Step current responce of the HH Model

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A constant current applied to the HH model produces a train of action potentials.

HH Model Step Current Responce

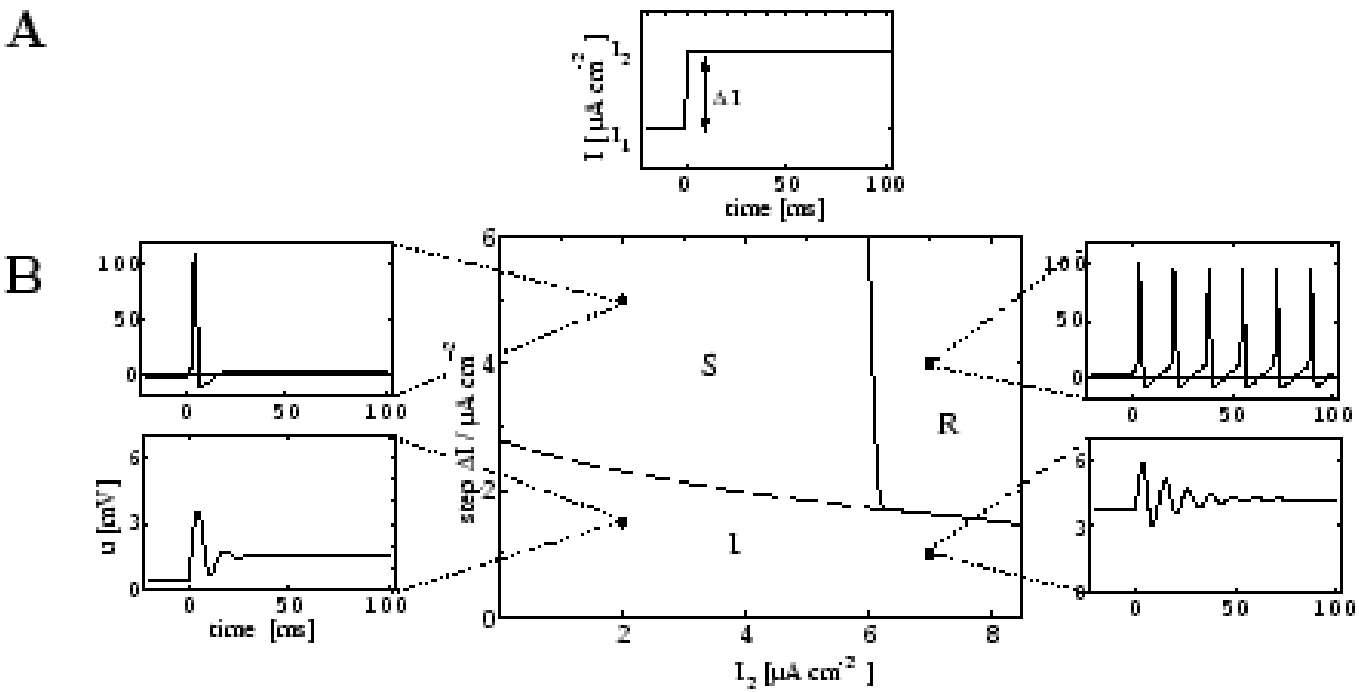

Figure : Step Current Stimulation Phase diagram

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Applications: Refractory Period

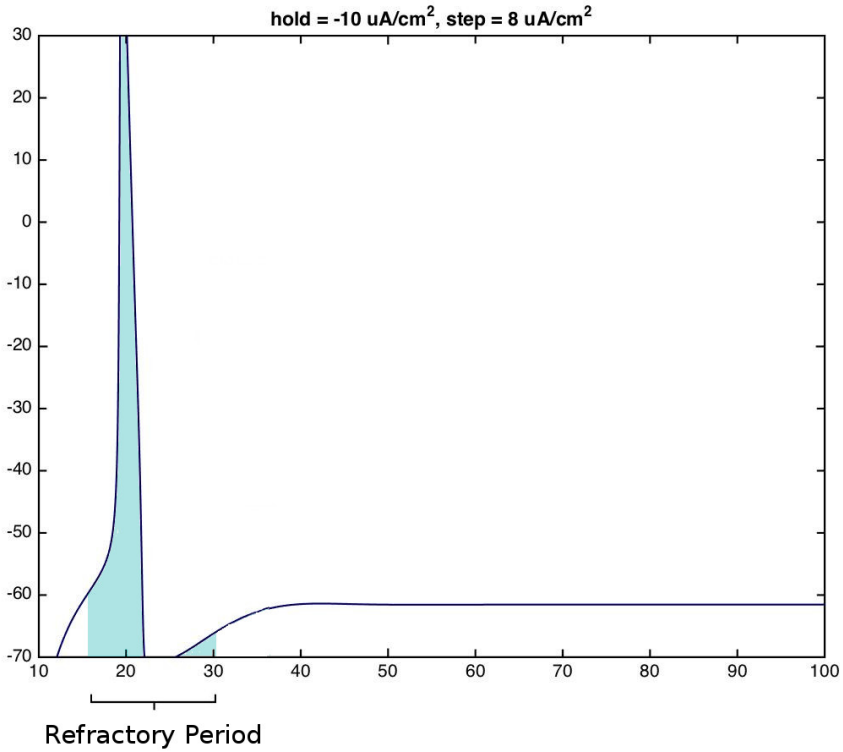


Figure : Reducing the Refractory Period can lead to faster reflexes.

