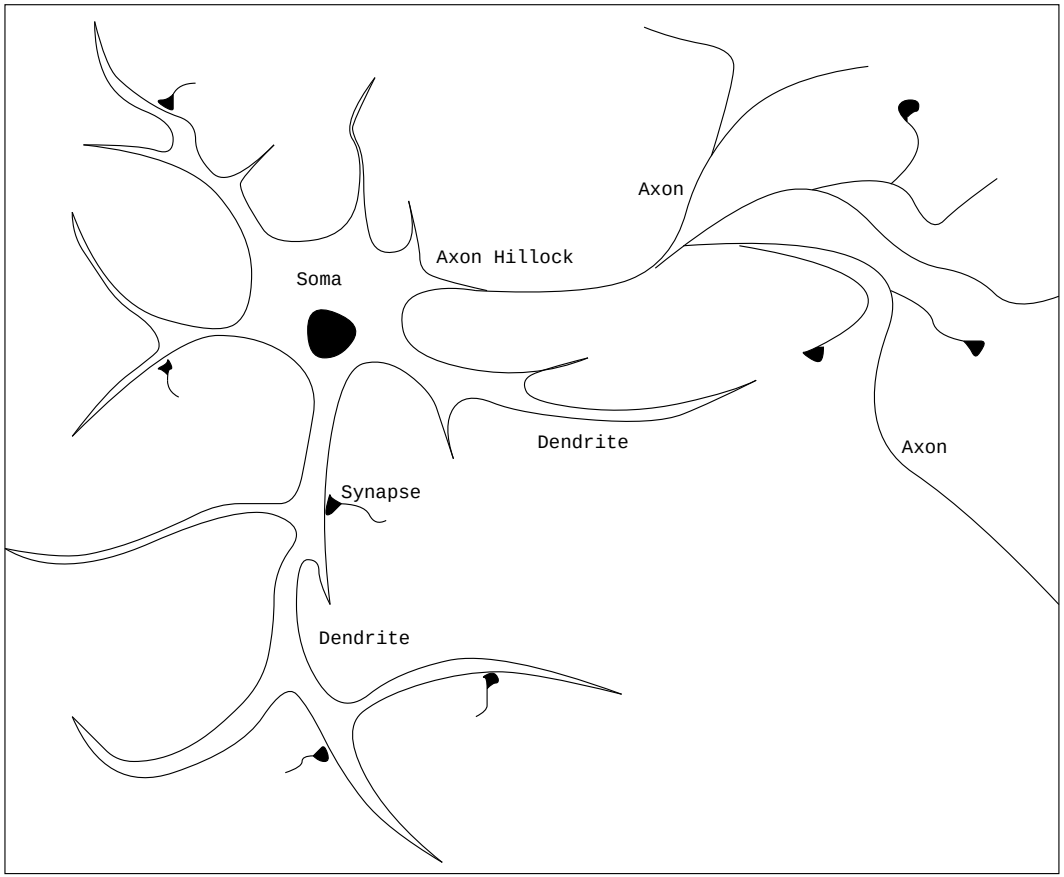
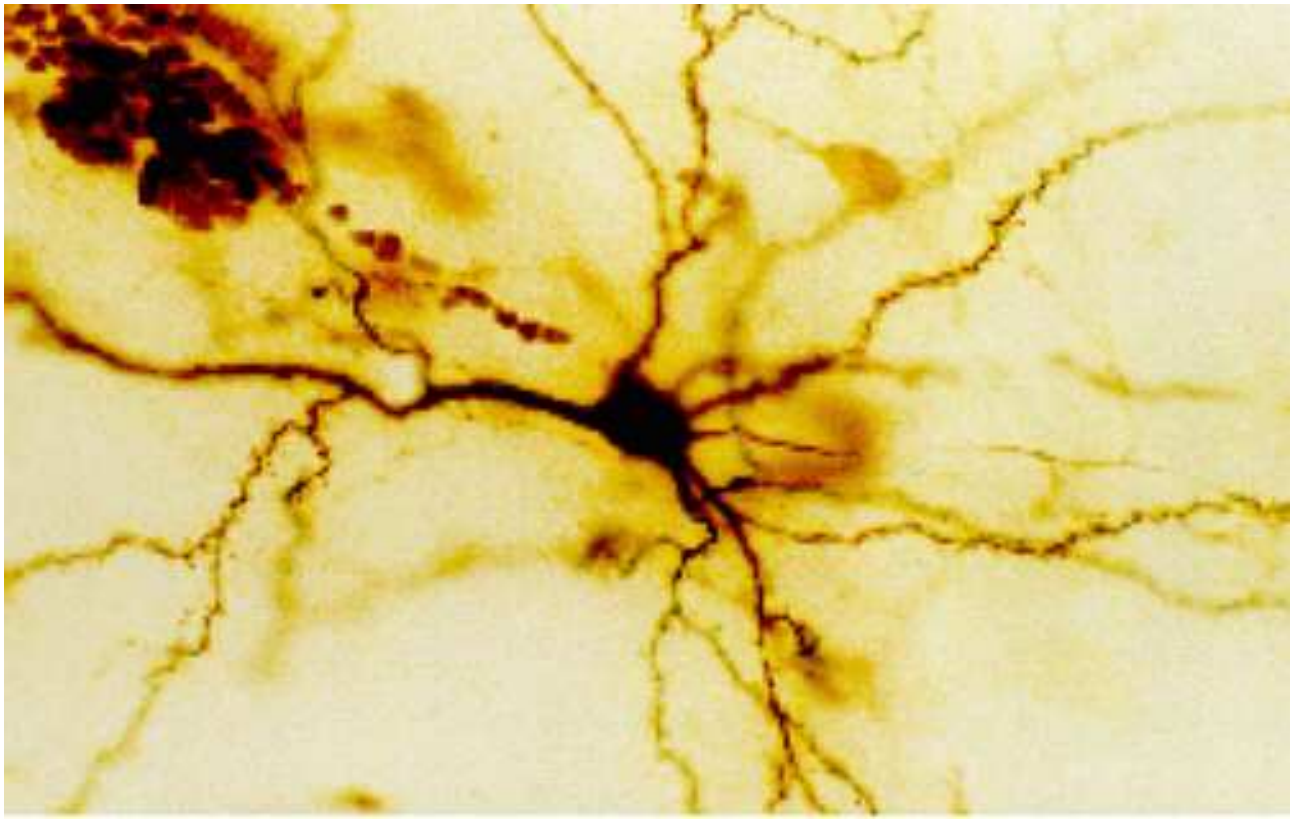
Basic Anatomical Parts



