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Signal estimation from intracellular recordings in the Feller neuronal model.

The estimation of the input parameters in a Feller neuronal model from a trajectory of the membrane potential sampled at discrete times is studied. These input parameters are identified with the drift and the infinitesimal variance of the underlying stochastic diffusion process with multiplicative noise. The state space of the process is restricted from below by an inaccessible boundary. Further, the model is characterized by the presence of an absorbing threshold, the first hitting of which determines the length of each trajectory and which constrains the state space from above. Both in the presence and in the absence of the absorbing threshold, the efficiency of different known estimators is compared. In addition, a new estimator for the drift term is proposed, and is proved to be more efficient than the others, at least in the explored range of the parameters. The presence of the threshold introduces a bias into the estimates of the drift term and two methods to correct it are suggested.