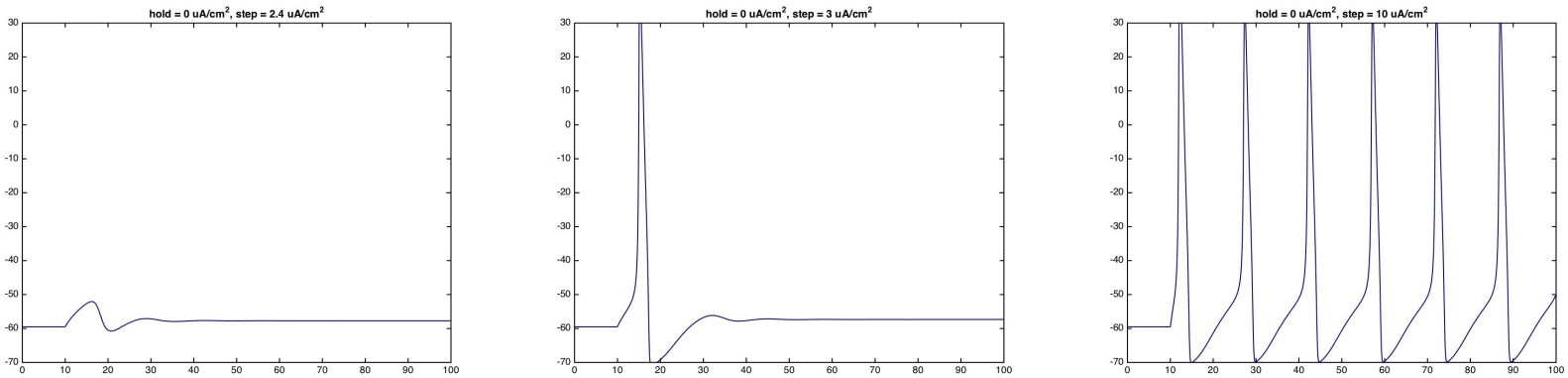


Figure : Response in the *Ringing*, *Single AP* and *AP Train* regions

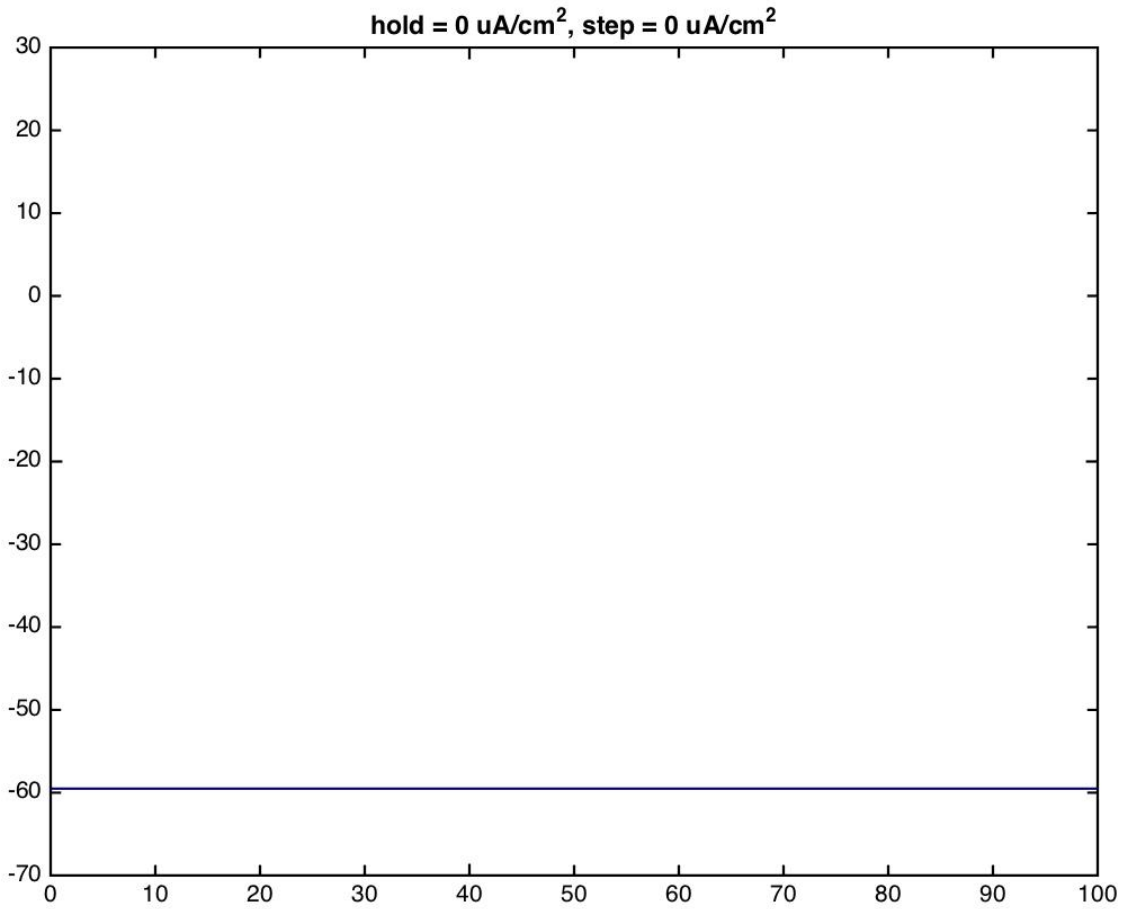
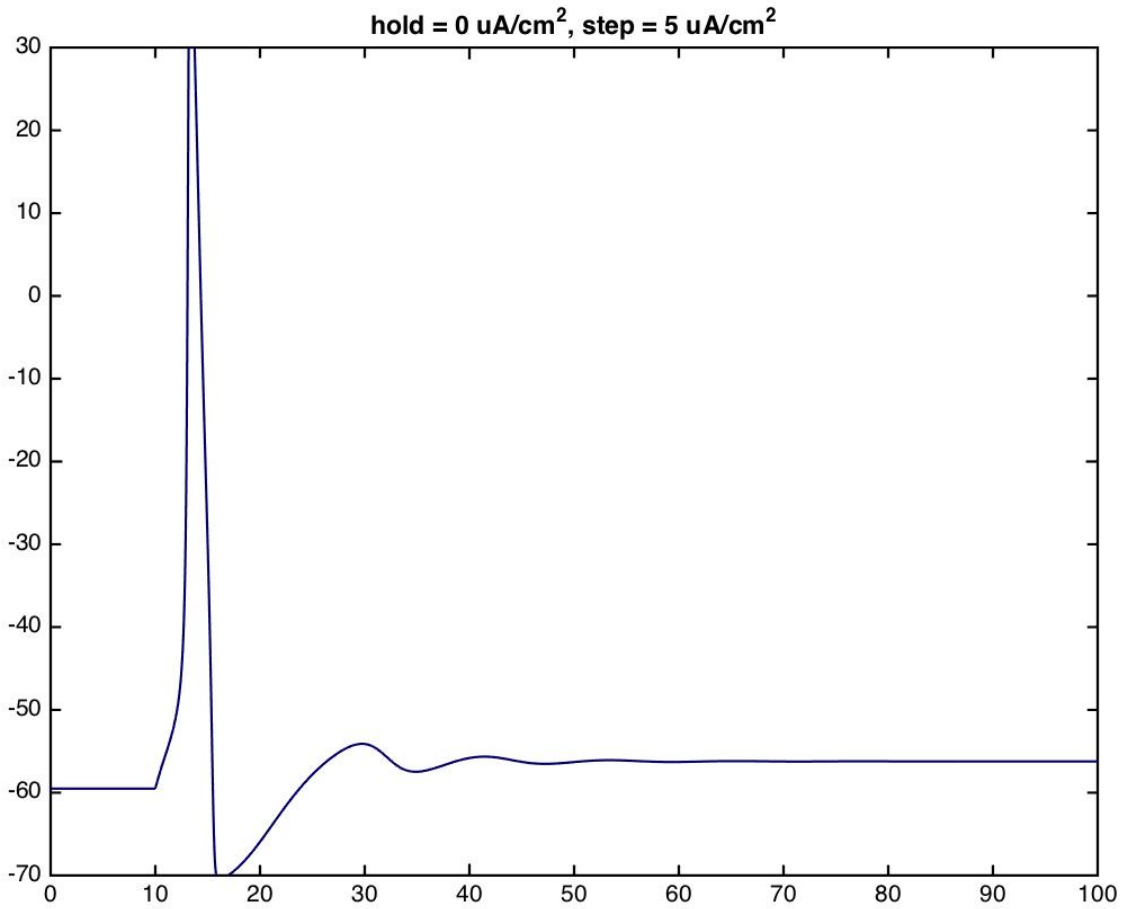


Figure : HH Models step current response starting at 0 $\mu A/cm^2$



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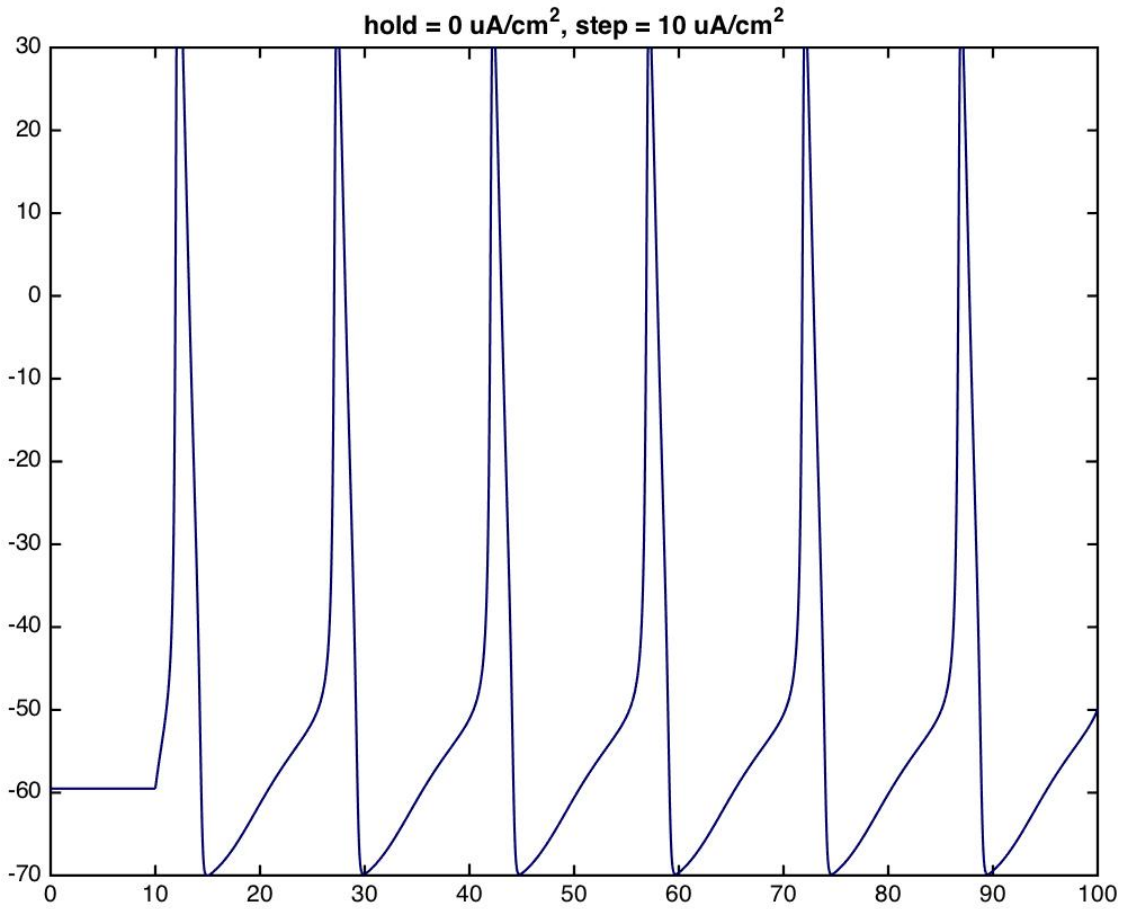

