Step current response of the HH Model

Eleftherios Ioannidis
elefthei@mit.edu

James Hobin
hobinjk@mit.edu

MIT EECS

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

HH Model Step Current Response

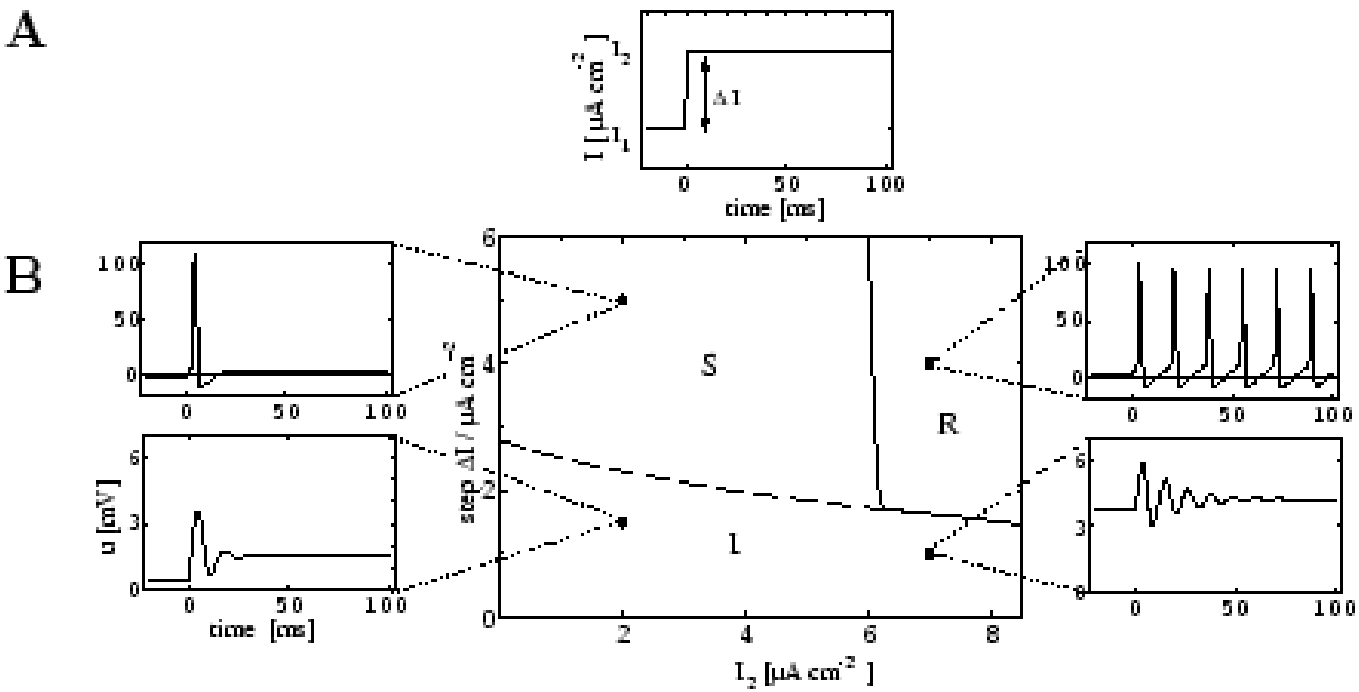

Figure : Step Current Stimulation Phase diagram

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Applications: Refractory Period

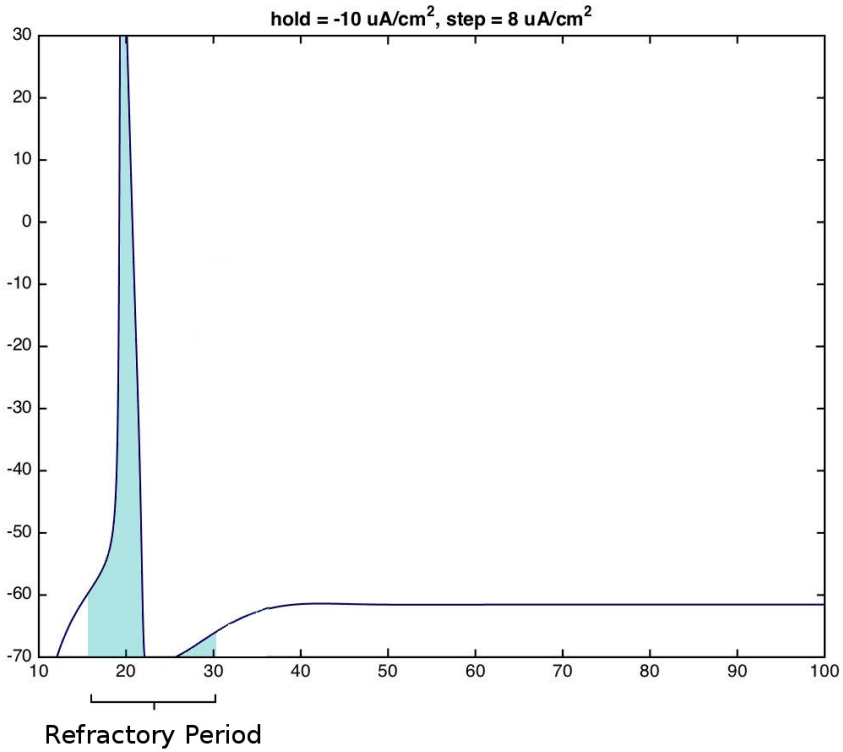


Figure : Reducing the Refractory Period can lead to faster reflexes.

