

Supplementary Methods

Analyzing a single AP

We begin by describing the analysis of a single spike. Spikes were detected by a crossing of a voltage threshold (-20 mV). The beginning of a spike was then determined by a crossing of a threshold on the derivative of the voltage (12mV/msec). Different threshold values yielded no qualitative change. The maximum of the second derivative was also considered as the beginning of the spike, yielding no qualitative change in the results. The end of the spike was determined by the minimum value of the after-hyperpolarization (AHP) following the spike. The peak point of the spike is the maximum in between these two points. The amplitude of a spike is given by the difference between the voltage at the beginning and peak of the spike.

Details of features:

1. Difference in the voltage value between the amplitude of the first and second AP.
2. Steady state AP amplitude is calculated as the mean amplitude of the set of APs that occurred during the latter third of the current step.
3. Amplitude of the first AP.
4. Amount of time in between the first crossing (in the upwards direction) of the half-height voltage value and the second crossing (in the downwards direction) of this value, for the first AP. Half-height voltage is the voltage at the beginning of the AP plus half the AP amplitude.
5. Amount of time between the peak of the first AP and the trough, i.e., the minimum of the AHP.
6. Difference in voltage value between peak and trough over the amount of time in between the peak and trough.
7. Difference between the minimum of voltage at the trough and the voltage value at the beginning of the AP.
- 8-12: Same as features 3-7 but for the second AP.
13. Difference in AP amplitude between first and second AP divided by the first AP amplitude.
14. Difference in AP width at half-height between first and second AP divided by the first AP width at half-height.
15. Difference in peak to trough rate of change between first and second AP divided by the first AP peak to trough rate of change.

16. Difference in depth of fast AHP between first and second AP divided by the first AP depth of fast AHP.
17. Input resistance calculated by injecting weak subthreshold hyperpolarizing and depolarizing step currents. Input resistance was taken as linear fit of current to voltage difference.
18. Mean of the delay to beginning of first AP over experimental repetitions of step currents.
19. Standard deviation of the delay to beginning of first AP over experimental repetitions of step currents.
20. As 18 but for second AP.
21. As 19 but for second AP.
22. Initial burst interval is defined as the average of the first two ISIs, i.e., the average of the time differences between the first and second AP and the second and third AP. This feature is the average the initial burst interval across experimental repetitions.
23. The standard deviation of the initial burst interval across experimental repetitions.
24. Initial accommodation is defined as the percent difference between the rate of the first fifth of the step current and the third fifth of the step current.
25. Steady-state accommodation is defined as the percent difference between the rate of the first fifth of the step current and the last fifth of the step current.
26. The percent difference between the rate of the first fifth of the step current and final fifth of the step current divided by the time taken to first reach the rate of steady state accommodation.
27. Accommodation analysis based on a fit of the ISIs to an exponential function:

$$ISI = A + B \exp\left(-\frac{1}{\tau}t\right)$$
This feature gives the relative size of the constant term to the term before the exponent.
28. Accommodation analysis based on a fit of the ISIs to an exponential function. This feature is the time constant of the exponent.
29. Coefficient of variation (mean divided by standard deviation) of the distribution of ISIs.
30. Median of the distribution of ISIs.
31. Difference between the first and second ISI divided by the value of the first ISI.
32. Firing rate of strong stimulus.
- 33-38. Same as 18-23, but for strong step stimulus (300% threshold current value).