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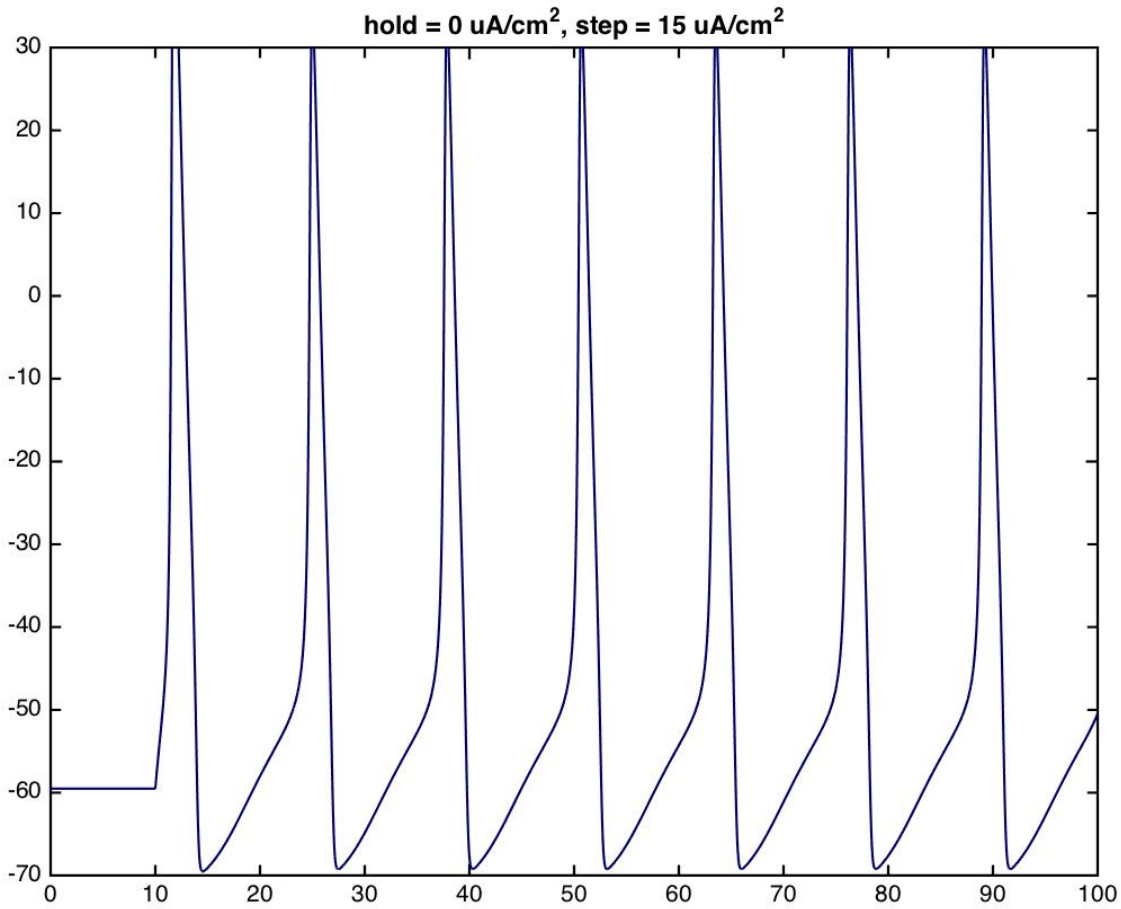

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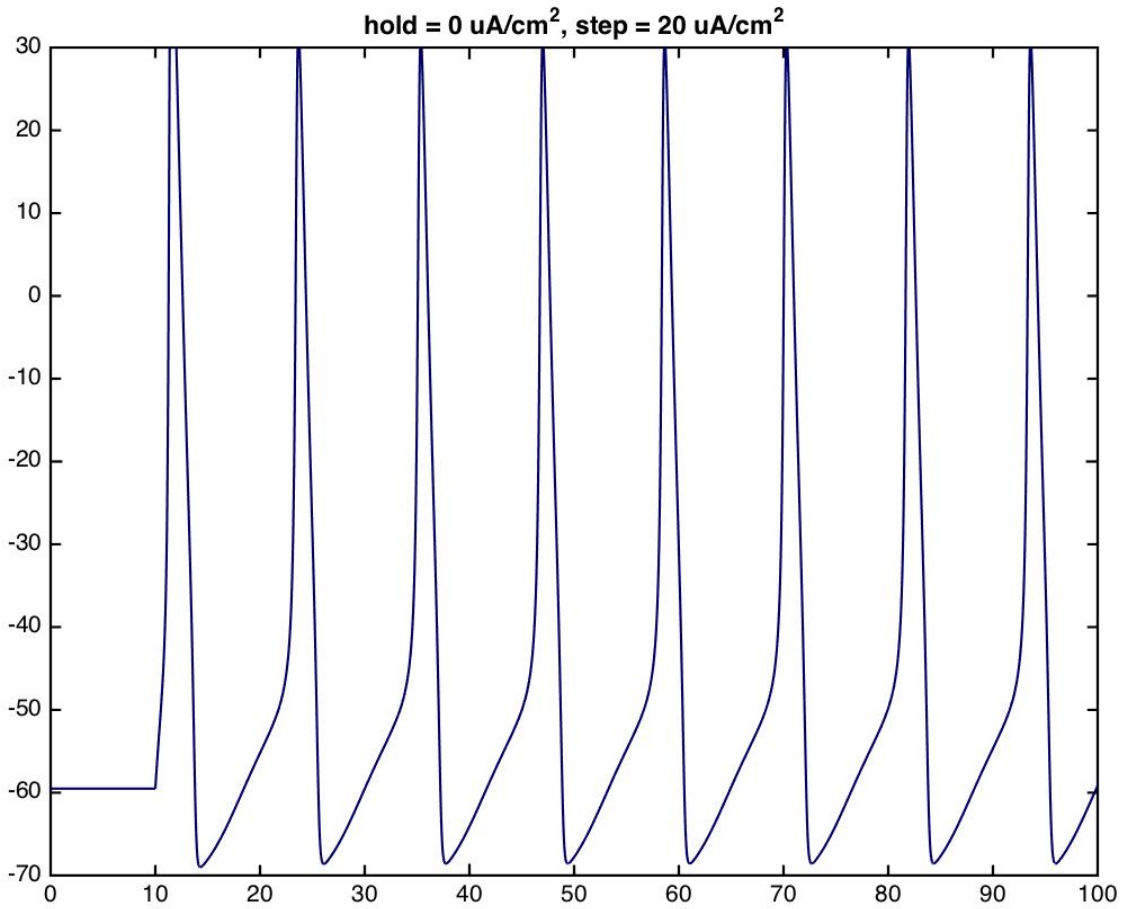

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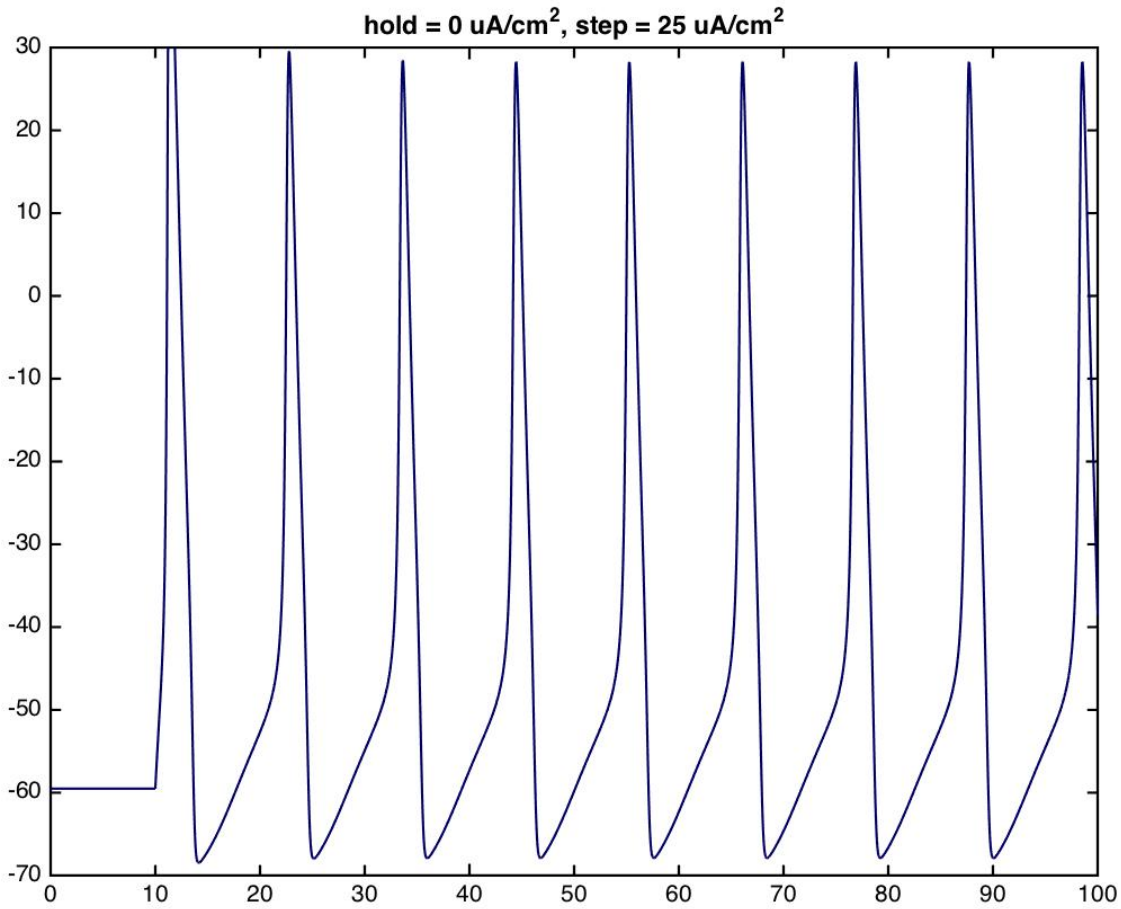

