

# Step current response of the HH Model

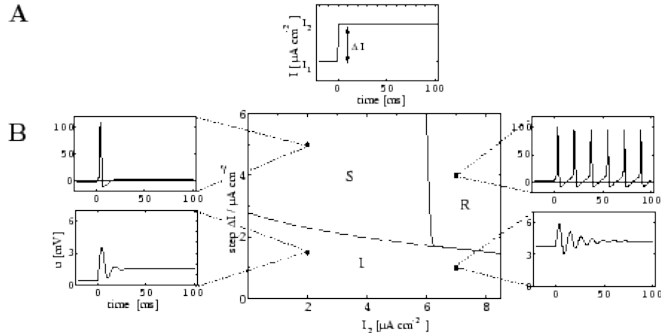
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December 2, 2014

# HH Model Step Current Response



**Figure :** Step Current Stimulation Phase diagram

# Applications: Refractory Period

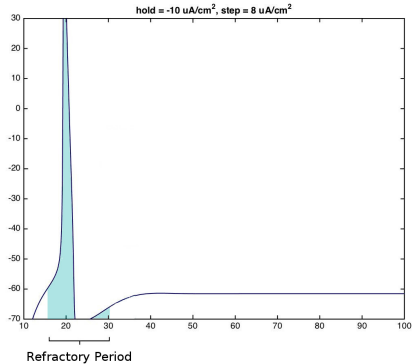


Figure : Reducing the Refractory Period can lead to faster reflexes.

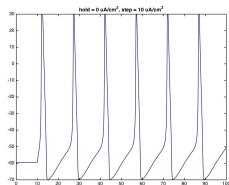
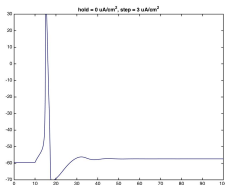
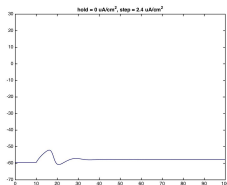


Figure : Response in the *Ring*ing, *Single AP* and *AP Train* regions

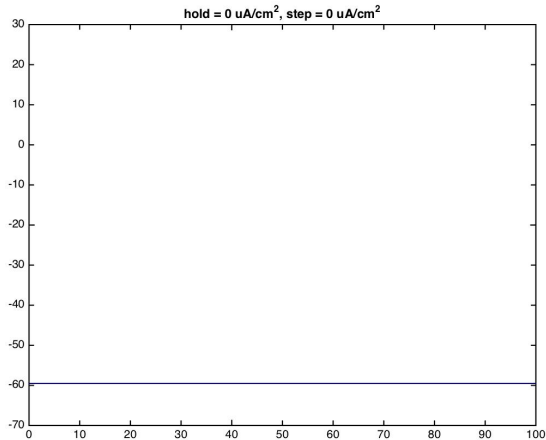


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

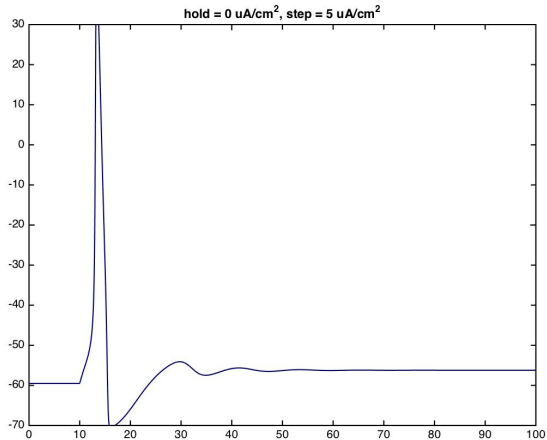


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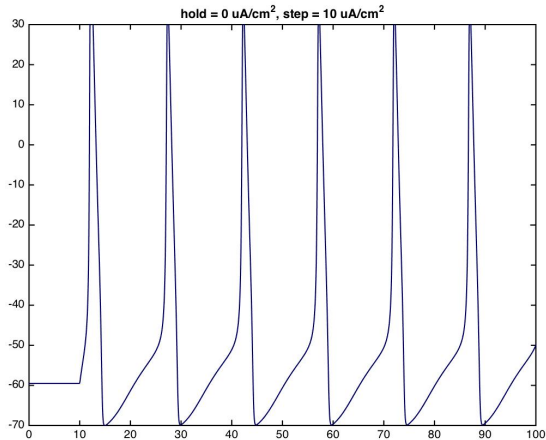