Microscope Picture of a Stained Neuron



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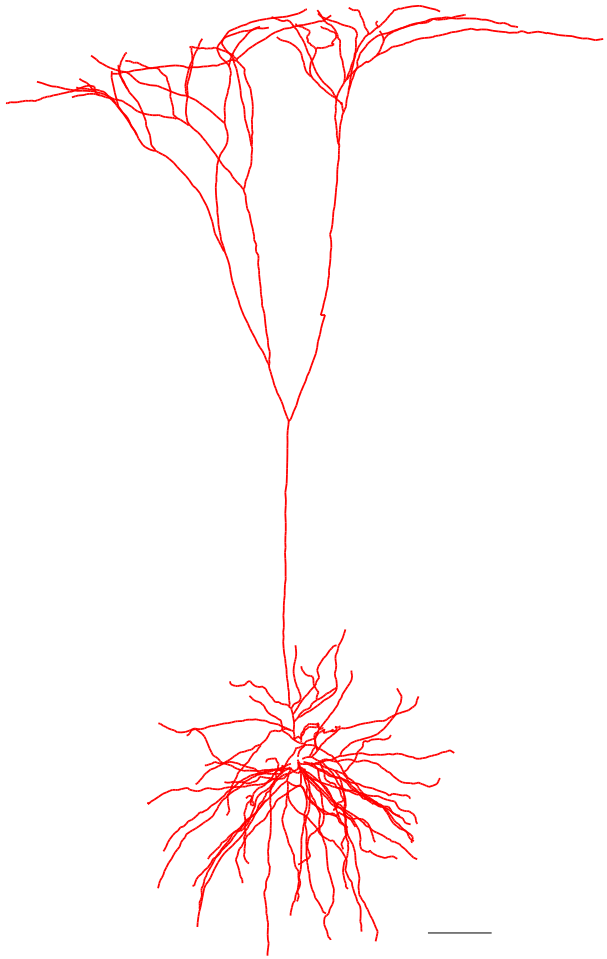
3D Reconstruction of Dendritic Tree