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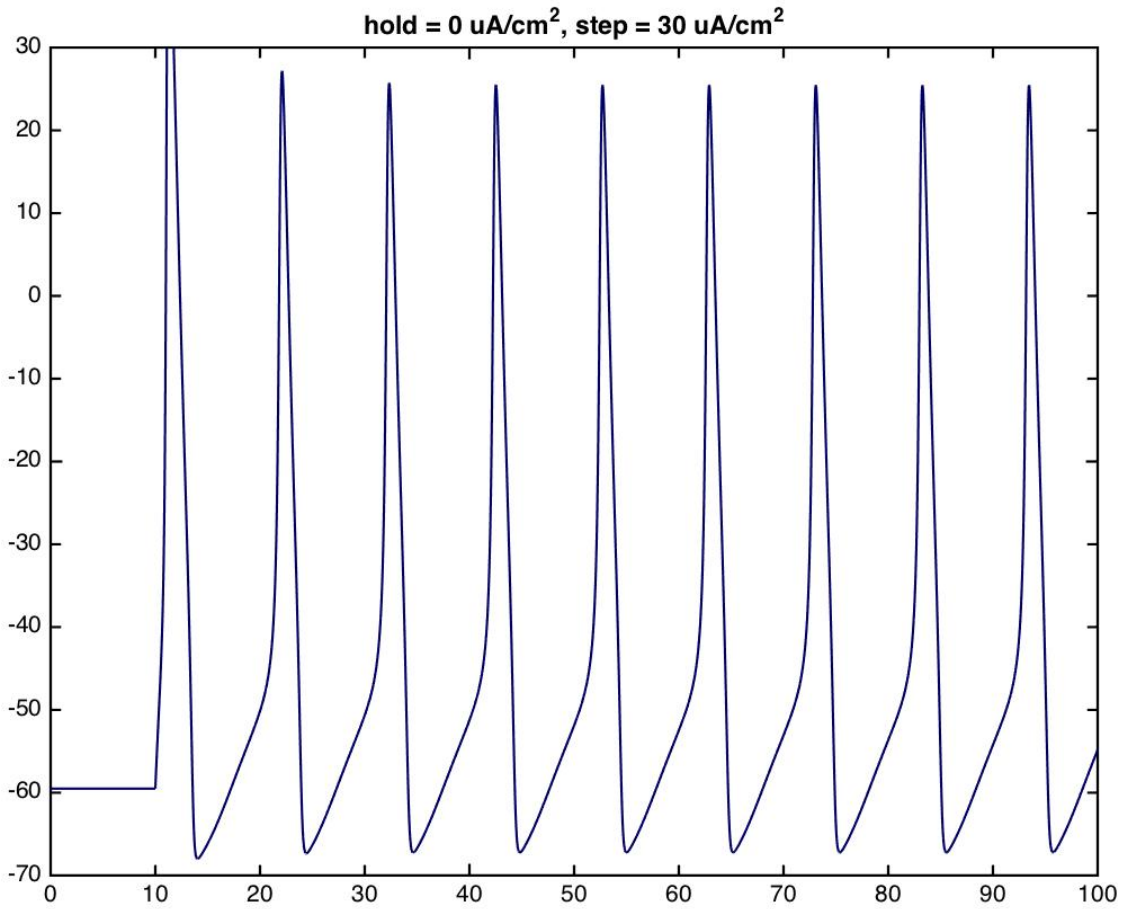
A constant current applied to the HH model produces a train of action potentials.



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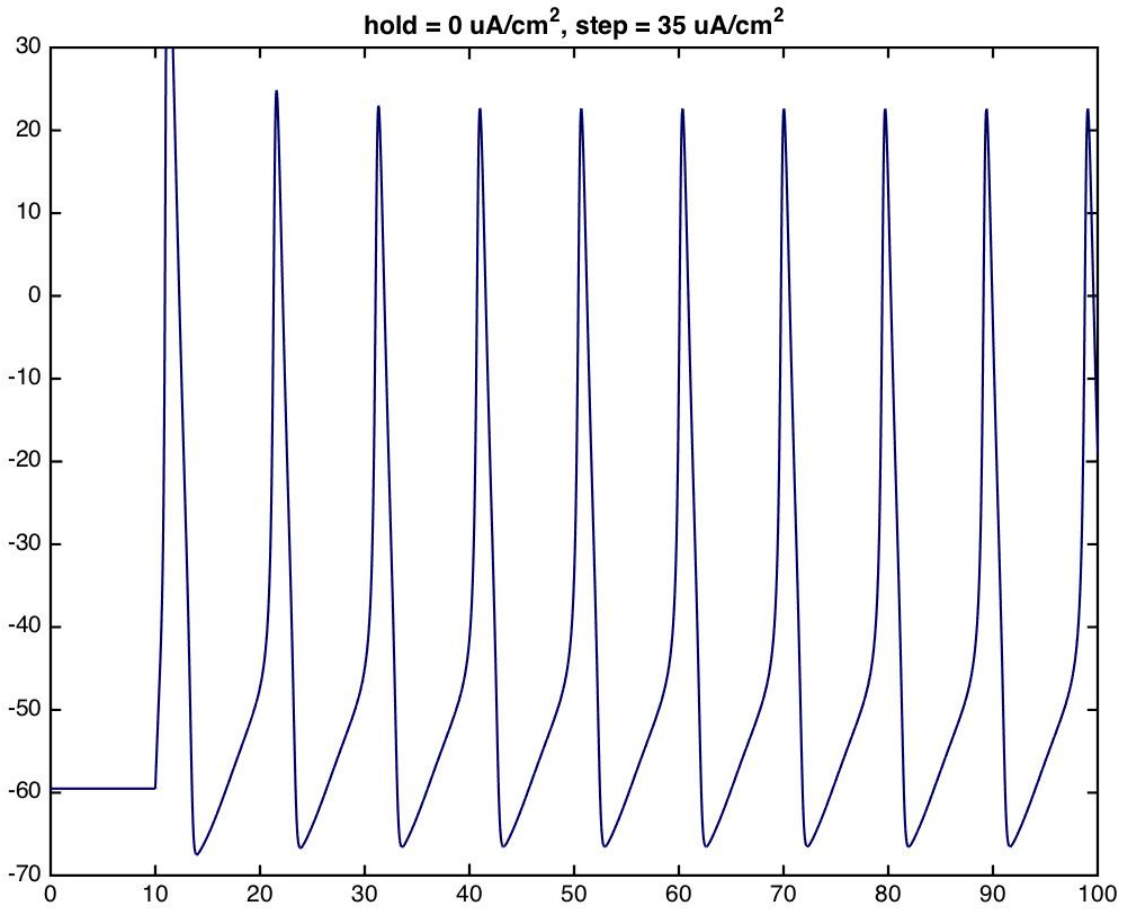

