

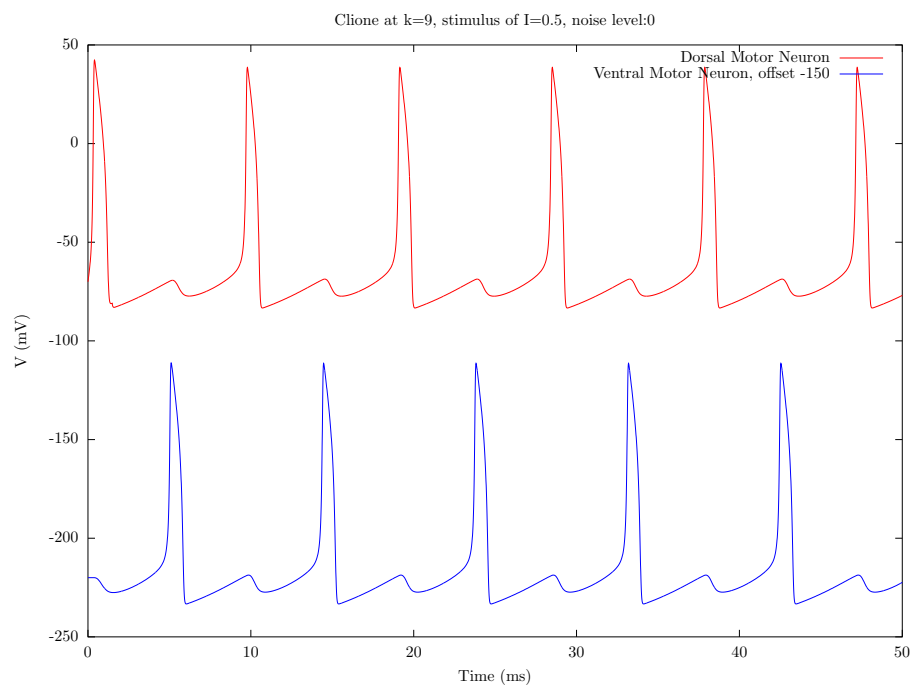
# Noise in an 8 Neuron Clione CPG simulation

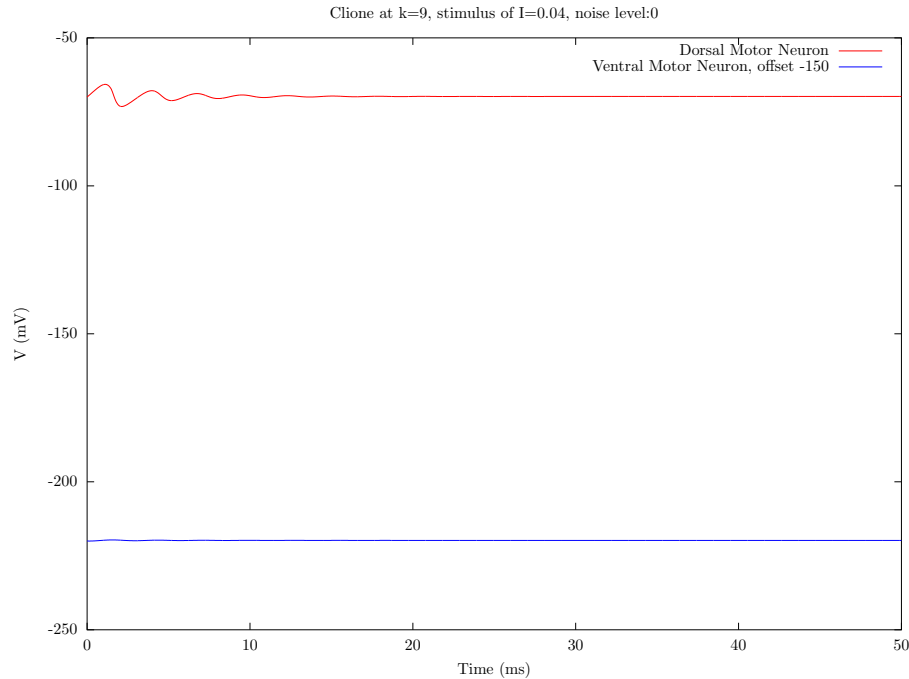
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## Introduction

In his book *Spikes, Decisions and Actions (SDA)*, Wilson presents an 8 neuron model of swimming in *Clione* based on the work of Satterlie and Spencer (1985). The model is two connected instances (dorsal and ventral) of a 4-neuron system. The two sides have an inhibitory connection to each other, and a spike on one side generates an inhibitory pulse on the other side, then a post-inhibitory rebound sufficient to trigger a spike, generating a stable out-of-phase pattern of spikes. With no initial stimulus, the system remains in a stable rest state.





Below, we examine the effect of noise on this model, determining the level of noise at which the characteristic out of phase synchrony is no longer stable, the level of noise at which the system is no longer stable at rest, and examining the other regimes which emerge as the system becomes noisy. We also look for some of the features of the Clione CPG observed in Satterlie's paper (1985). He found phase-locked sub-threshold activity, as well as phase-locked spiking, and observed alternating spikes and sub-threshold potentials as well.

## Methods

All simulations were run in GNU Octave, using a version of the Clione.m included in SDA modified for flexibility, to include noise, and to use Forward Euler integration. Noise was generated by first generating Gaussian white noise, then filtering it to correspond to a  $1/f^x$  "pink noise" pattern.

## Results

## Conclusions