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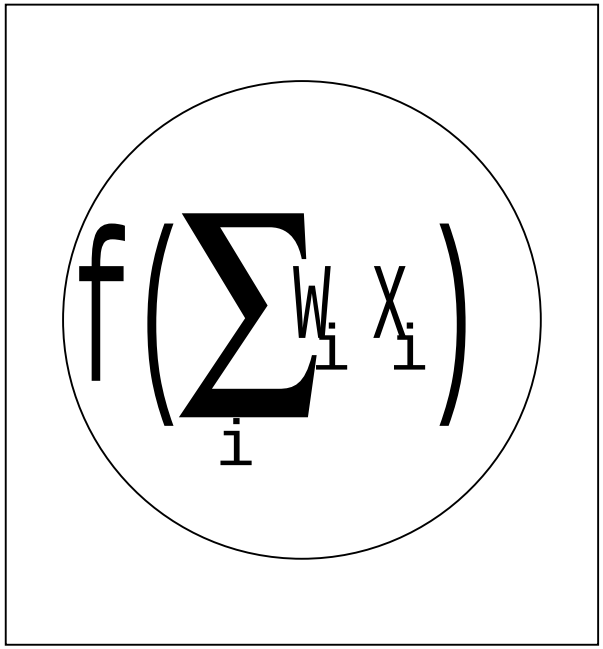
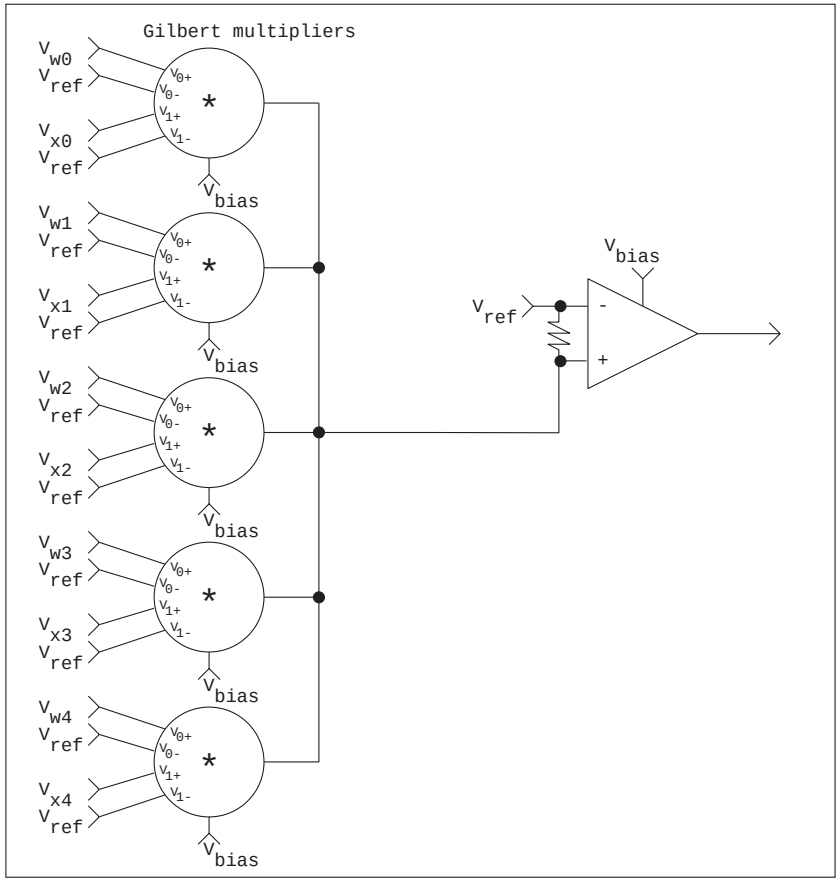
Level of Detail in some Neuronal Models

electrical nodes	most simple, big networks implementable
perceptrons	mathematically simple, but complicated in aVLSI
integrate and fire neurons	mathematically complex, but simple in a VLSI
compartemental models	complex, simulation of big networks are very slow, aVLSI in real time