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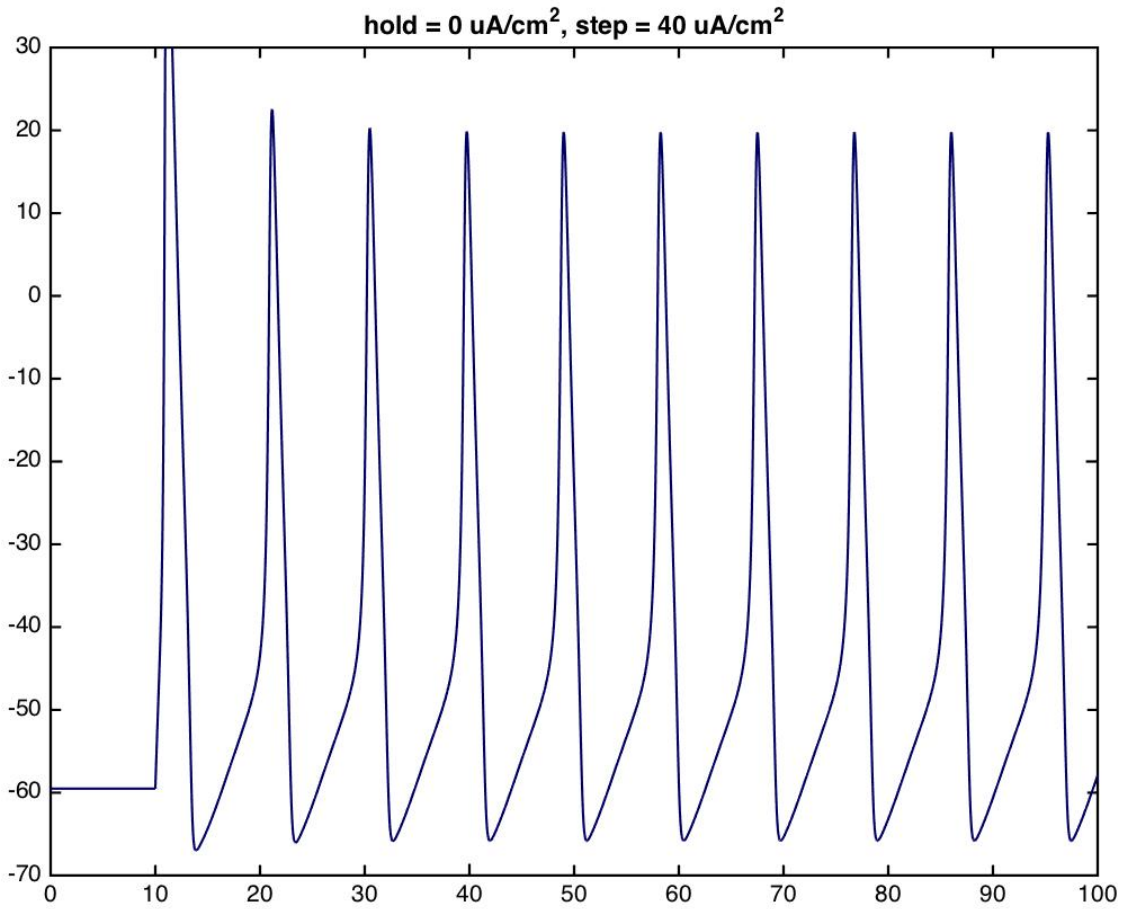

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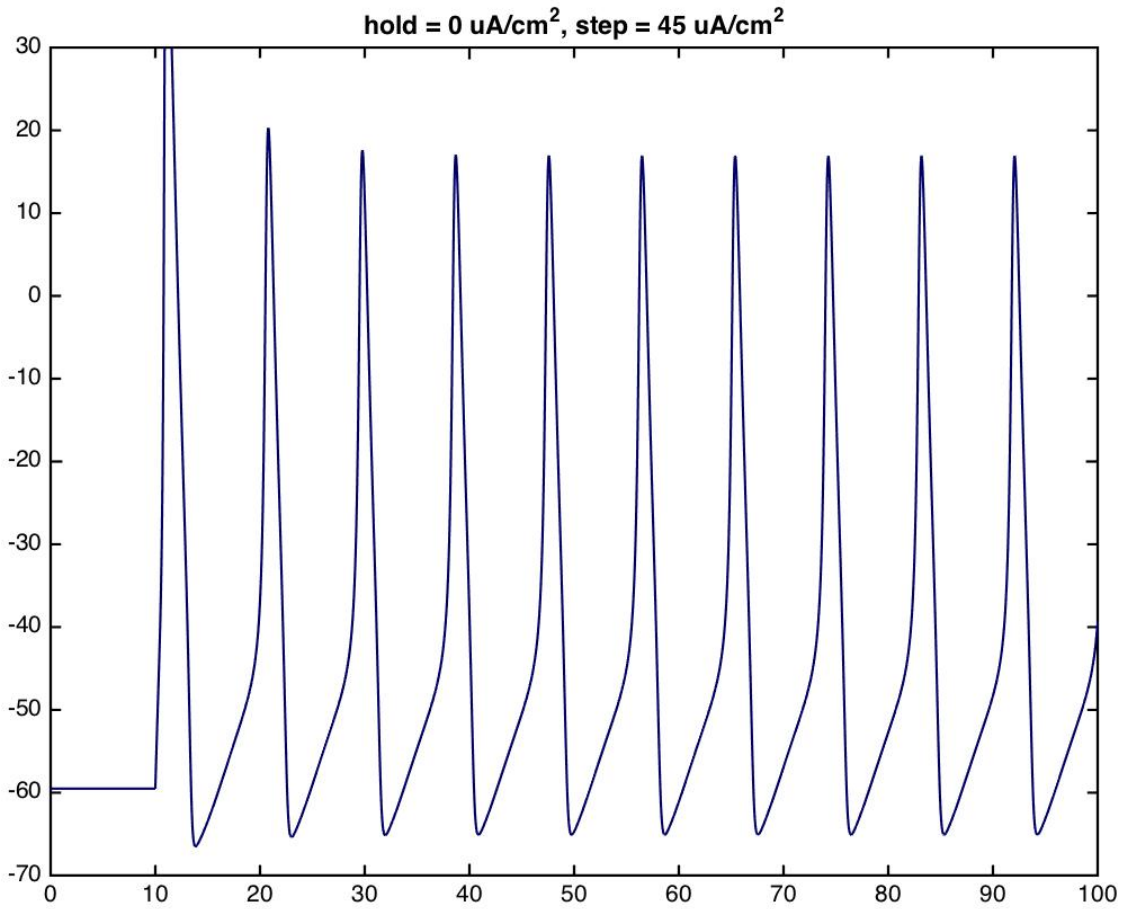

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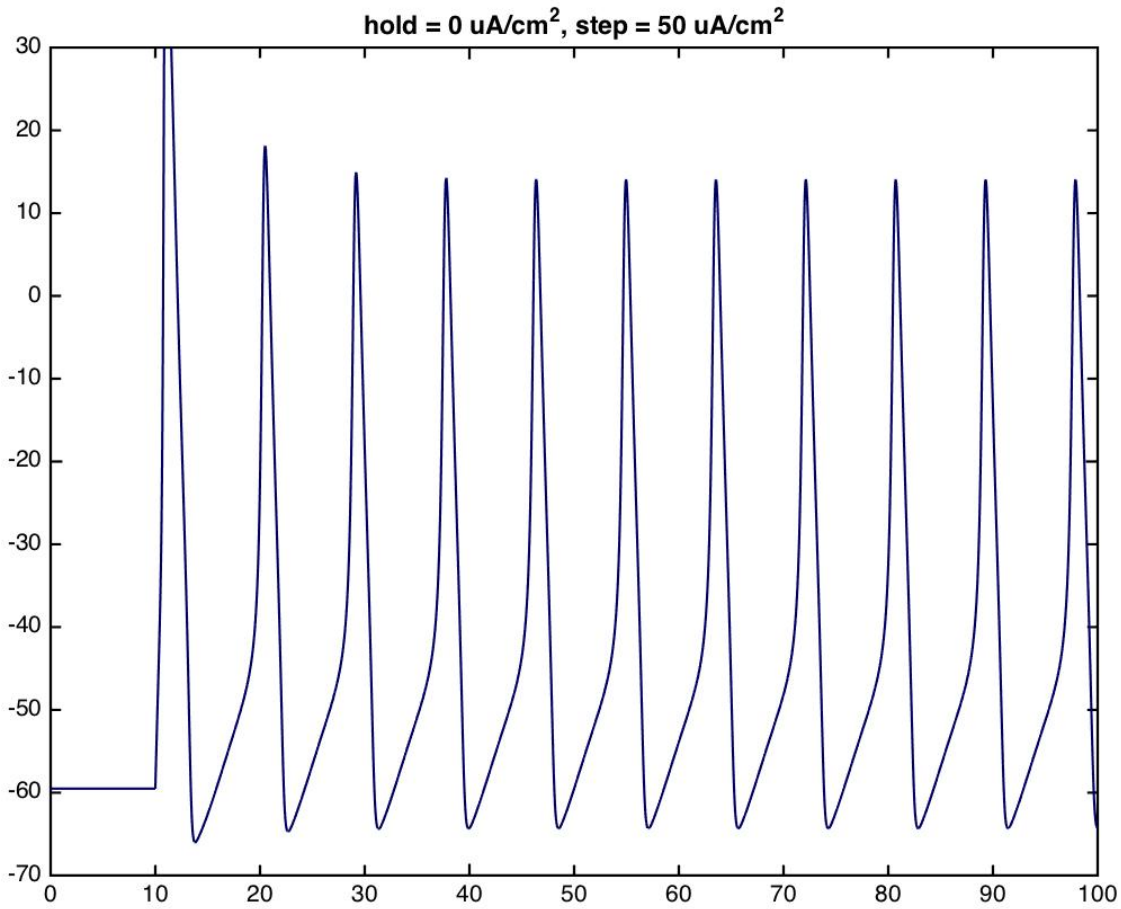