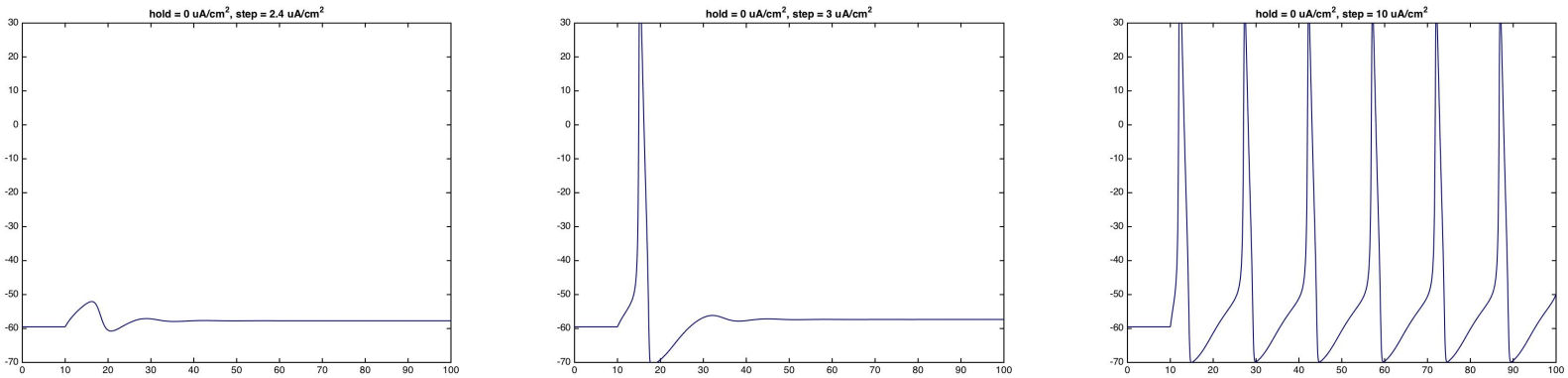


Figure : Response in the *Ringing*, *Single AP* and *AP Train* regions

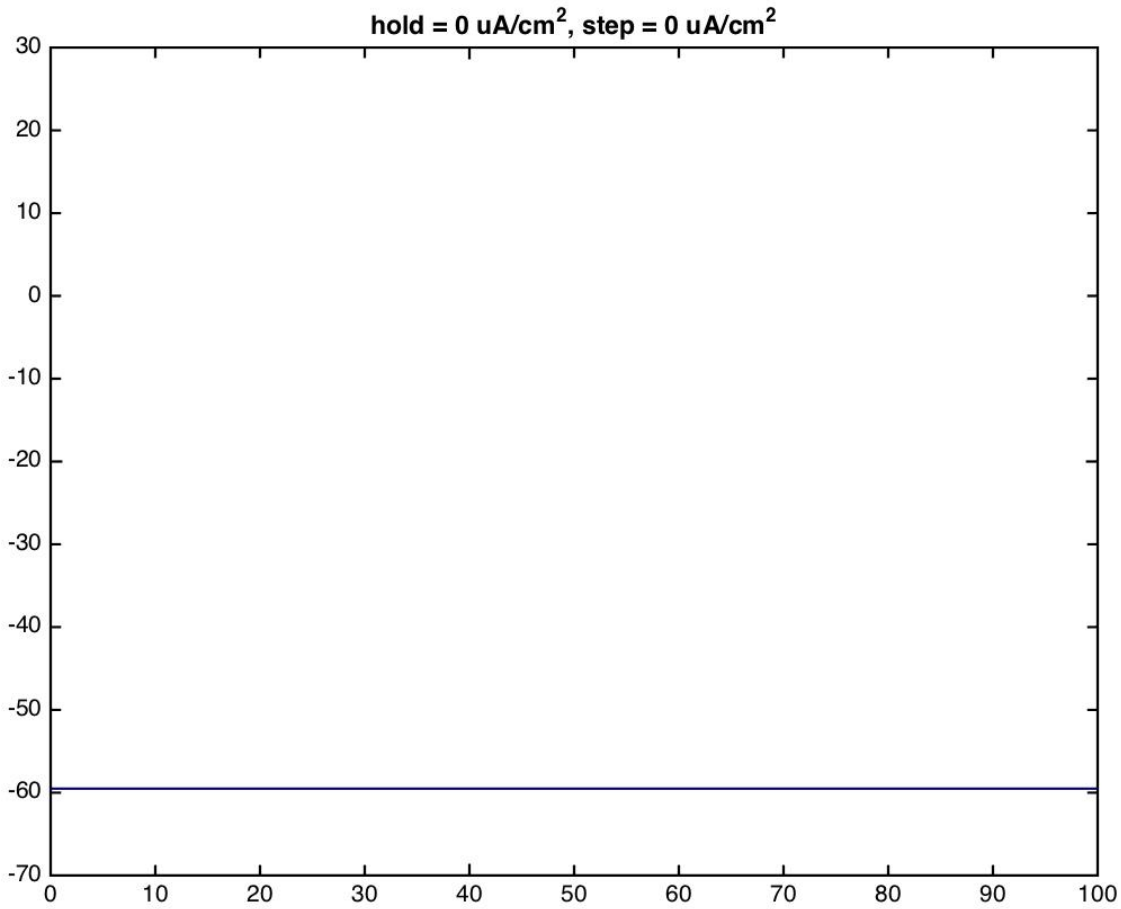
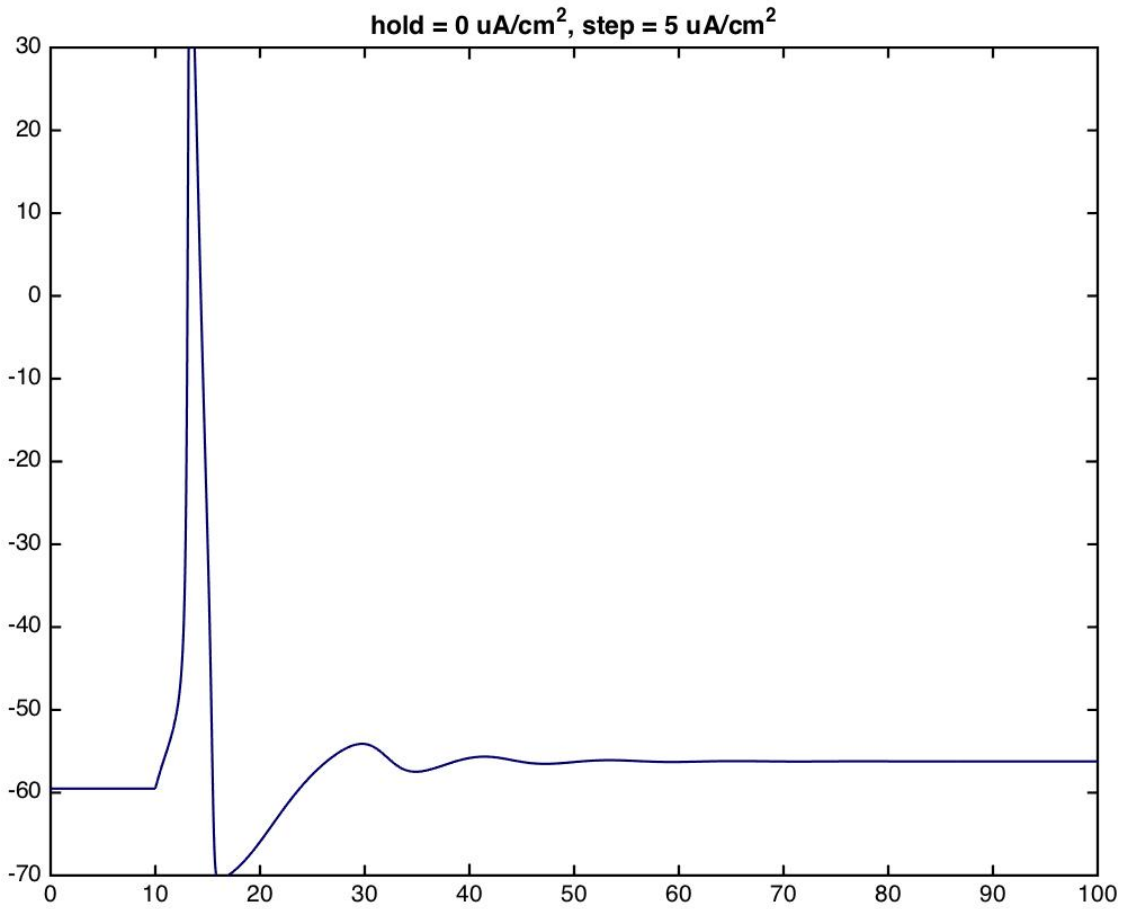


Figure : HH Model's step current response starting at 0 $\mu A/cm^2$



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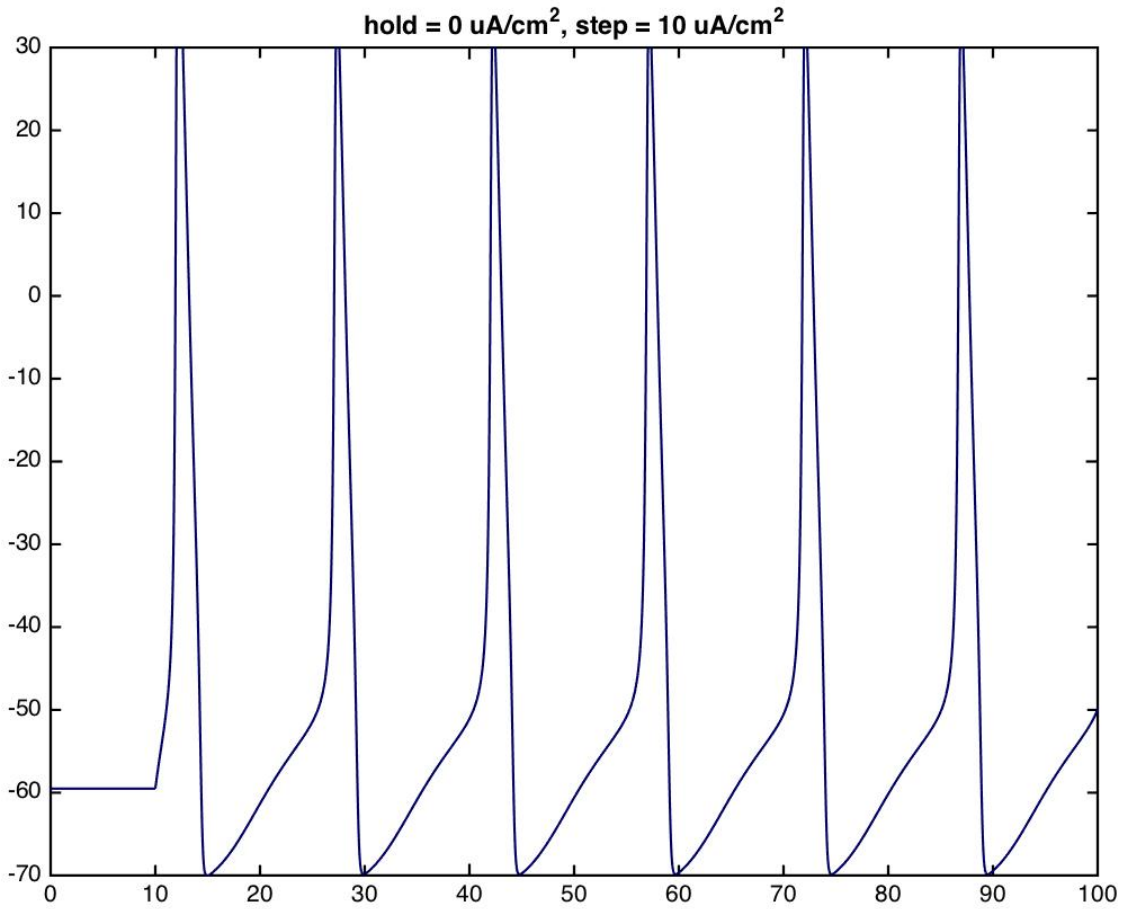