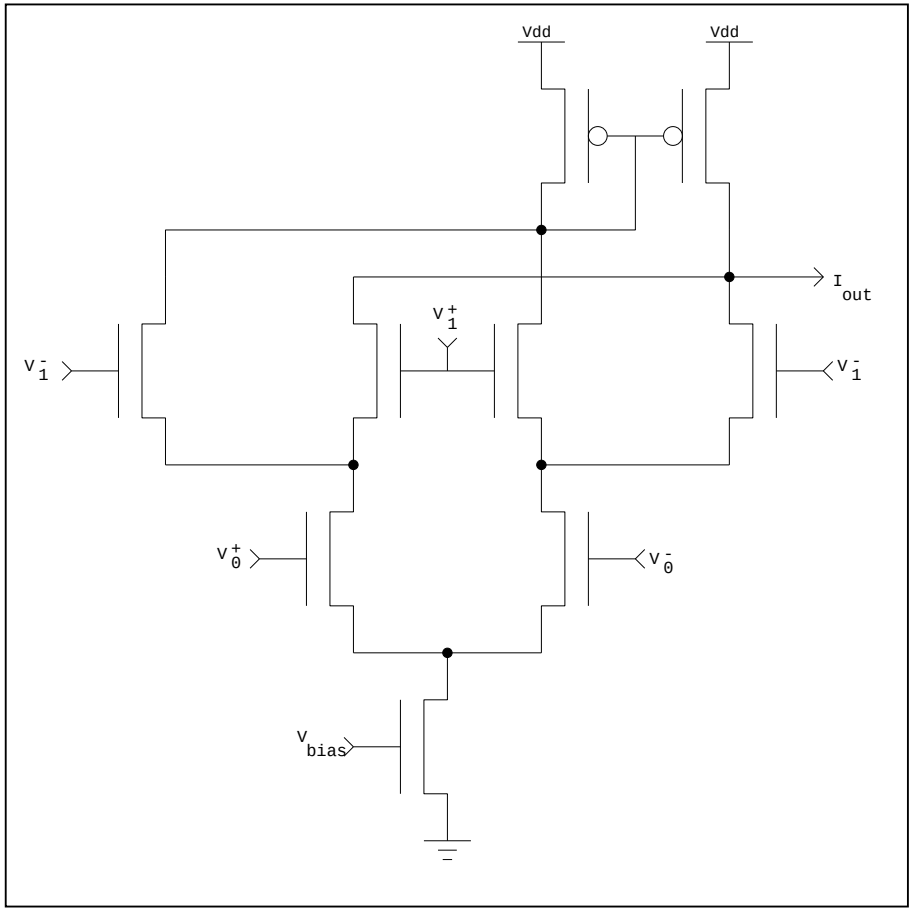
Perceptron



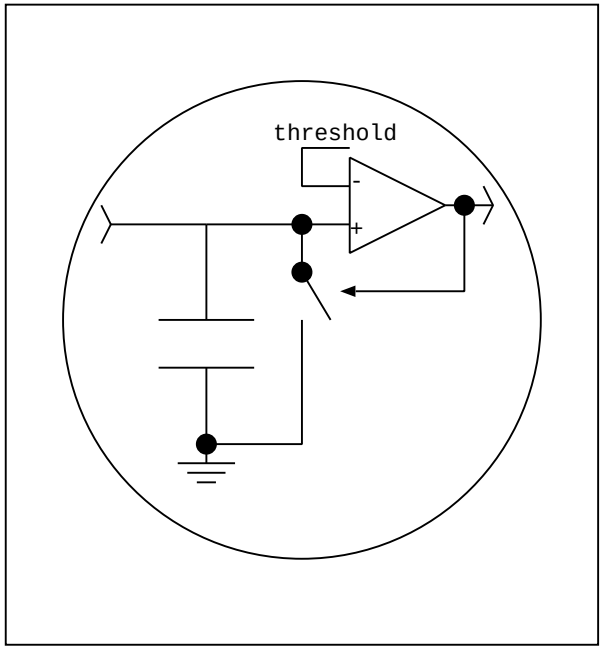
Possible Perceptron Schematics



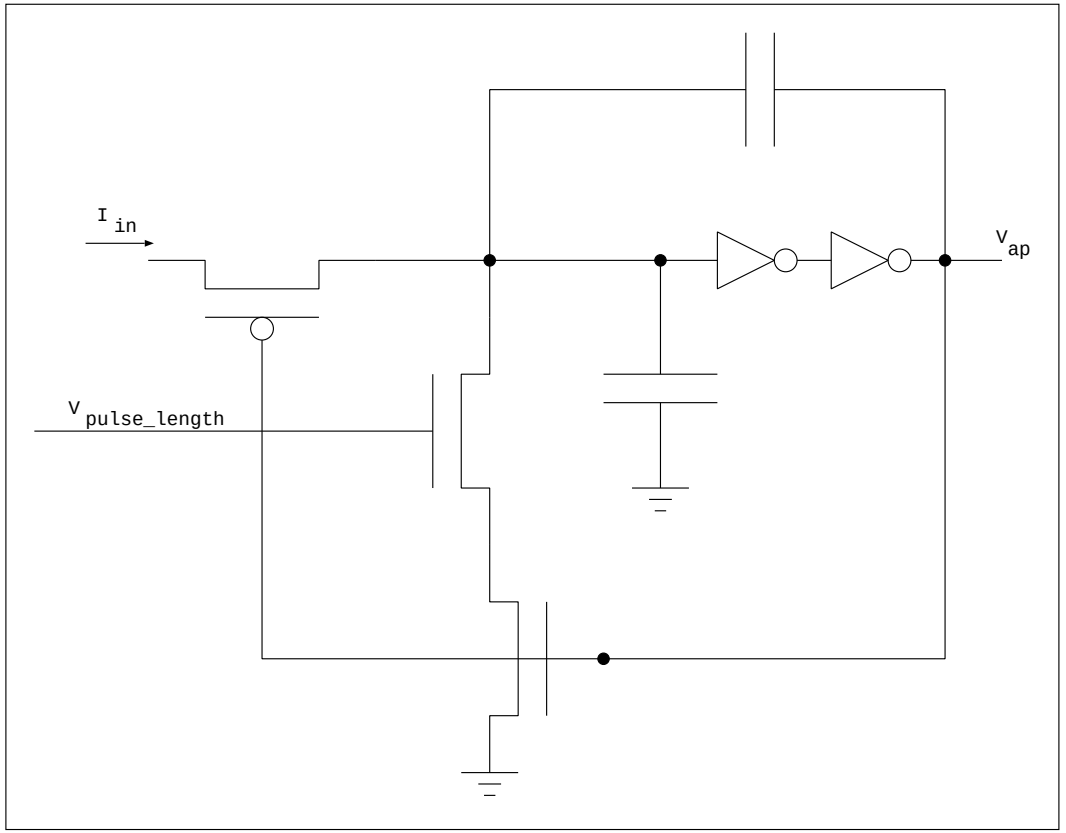