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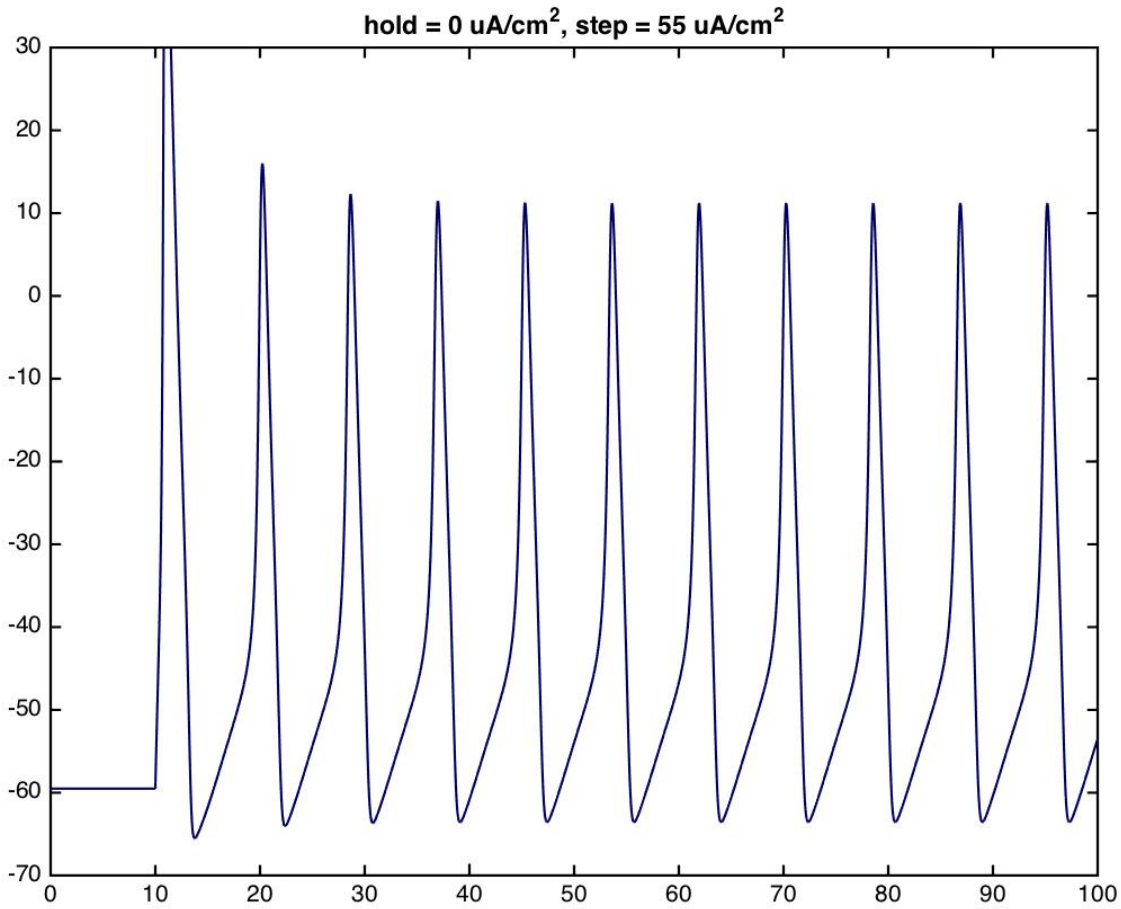

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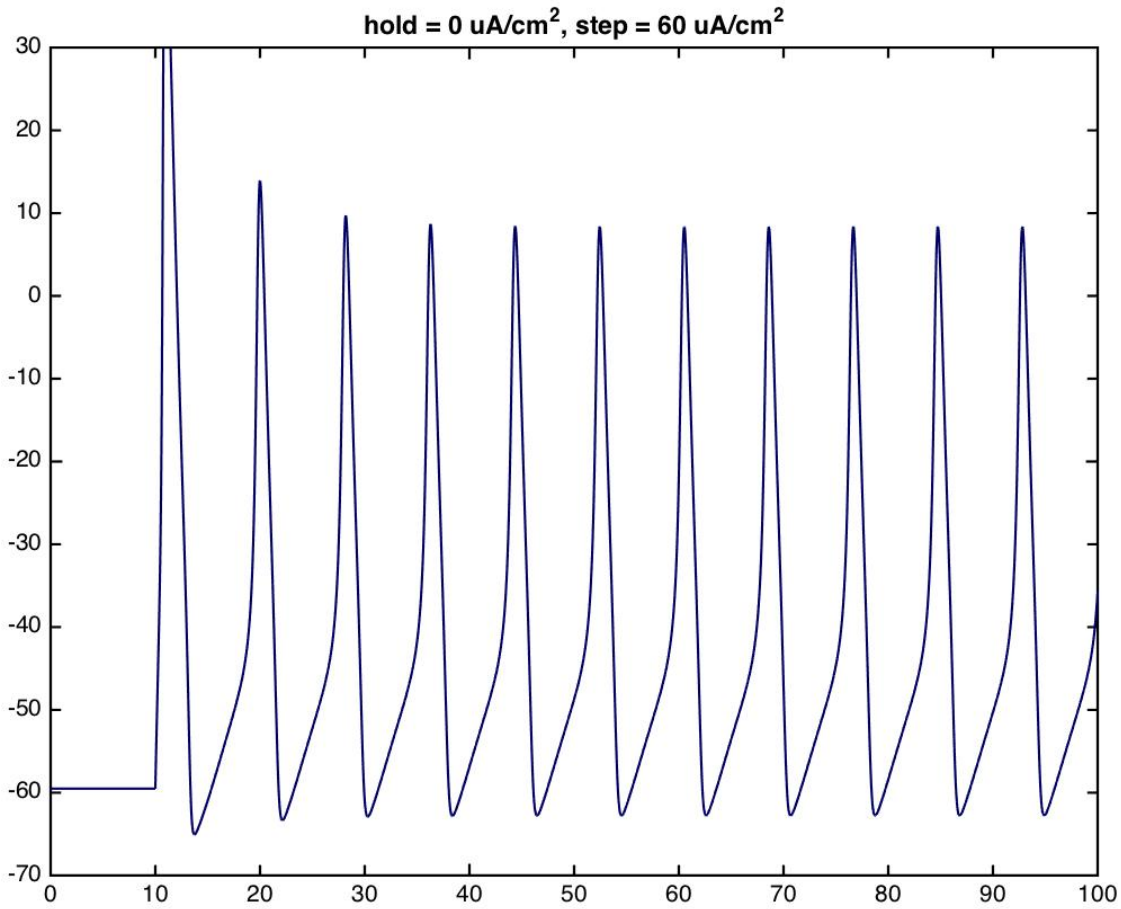

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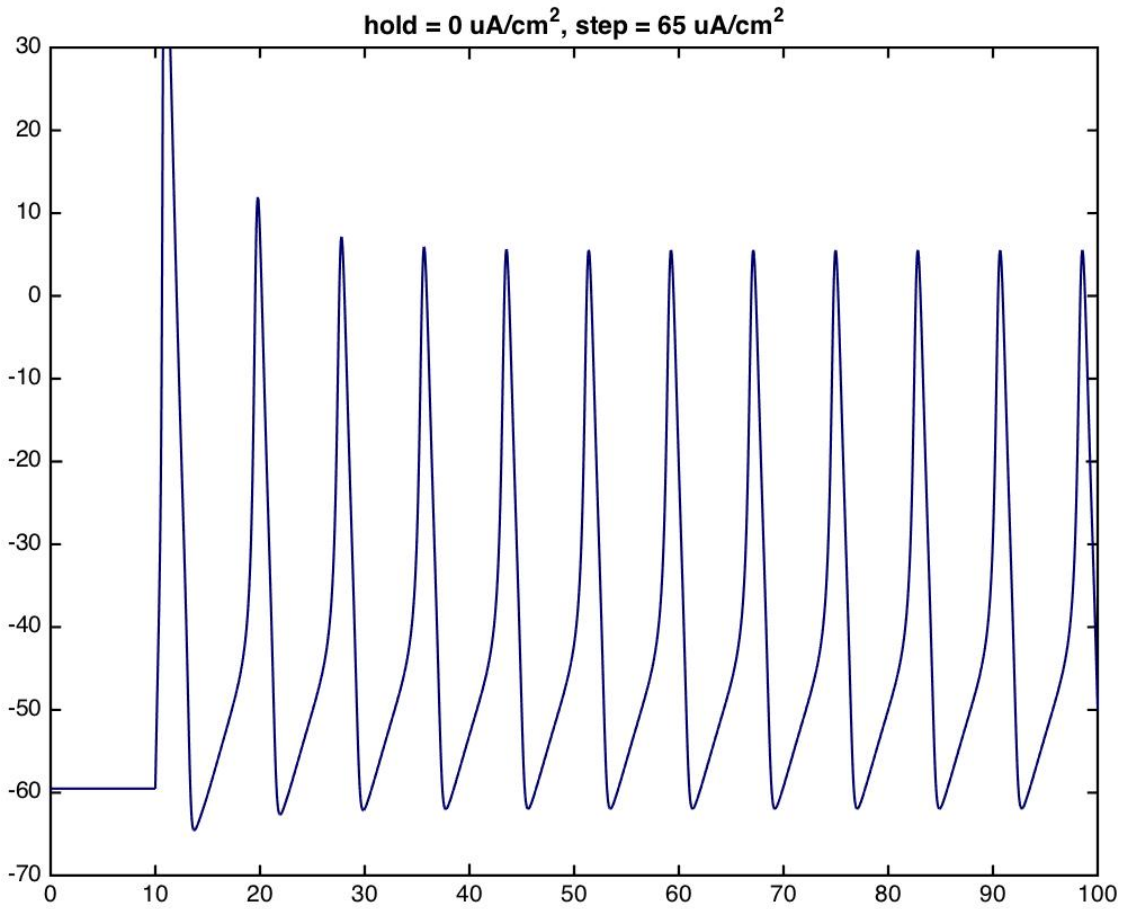