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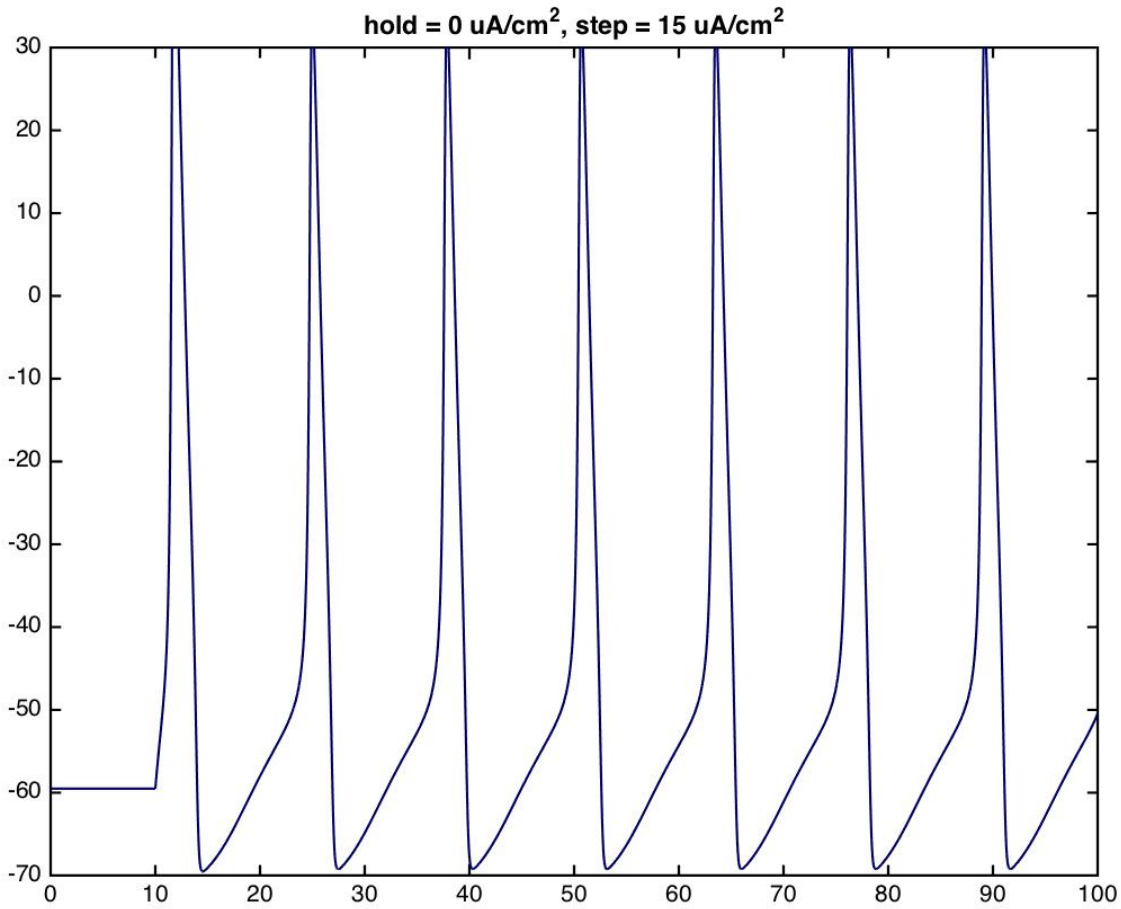

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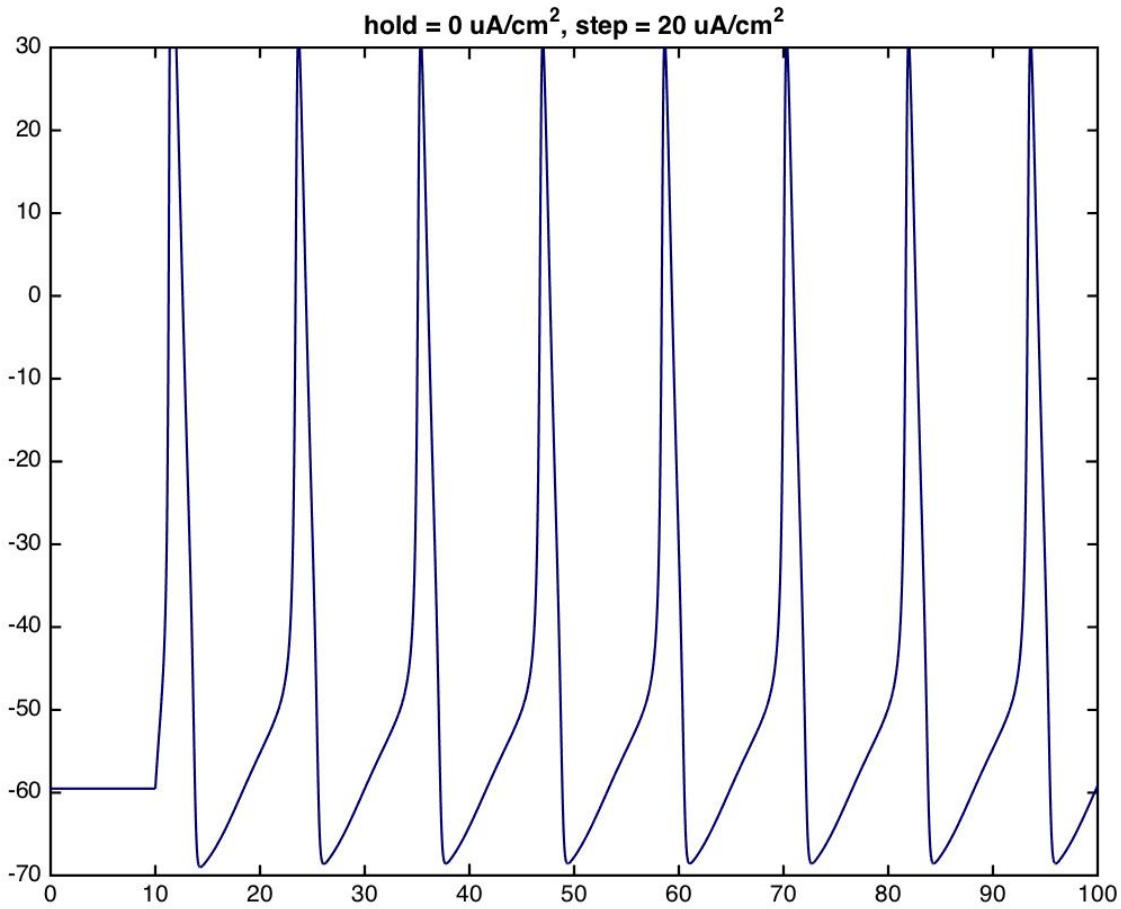

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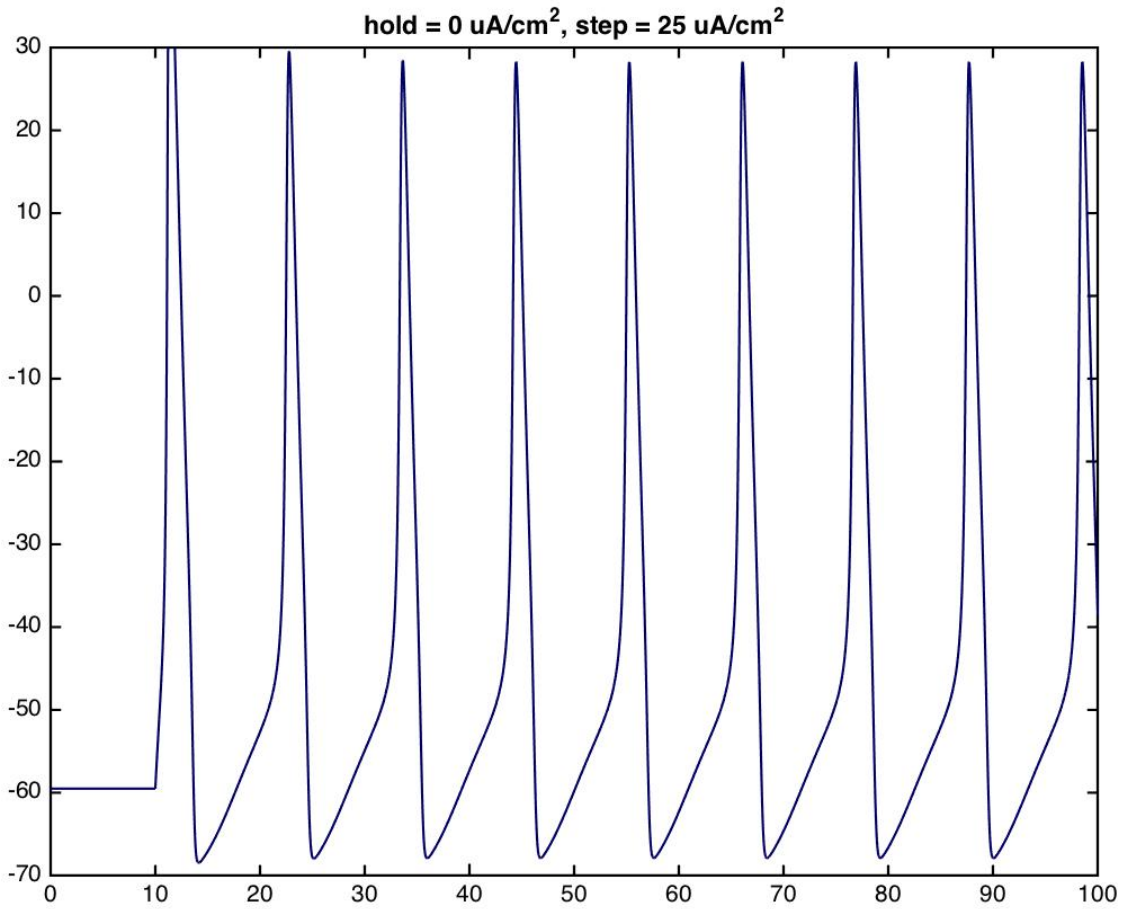

