

Finite Difference Model Representing Cell Distribution in Monolayer

E. Acerbo; M. I. Bellotti and F. J. Bonetto

Universidad Nacional de Cuyo – Instituto Balseiro (Argentina)

Universidad Nacional de Río Negro – Sede Andina (Argentina)

Consejo Nacional de Investigaciones Ciencia y Técnica – CONICET (Argentina)

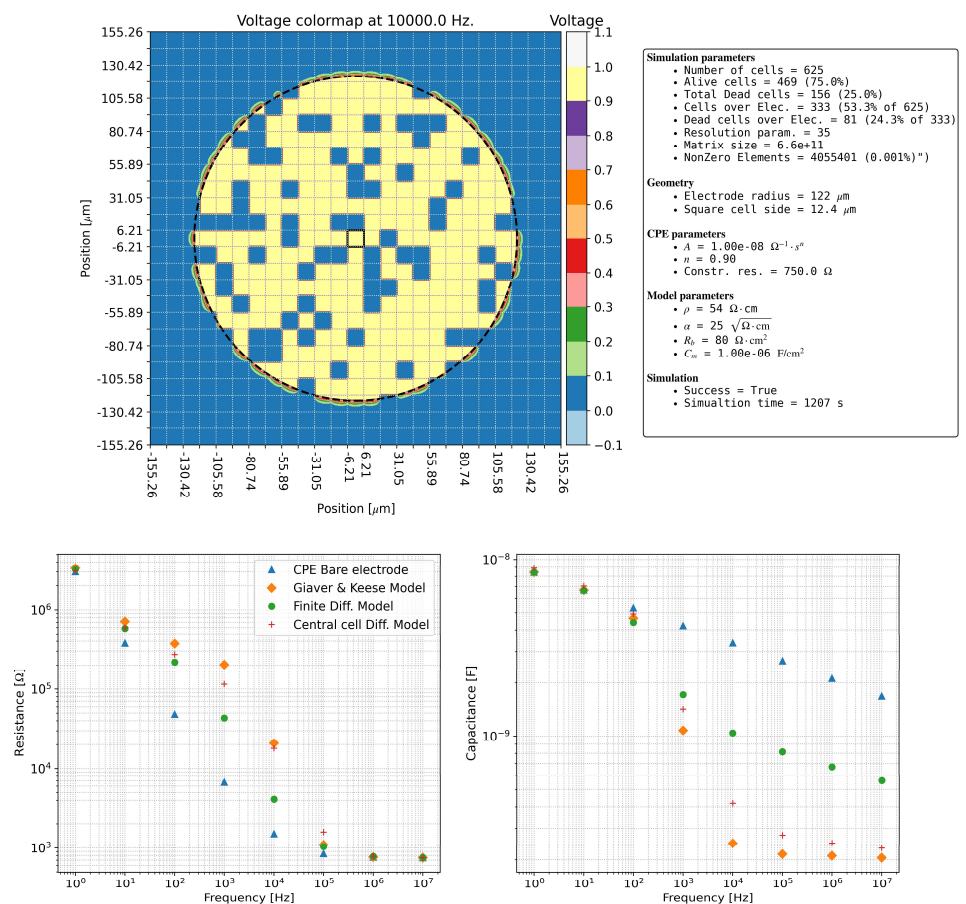
esteban.acerbo@ib.edu.ar

In this work we developed a finite difference algorithm to calculate the spectral impedance of any distribution of square cells over an electrode. Allowing to simulate assays evolution, cell death dynamics, different cell morphologies and any electrode shape.

The spectral impedance is calculated as a function of α , R_b and C_m . The same parameters proposed by Giaever and Keese to analytically model a confluent culture over an infinite electrode [1]. Using the same parameters allows us to compare the simulation results of a non-confluent culture to its confluent equivalent.

As seen in the Figure, a simulation resume of a culture with 75% alive – 25% dead cells emplaced randomly. The results show the system spectral impedance between the bare electrode (100% dead cells) and GK model (100% alive cells) as expected.

This model is aimed to estimate the cell population above the electrode by contrasting simulations with experimental measurements. For this it is necessary to simulate different cell distributions or assay evolutions, using a range of parameter to compare before the measurement as each simulation is computationally expensive.



References:

- [1] Lo, Chun-Min, Charles R. Keese, and Ivar Giaever. "Impedance analysis of MDCK cells measured by electric cell-substrate impedance sensing." *Biophysical journal* 69.6 (1995): 2800-2807.