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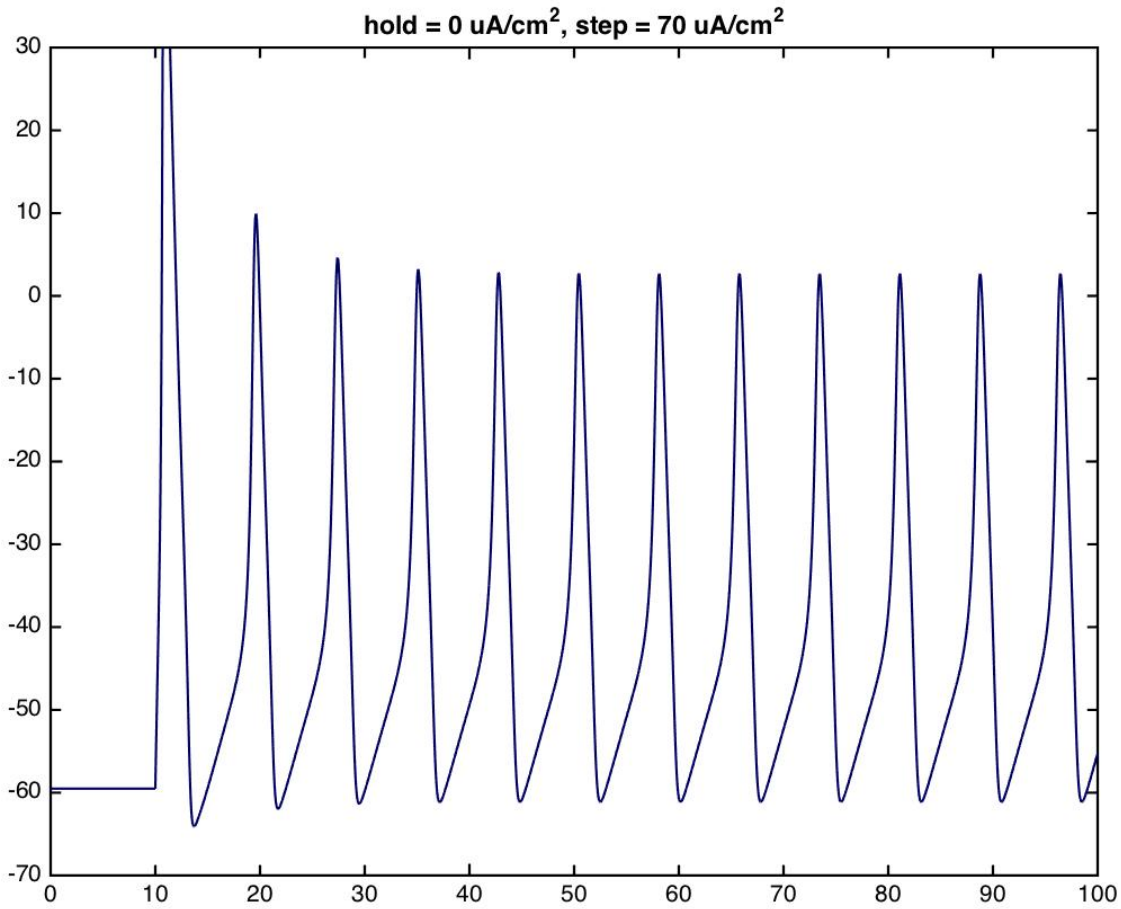

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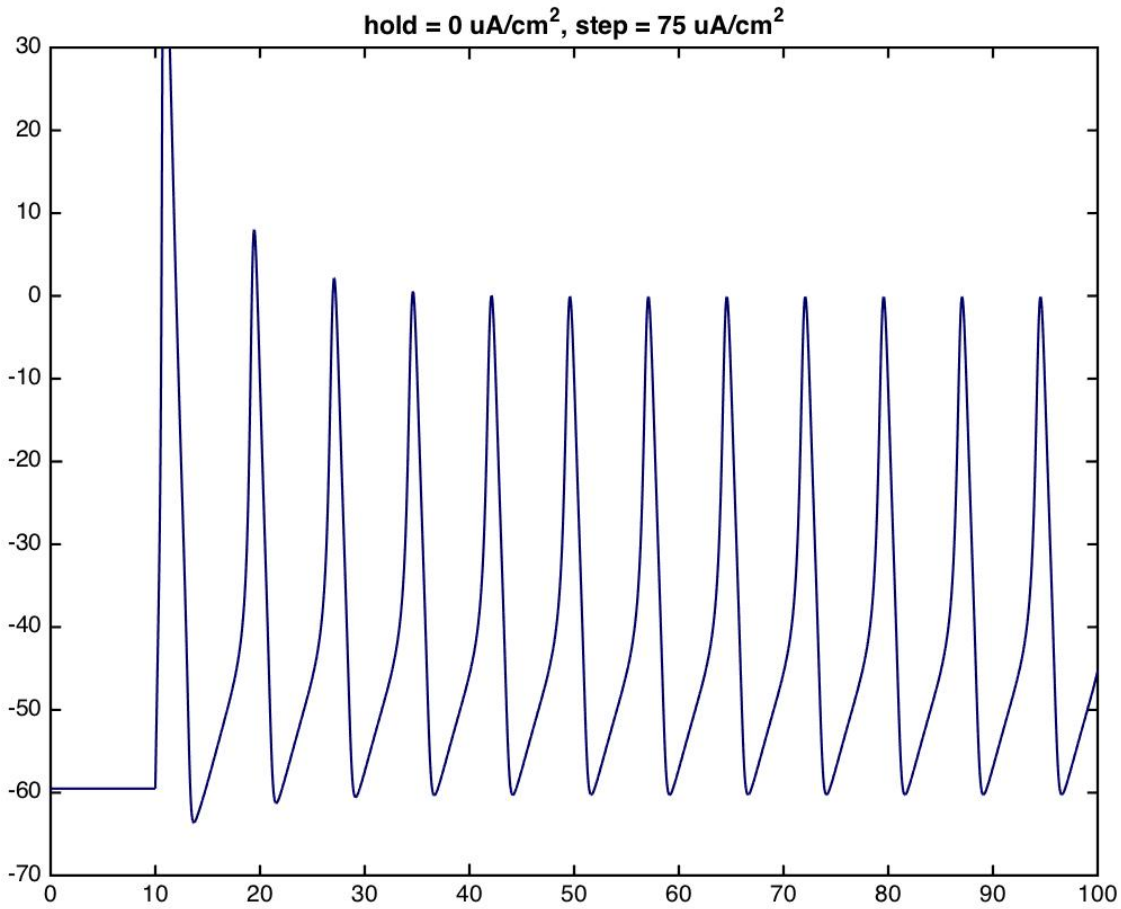