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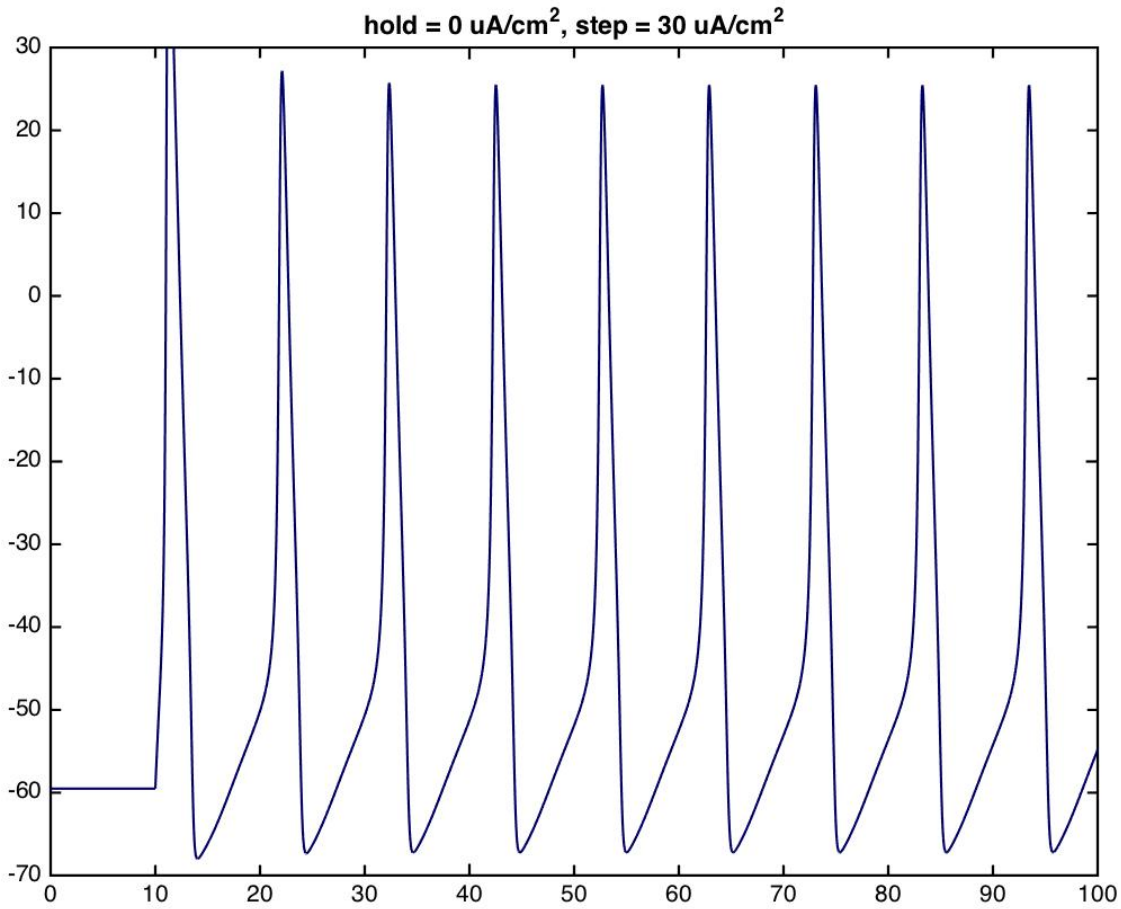

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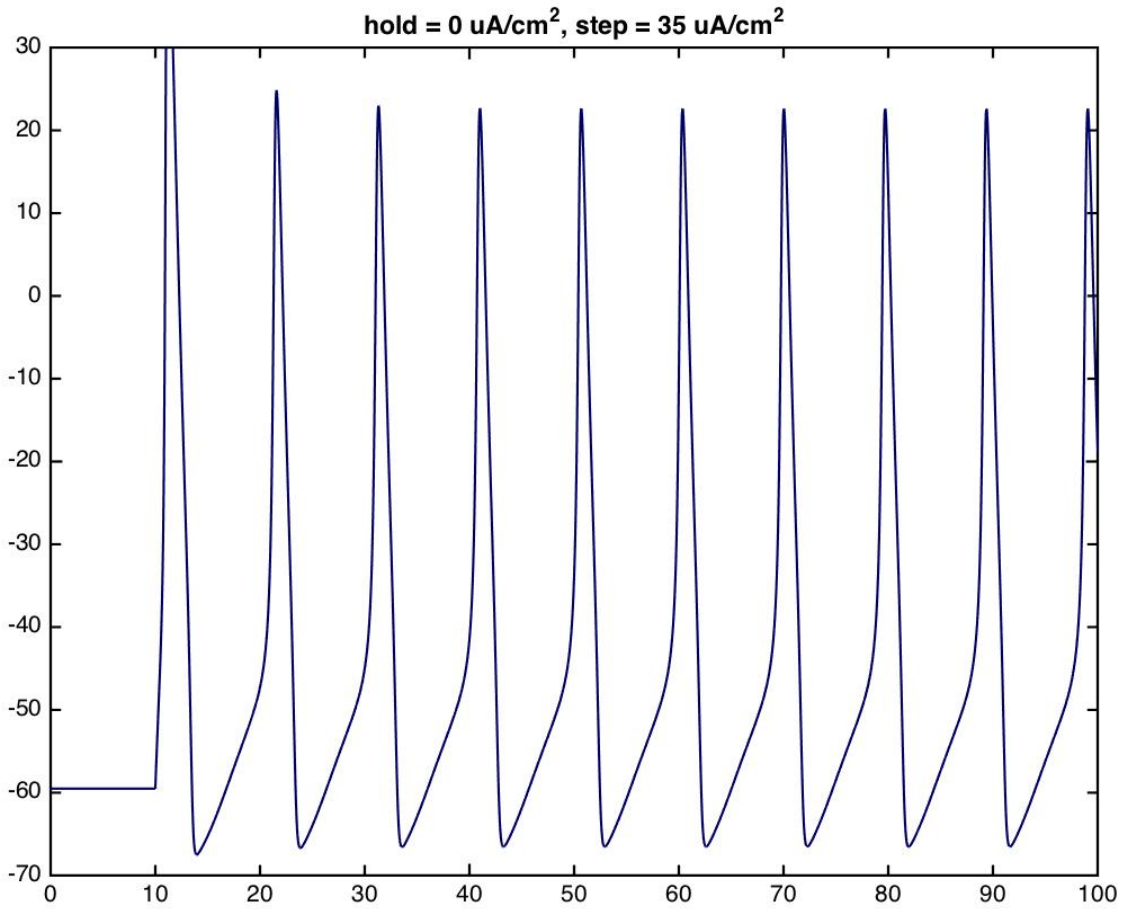

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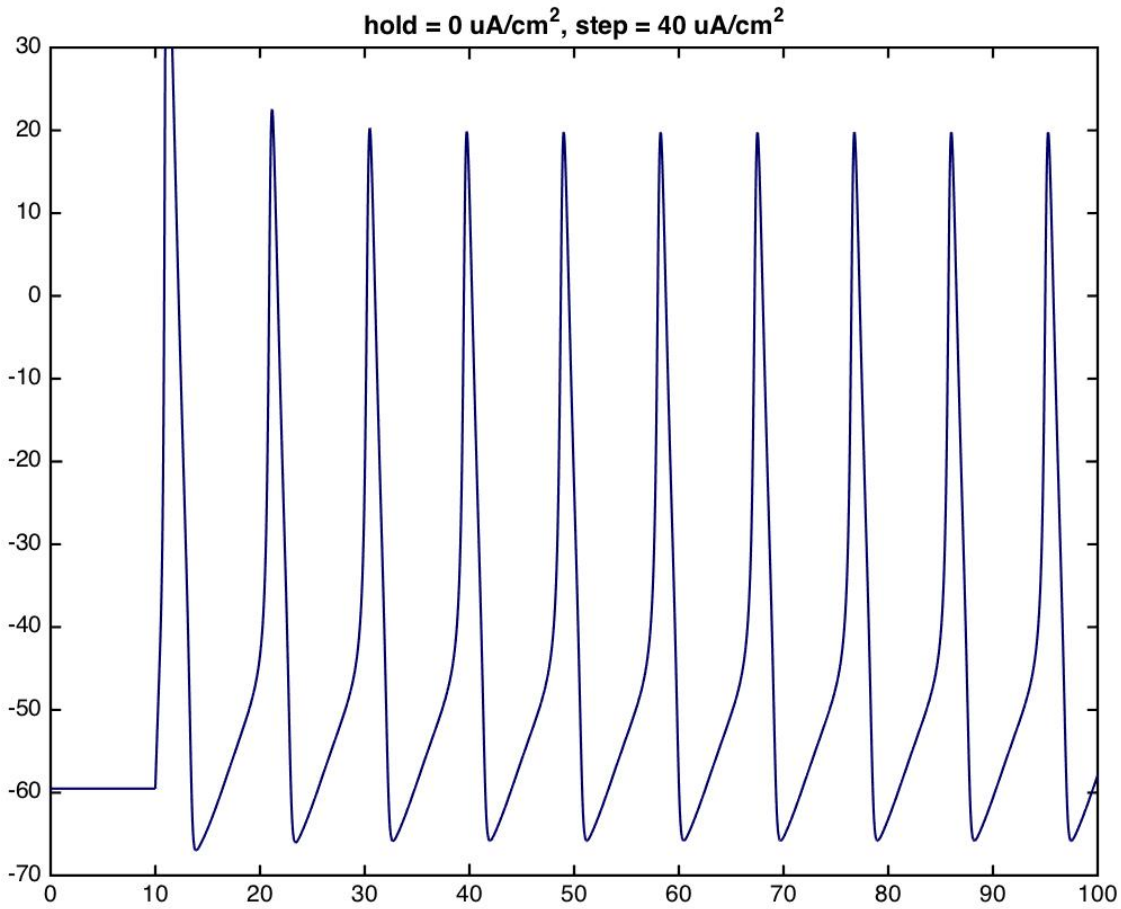