Gilbert Multiplier



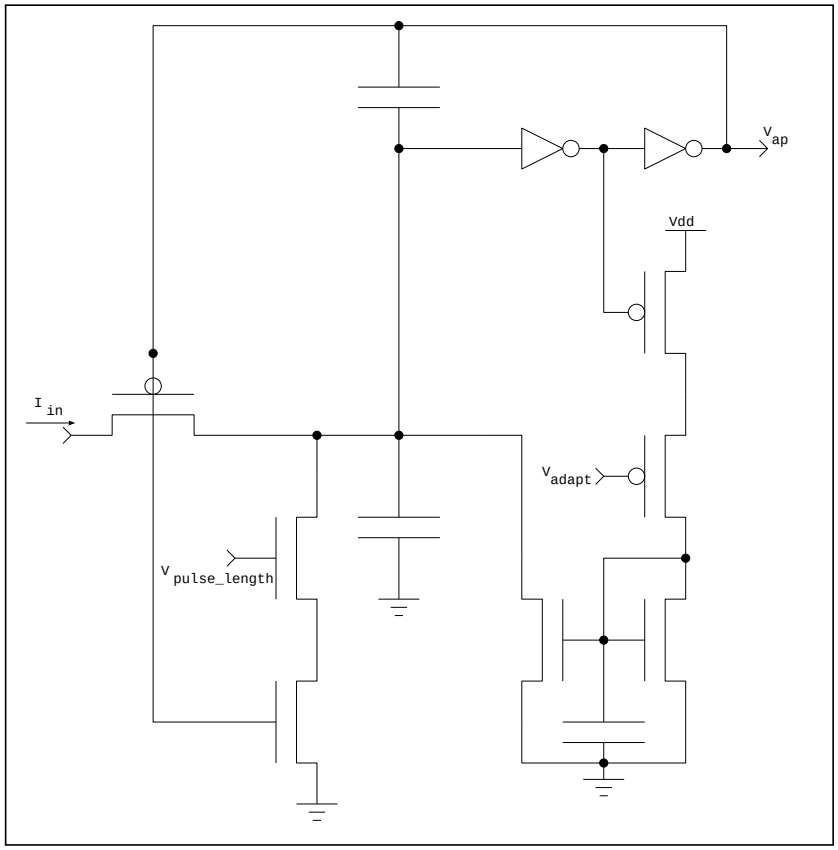
Integrate-and-Fire Neuron



A Variant of a Integrate-and-Fire Neuron (Carver Mead)



