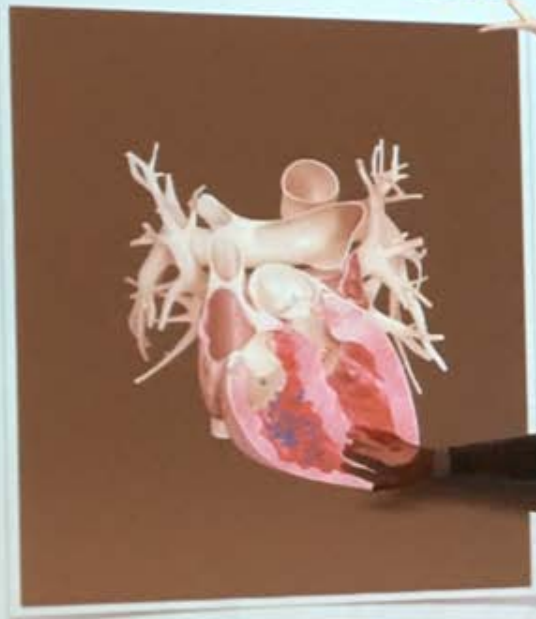




Cardiac Models &

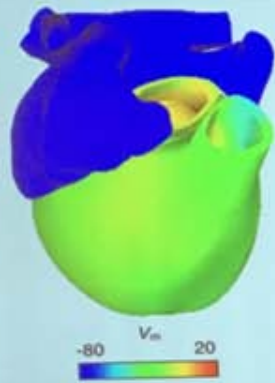


Unila

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2019





Reaction diffusion (bidomain) model in the heart + Poisson diffusion over the thorax

D. Choppin, M.A. Fernández, J.F. Gómez, P. Martínez, J. Sanjaume, N. Zanzi. Numerical simulation of the electrophysiological activity of the heart. FIAS 2009.
 E. Schemm, A. Cohen, J.F. Gómez. Numerical simulation of electrocardiograms for full cardiac cycles in healthy and pathological conditions. International Journal of Numerical Methods in Biomedical Engineering 2013.



$$\begin{aligned}
 A_m \left(C_m \frac{\partial V_m}{\partial t} + I_{ion}(V_m, \dots) \right) - \operatorname{div}(\sigma_m \cdot \nabla V_m) &= \operatorname{div}(\sigma_m \cdot \nabla u) + I_{ion}(u) && \text{in } \Omega^{\text{heart}} \\
 \operatorname{div}((\sigma_m + \sigma_e) \cdot \nabla u) &= -\operatorname{div}(\sigma_m \cdot \nabla V_m) && \text{in } \Omega^{\text{thorax}} \\
 \partial u + g(V_m, u) &= 0 && \text{in } \Omega^{\text{thorax}} \\
 -\operatorname{div}(\sigma_m \cdot \nabla u) &= 0 && \text{in } \Omega_c \\
 A_e (\sigma_m \cdot \nabla u) \cdot \nu + I_{ion}(u) &= u && \text{on } \partial \Omega^{\text{heart}} \\
 \sigma_m \cdot \nabla u \cdot \nu &= 0 && \text{on } \partial \Omega_c^{\text{thorax}}
 \end{aligned}$$