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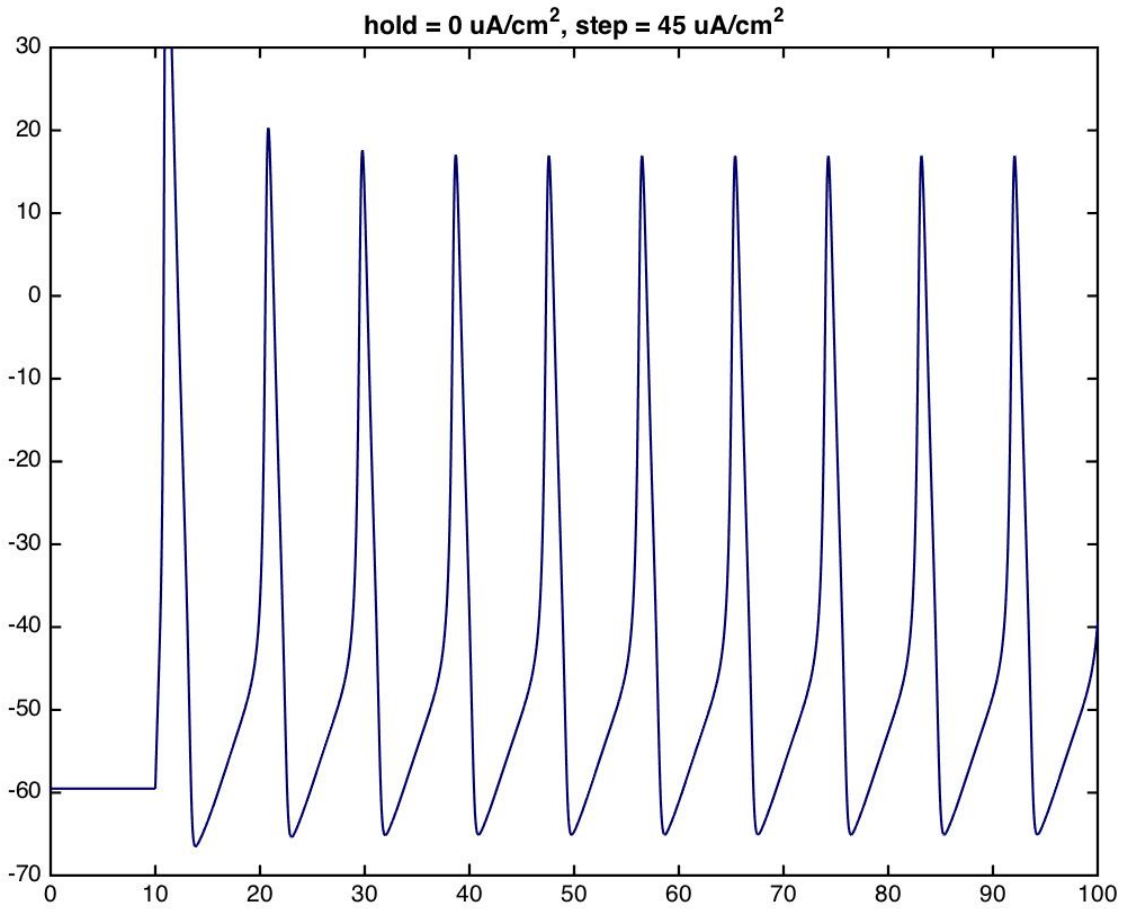

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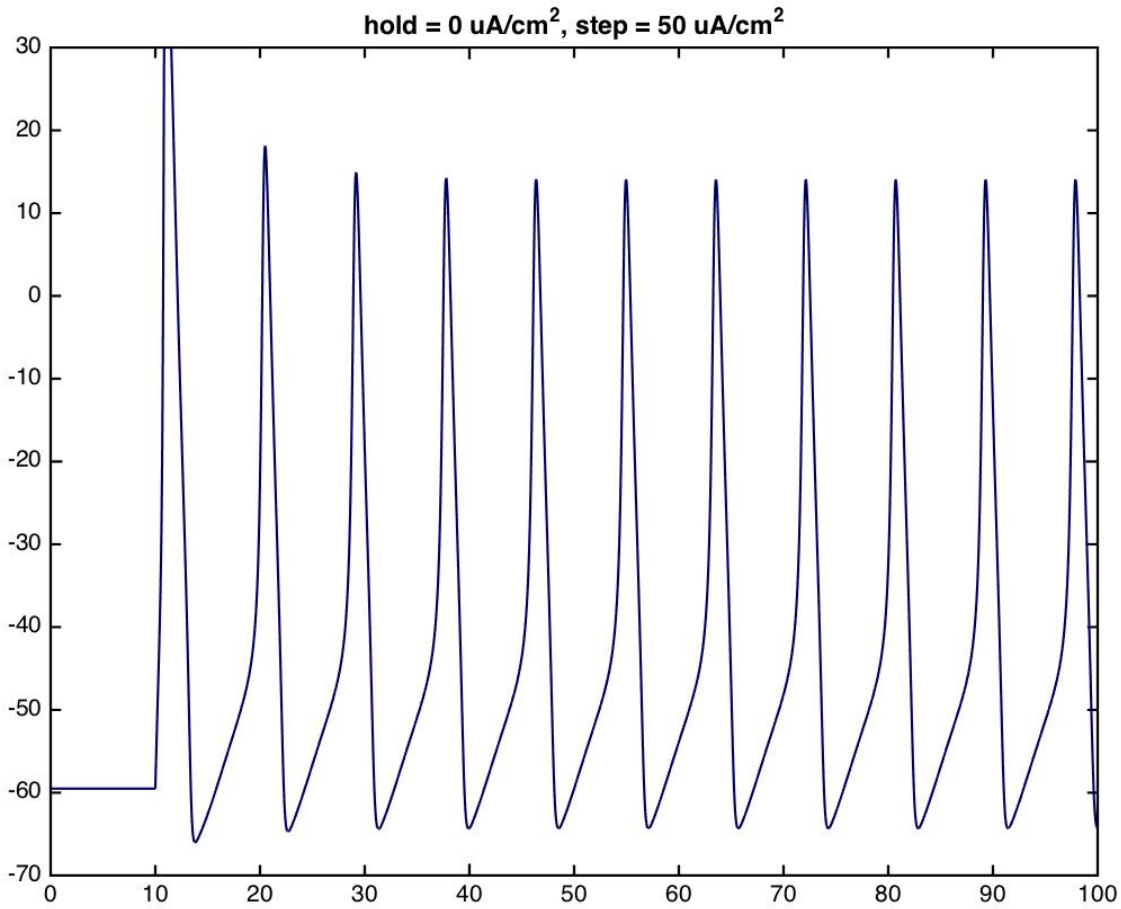

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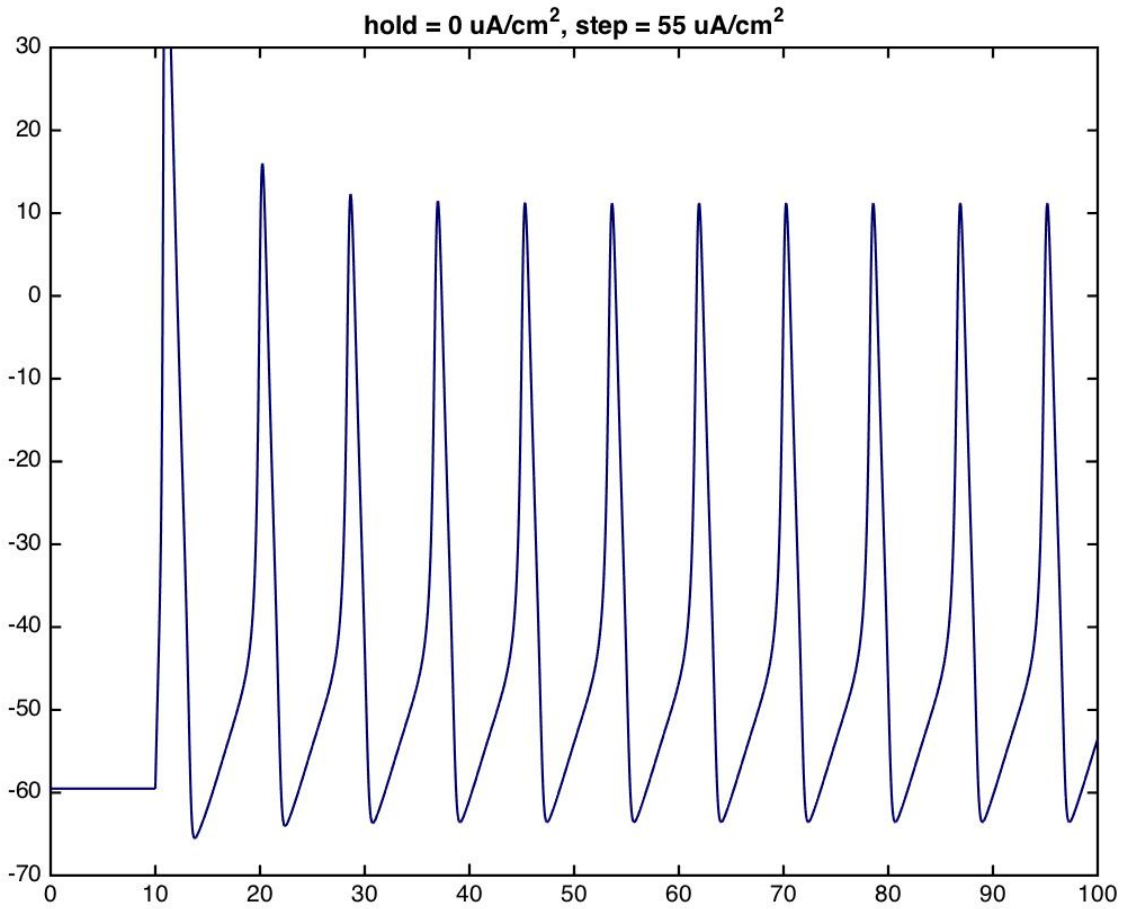

