Poster 1-129

THE EFFECTS OF ACTION POTENTIAL PROPAGATION DELAY TIMES AND AN ABSOLUTE REFRACTORY PERIOD UPON THE SYNCHRONIZATION INDEX IN THE INTEGRATE AND FIRE NEURON MODEL AND A COMPARISON WITH NEURONS IN THE AUDITORY PATHWAY

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The effects of action potential (AP) propagation delay times and the absolute refractory period upon the synchronization index are analysed for the integrate and fire neuron model, and the results are compared with recordings from auditory ganglion neurons and cochlear nucleus neurons. In the model the noisy periodic synaptic input to the neuron is summed and an AP is generated when the membrane potential reaches threshold. The output phase distribution (phase histogram) is calculated at the site at which the APs are generated. The AP propagation delay times along an axon are modelled using a periodically wrapped Gaussian distribution, with the width fitted from experimental data. This distribution is convolved with the calculated phase distribution to obtain the phase distribution at the axon terminal. The model is implemented using the parameter values for the membrane time constant and the refractory period of both auditory ganglion neurons and cochlear nucleus neurons. It is found that the synchronisation index of the output APs decreases rapidly at high frequencies of the input (greater than 1 kHz). Inclusion of an absolute refractory period to the original model increases the interspike intervals, and the resultant reduction of the synchronization index is most pronounced at higher frequencies of the input. The computed phase distributions of the model show close agreement with experimentally recorded phase histograms.

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