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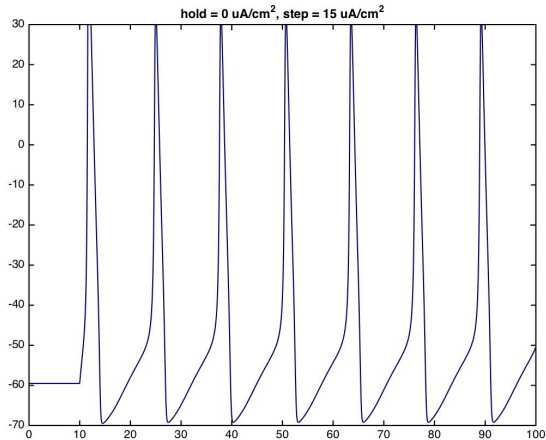


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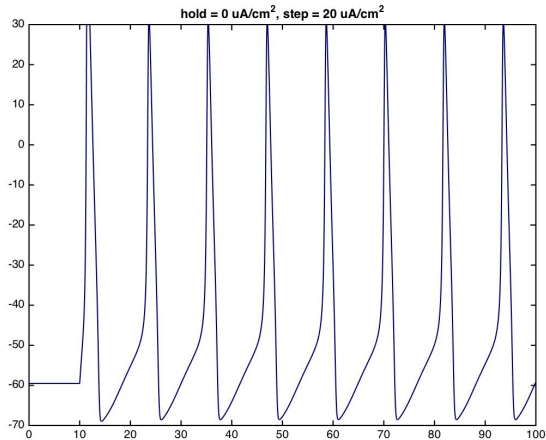


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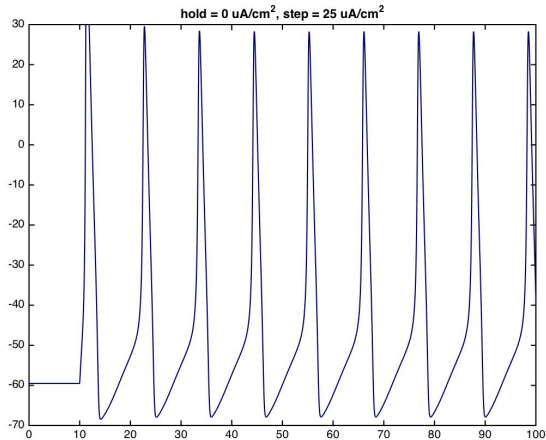


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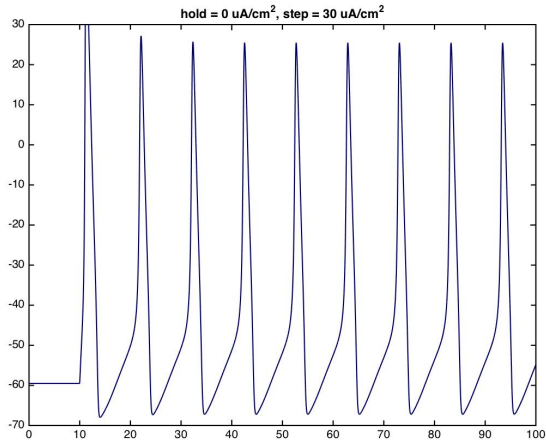


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

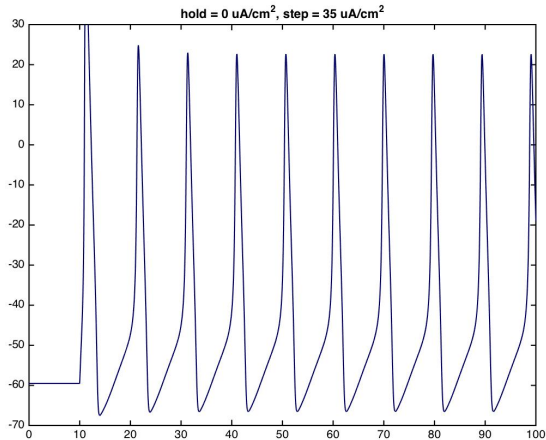


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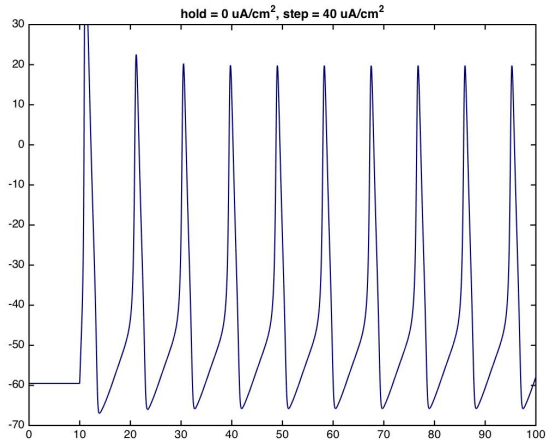