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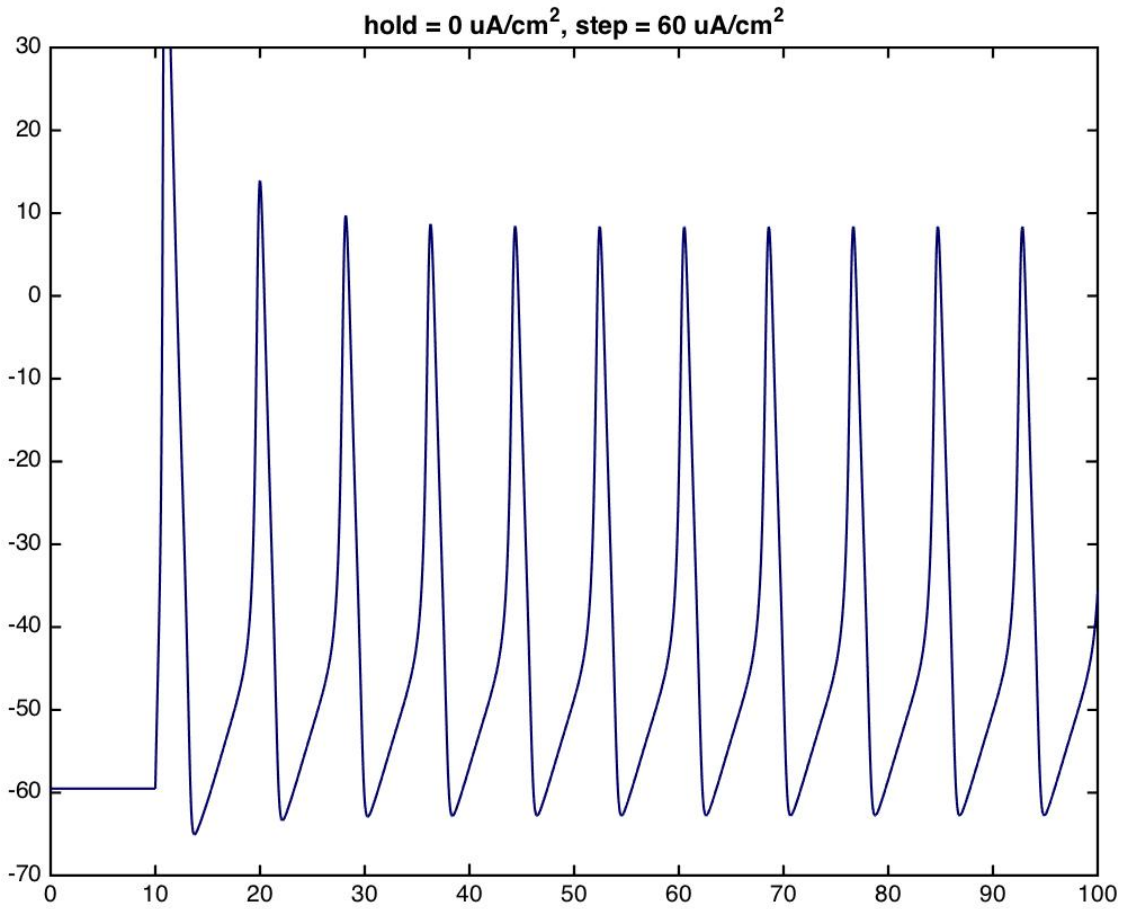

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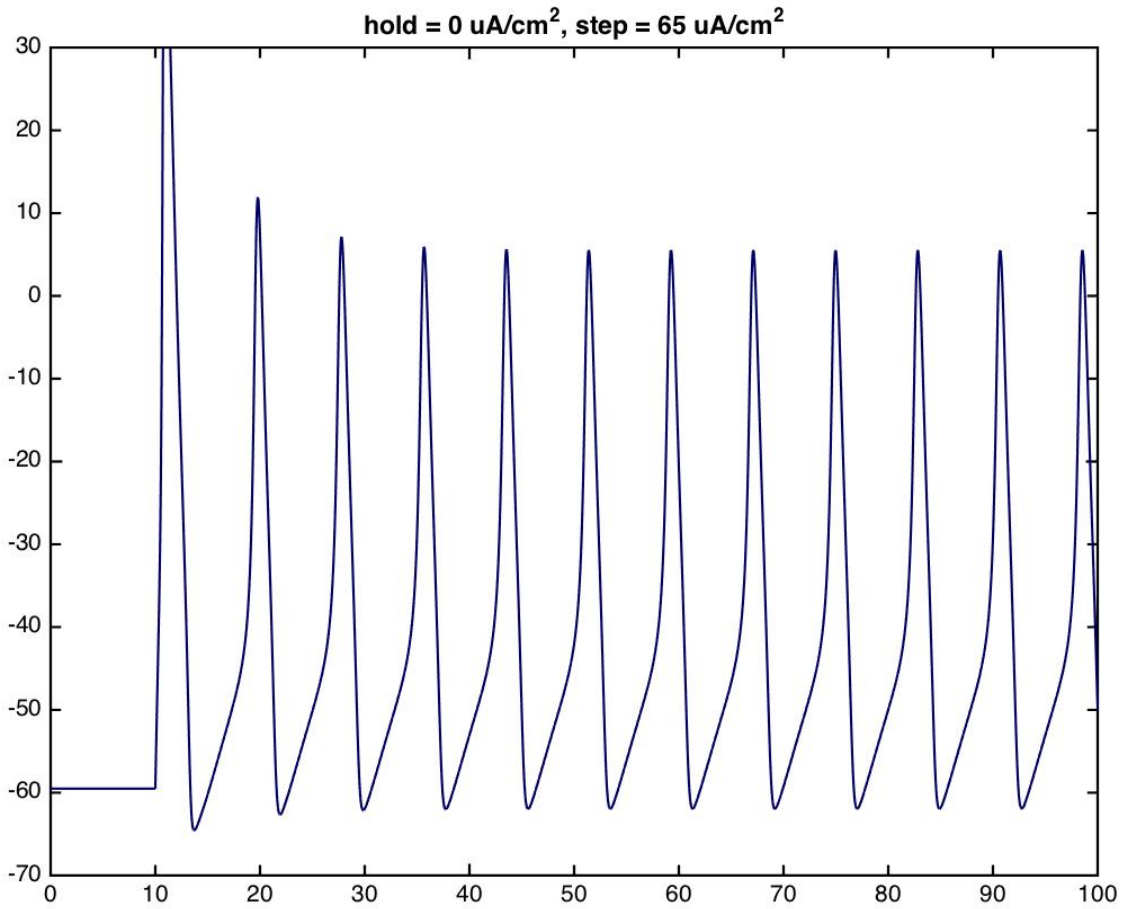

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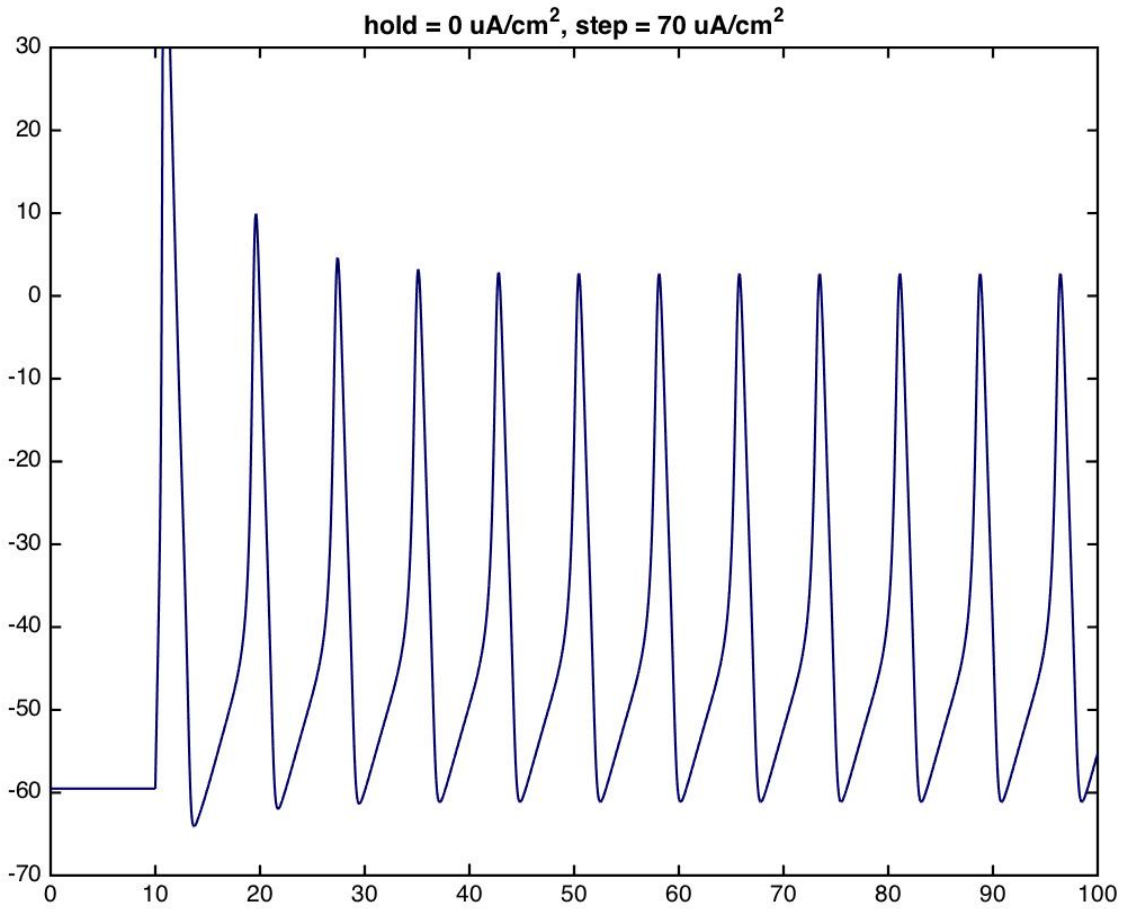