A Schematics of an Adaptive Integrate-and-Fire Neuron



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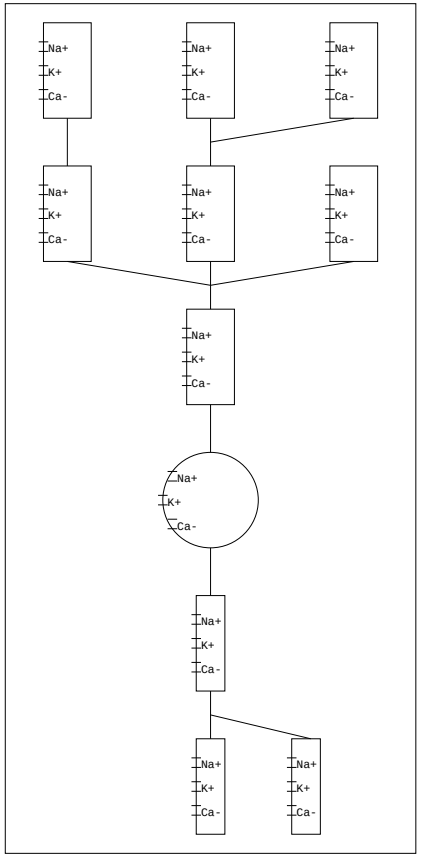
A Compartemental Model of a Neuron