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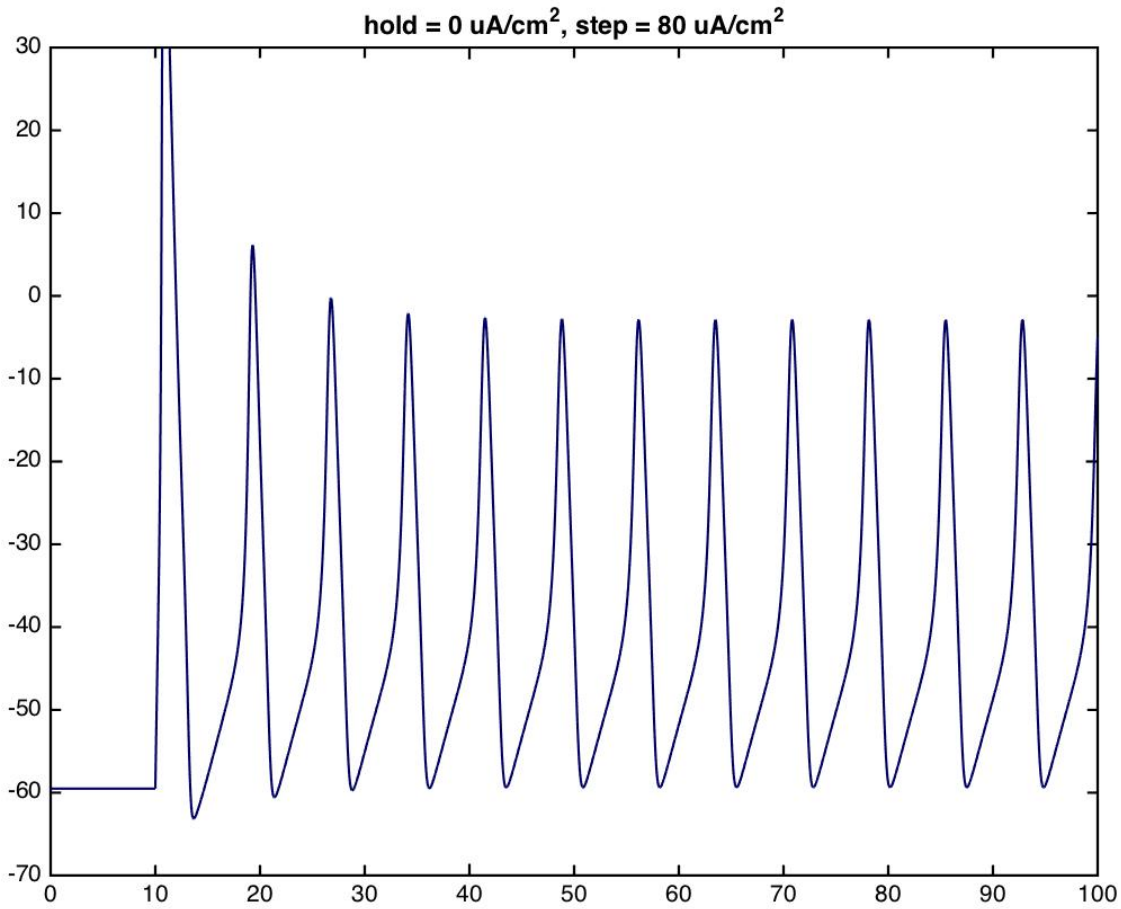

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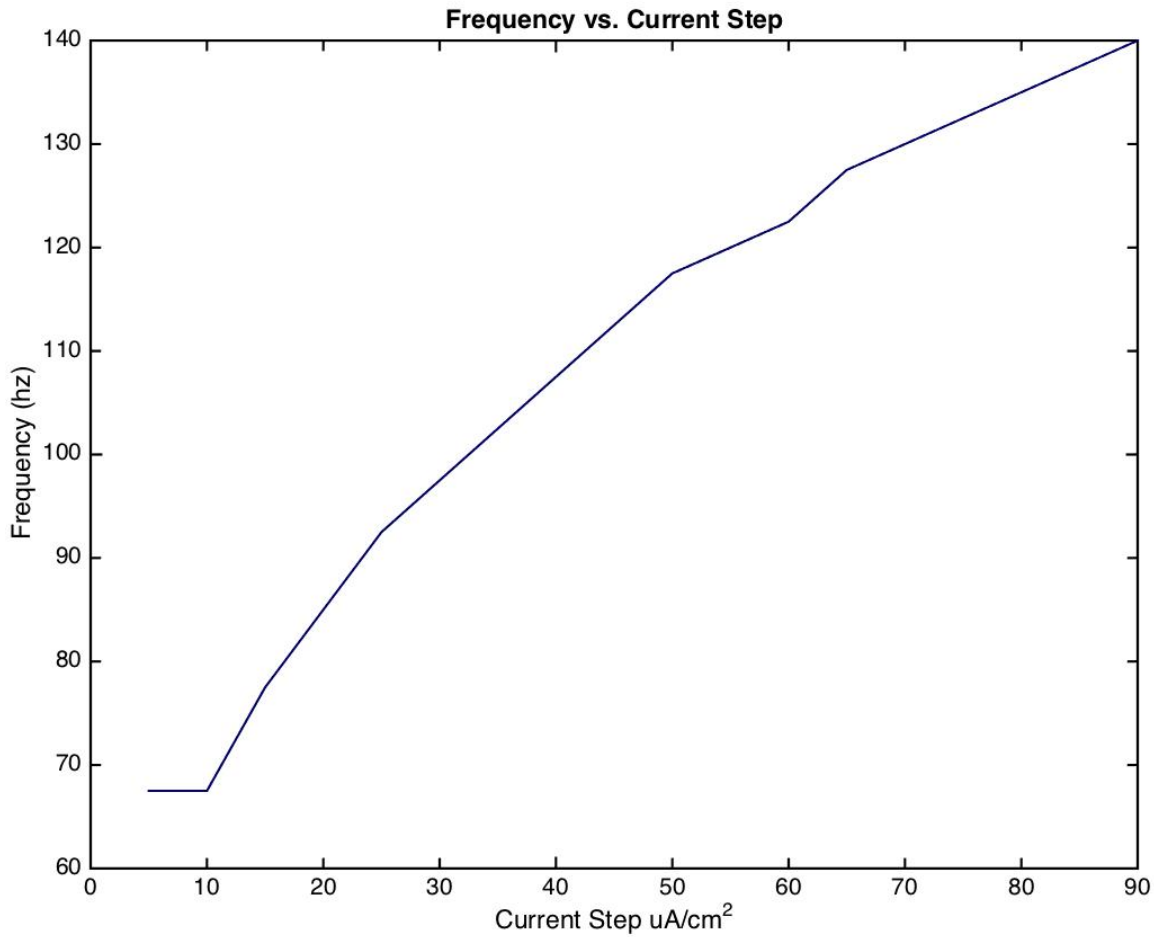
Finding train frequency; LSSA

To find the train frequency we used the Least-Squares spectral analysis method (LSSA). LSSA is a method of estimating a frequency spectrum, based on a least squares fit of sinusoids to data samples, similar to Fourier analysis.

It works *better* than Fourer Analysis on data with variable time intervals such as the ones we are studying.

Train frequency over increasing input step



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Issues with precision approximation

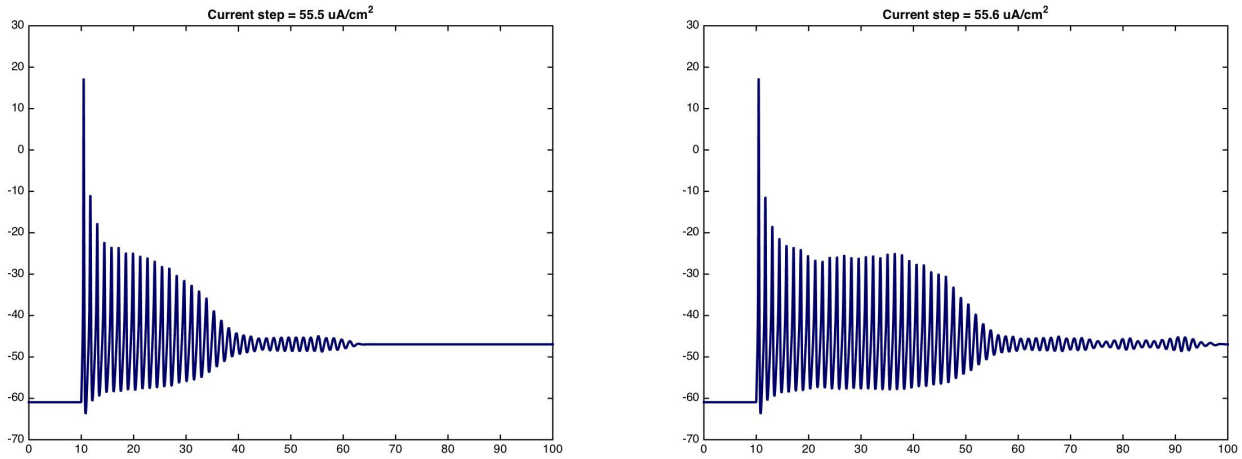

Figure : Incorrect behavior due to low precision

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References

1. Weiss, T. F. (1995).Cellular Biophysics. Volume 1: Transport, MIT Press.
2. Weiss, T. F. (1995).Cellular Biophysics. Volume 2: Electrical Properties, MIT Press.
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4. Gerstner, Wulfram, and Werner M. Kistler. Spiking neuron models: Single neurons, populations, plasticity. Cambridge university press, 2002.
5. Press, William H., and George B. Rybicki. "Fast algorithm for spectral analysis of unevenly sampled data." The Astrophysical Journal 338 (1989): 277-280.