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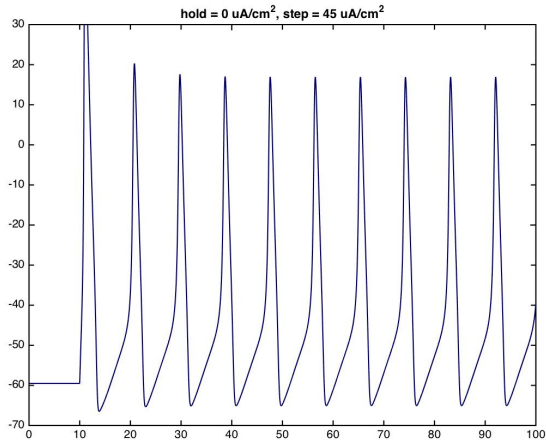


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

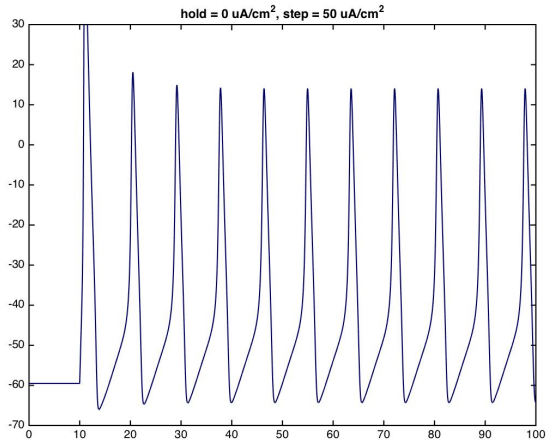


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

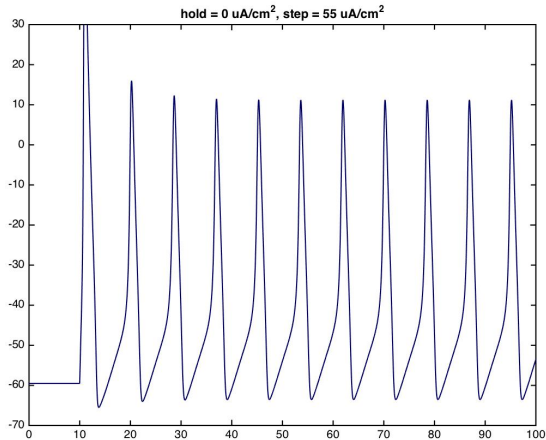


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$



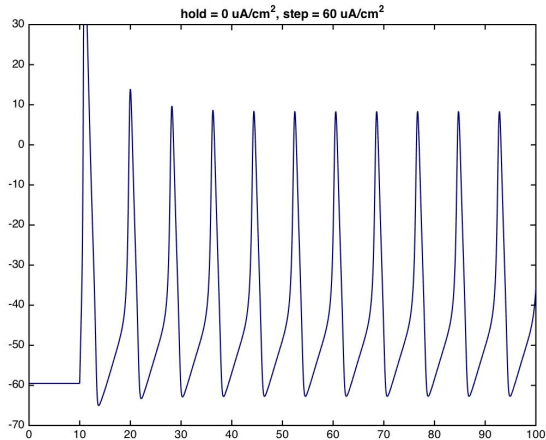


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

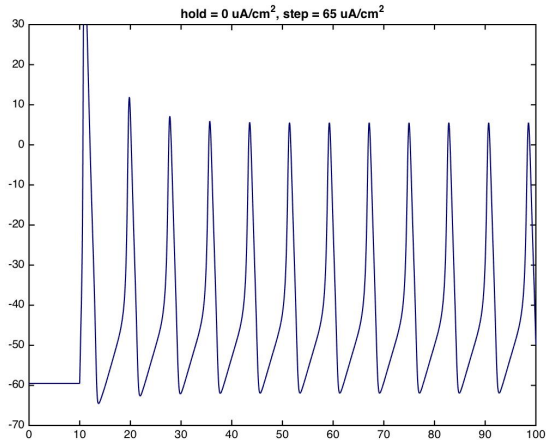


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

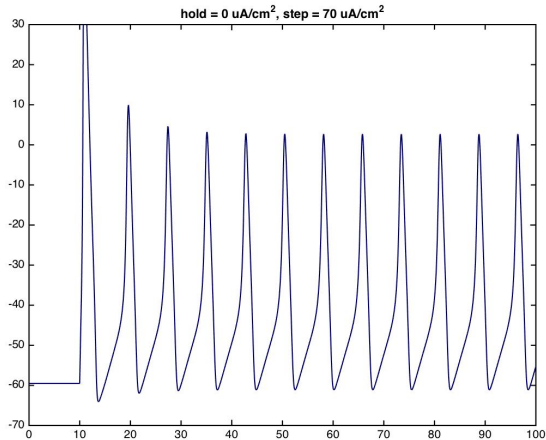


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

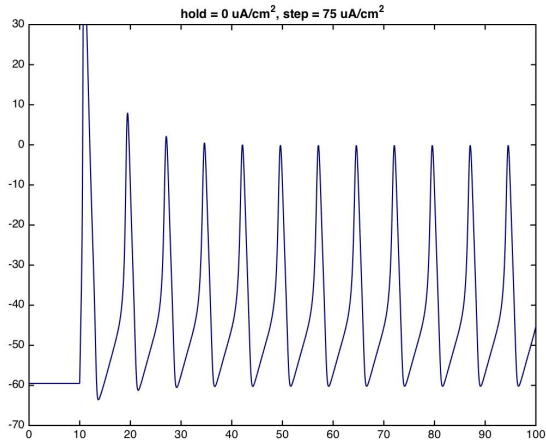


Figure : HH Models step current response starting at 0  $\mu\text{A}/\text{cm}^2$

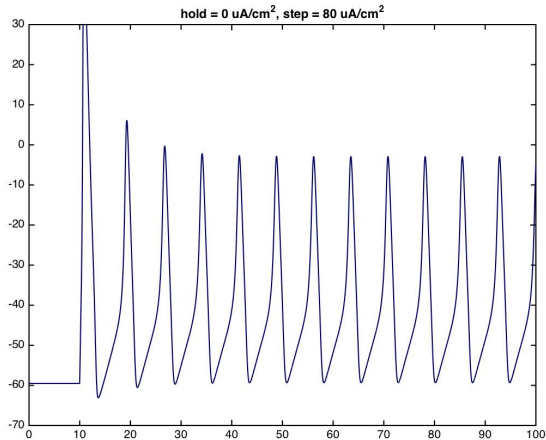


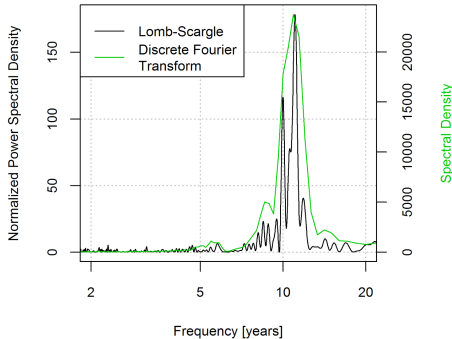
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# DFT insufficient