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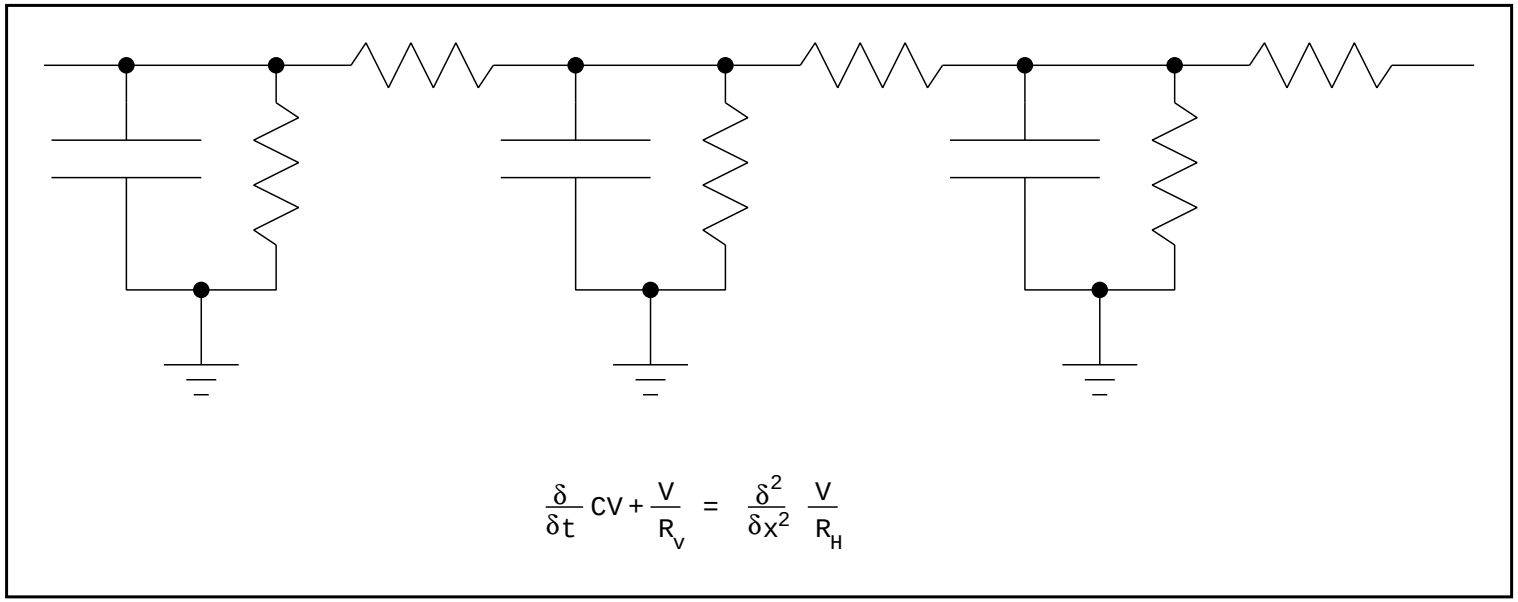
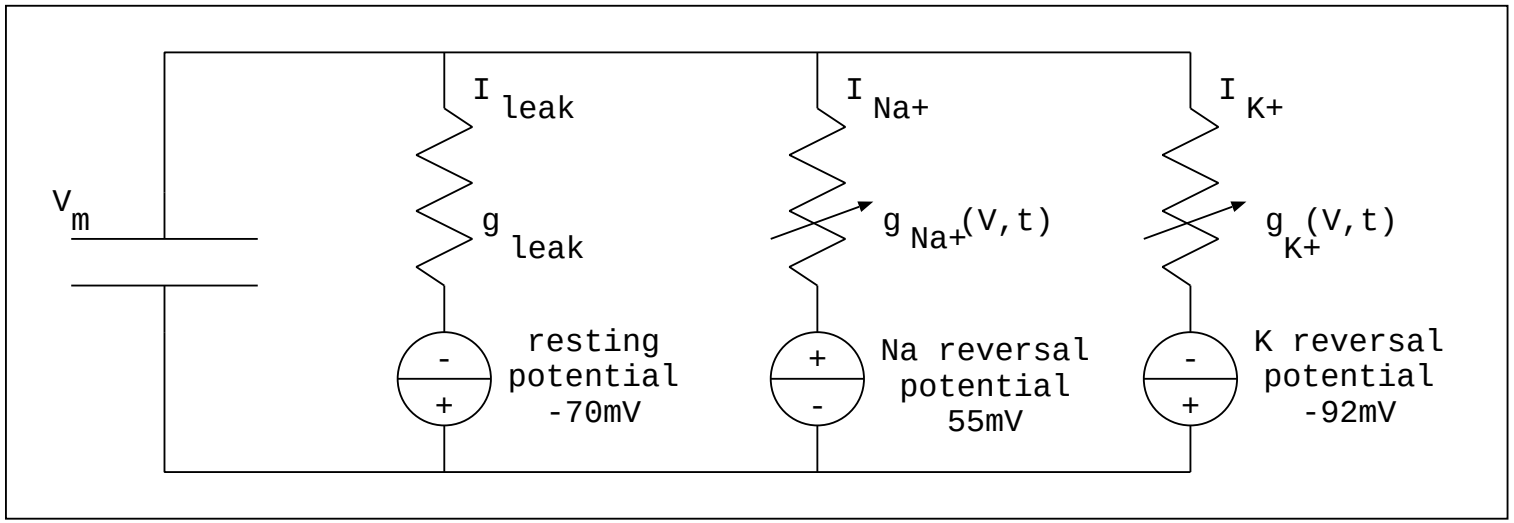
Model of a Cable



The Hudgkin Huxley Model of Action Potential Production



A CMOS Implementation of a HH-soma