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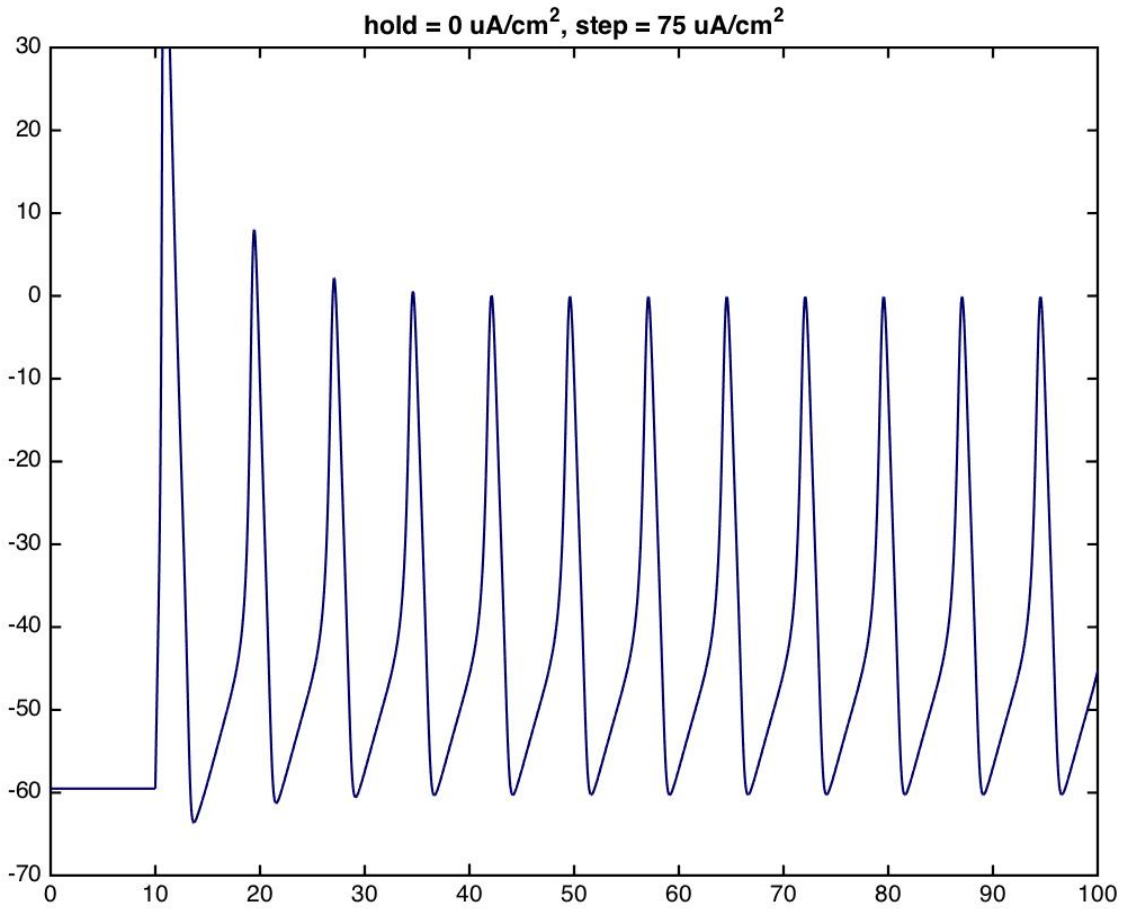

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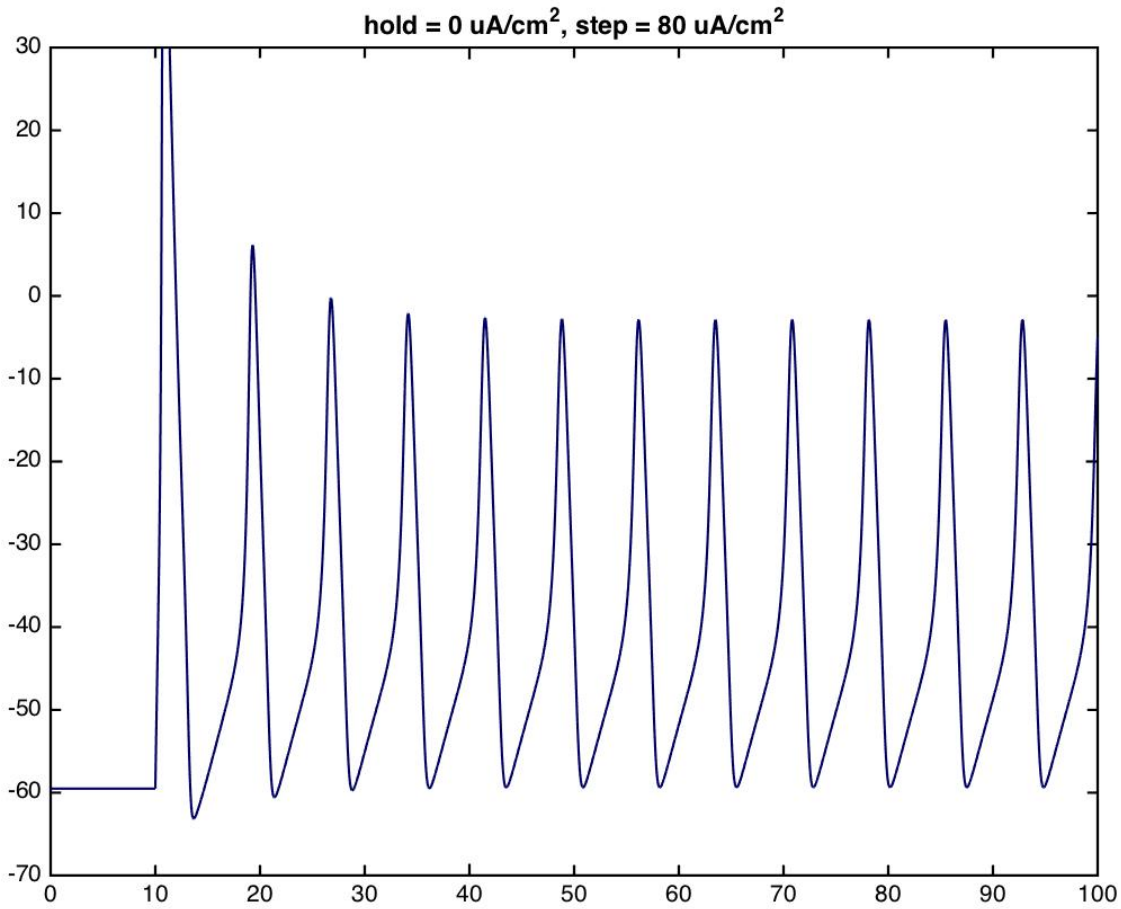

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Fourier Transform insufficient: Inconsistent Time Intervals

