

Poster presentation

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Genetic algorithm modification to speed up parameter fitting for a multicompartment neuron model

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The parameter space of neural multi-compartment models is a non-linear complex multidimensional space. Therefore, the problem of parameter fitting for such models is an optimization problem which searches for a solution point in a surface with ravines and mountains. Recent studies [1-4] showed that a genetic algorithm (GA) effectively solves such complex problems. However, usually a GA needs to generate several millions individuals for a good fitting. If the simulation of each individual requires four seconds for fitness evaluation, the full time for performing an optimization procedure grows to 46 days.

Here a description of a GA modification (MGA) allowing a speeding up of parameter fitting is presented. The use of two types of reproduction operators implements both combinatorial and continual searches. The individual mutation factor (IMF) and second order limitation operator (SOL) proposed in this study allow the algorithm to avoid a capture of the population by local attractors and also reduce the number of generations required for the optimization procedure. The results of preliminary tests and limitations of the proposed method are discussed.

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References

1. Vanier MC, Bower JM: **A comparative survey of automated parameter-search methods for compartmental neural models.** *J Comput Neurosci* 1999, **7**:149-171.
2. Murase K, Mochizuki T, Kikuchi T, Ikezoe J: **Kinetic parameter estimation from compartment models using a genetic algorithm.** *Natl Med Commun* 1999, **20**(10):925-932.

3. Keren N, Peled N, Korngreen A: **Constraining compartmental models using multiple voltage recordings and genetic algorithms.** *J Neurophysiol* 2005, **94**:3730-3742.
4. Weaver CM, Wearne SL: **The role of action potential shape and parameter constraints in optimization of compartment models.** *Neurocomputing* 2006, **69**:1053-1057.