

The Development of a Physiological Based Evoked Potential Simulator for Research & Clinical Applications

Michael J. Pougnet¹, Dennis F. Lovely¹

¹University of New Brunswick, Dept. of Electrical & Computer Engineering

A somatosensory evoked potential (SEP) simulator is under development. Based on physiological parameters, the foundation of this model is the axonal transmembrane action potential whose voltage profile is well understood at the ionic level. Key parameters of the simulator include the number of active axons, a conduction velocity profile, and the distance between stimulation and recording sites. Future expansions of the simulator will include multilayer tissue effects.

The simulator is intended to be used as a research tool to investigate various noise reduction strategies for SEP acquisition. However, a second application is foreseen due to the physiological basis of the design. It is expected that by fitting simulated data to that obtained experimentally, subject's physiological parameters can be extracted. If this can be done, the simulator could be used as a valuable clinical tool.

To validate the performance of the SEP simulator, an adaptive comparison between a generated test signal and various simulated signals will be done. This comparison works by giving the best fit between the two signals on a least mean square sense. In an attempt to optimize the speed of this fitting procedure, an investigation into the use of a genetic algorithm will also be conducted. By comparing the known parameters from the test signal and those given by the best match in the fitting procedure, the robustness of the simulator can be measured.