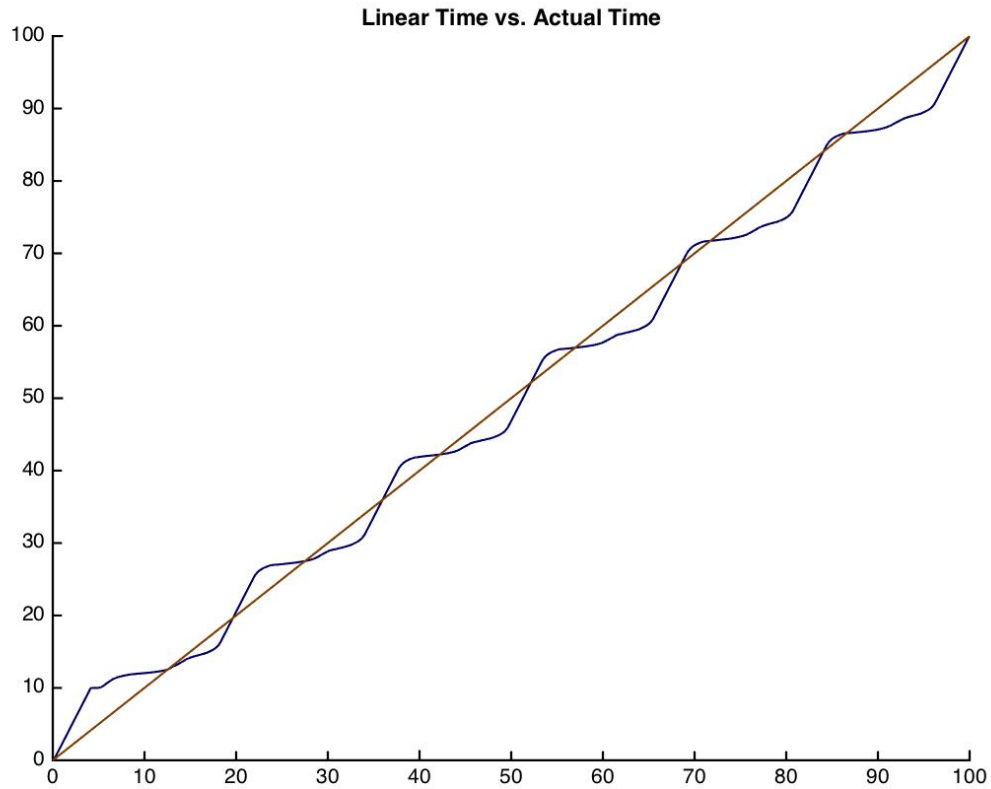


Figure : FFT insufficient, need a better Spectral Analysis Method

Least-squares spectral analysis

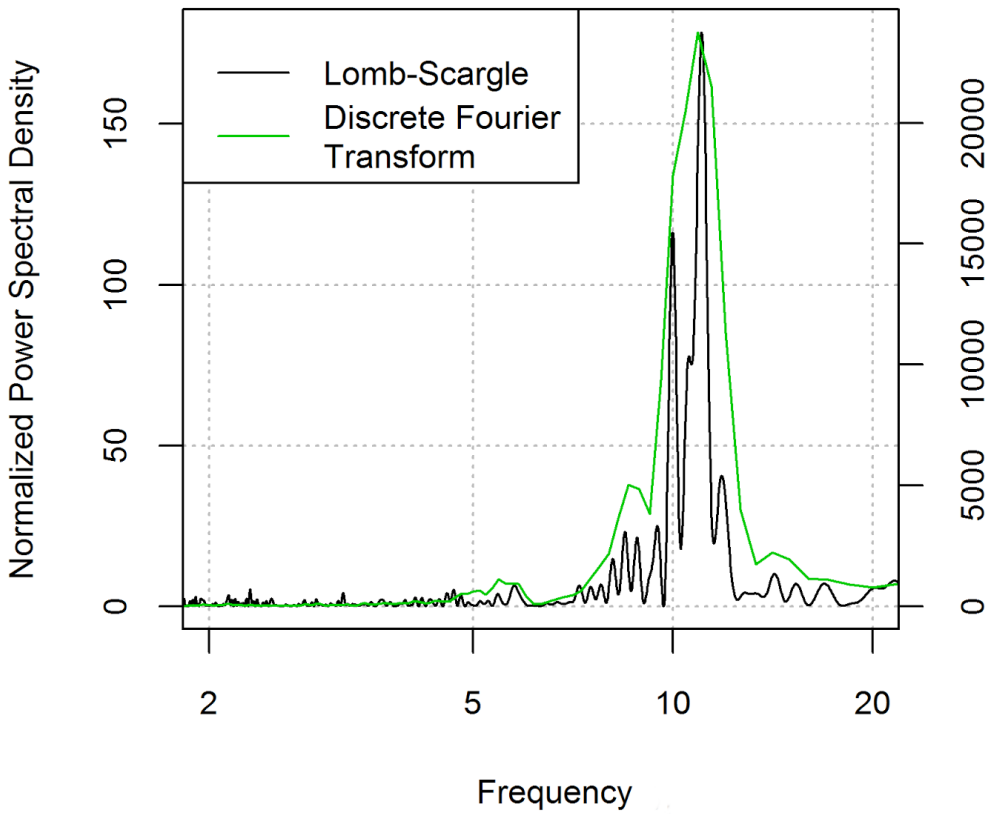
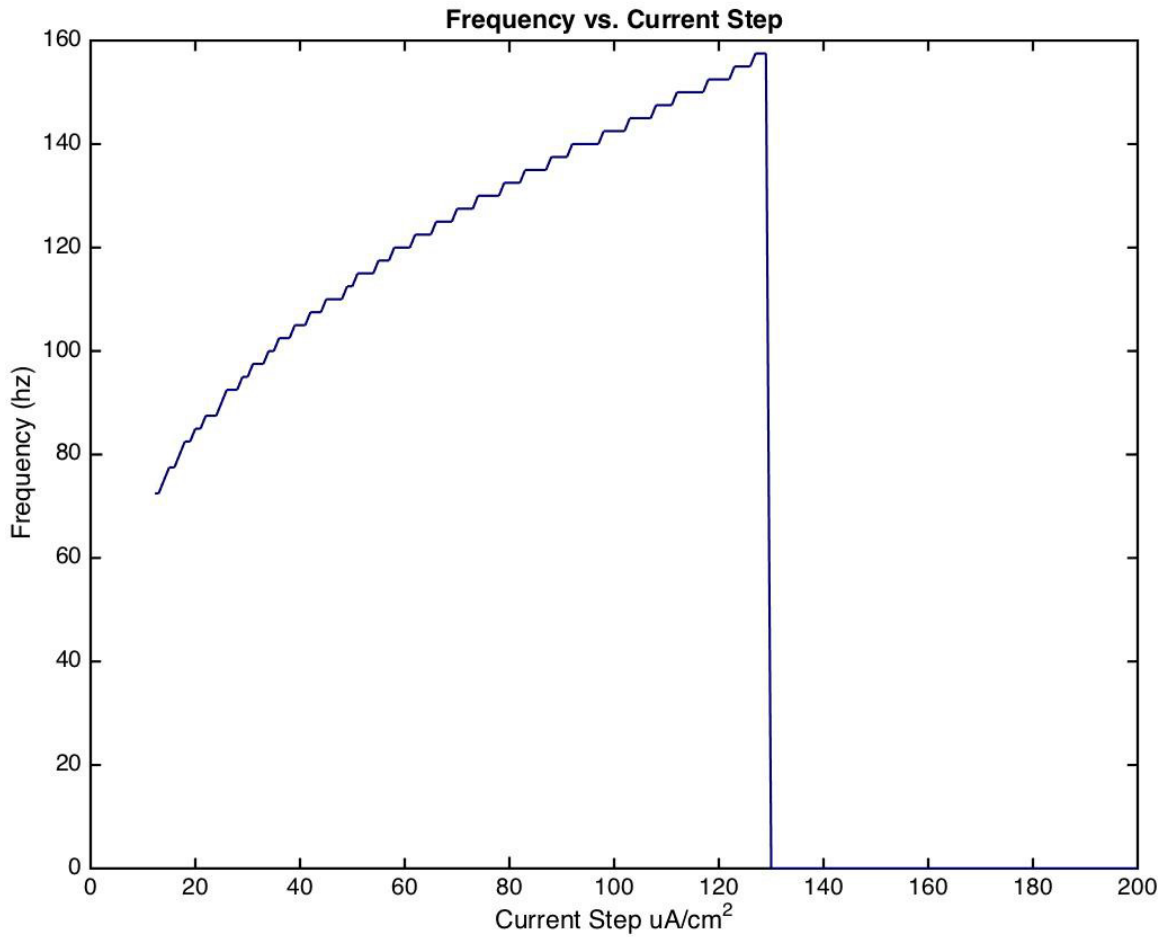


Figure : The Lomb-Scargle Periodogram works with variable intervals.

Train frequency over increasing input step



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Issues with precision approximation

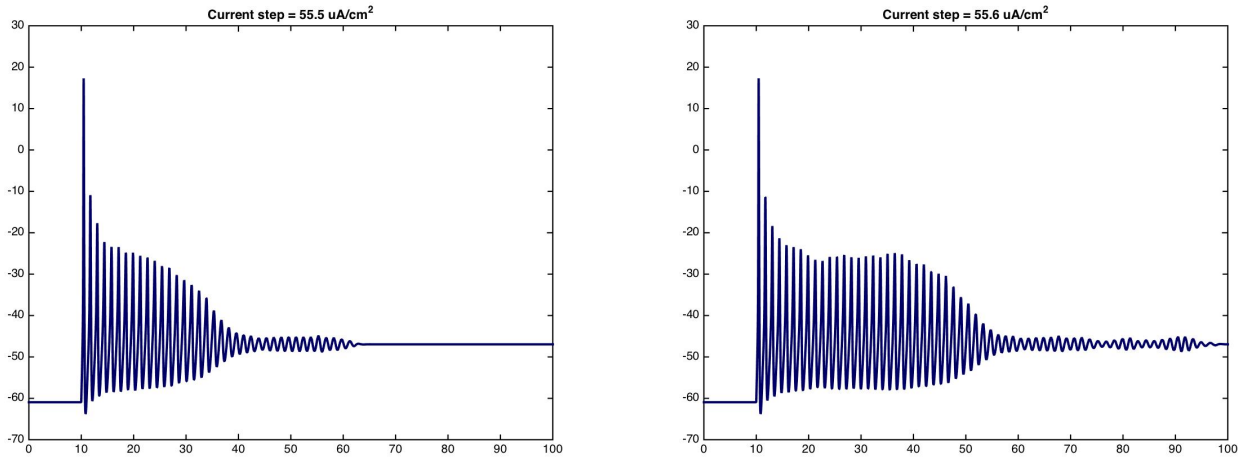

Figure : Incorrect behavior due to low precision

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References

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2. Weiss, T. F. (1995).Cellular Biophysics. Volume 2: Electrical Properties, MIT Press.
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