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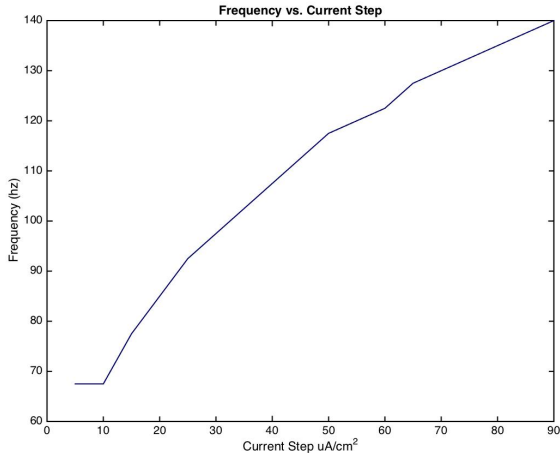
**Figure :** Discrete Fourier Transform insufficient due to variable time intervals.

# Least-squares spectral analysis



**Figure :** The LombScargle Periodogram works better with variable intervals.

# Train frequency over increasing input step





# Issues with precision approximation

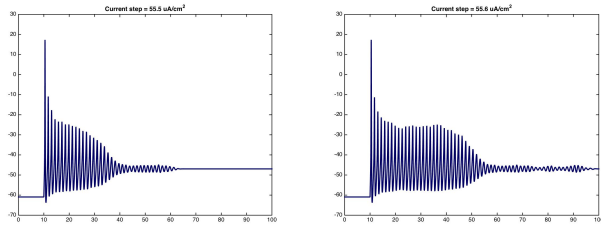


Figure : Incorrect behavior due to low precision

# References

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- 2 Weiss, T. F. (1995). Cellular Biophysics. Volume 2: Electrical Properties, MIT Press.
- 3 Blaustein, M.P., Kao, J.P.Y., Matteson, D.R. (2012). Cellular Physiology and Neurophysiology, 2nd edition, Elsevier-Mosby.
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- 5 Press, William H., and George B. Rybicki. "Fast algorithm for spectral analysis of unevenly sampled data." The Astrophysical Journal 338 (1989): 277-280.