# Finite volume discretization of a microscopic cell-by-cell model for electrocardiology

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**Résumé**

Each year in France, 50 000 sudden cardiac death (SCD) are recorded. They are explained by fatal disorganization of the electrical activation of the heart. This activation depends on the specific and complex network organization of cardiac cells, and their coupling. Several studies have shown that very localized defects in this cell-by-cell structure, or cell-to-cell connections, may induce large scale events such as SCD.
However, current computer simulations are based on homogenized models, whereas the study of micoscopic structural abnormalities require an explicit description of individual cells and their connections.

Building a cell-by-cell computational model of a macroscopic cardiac tissue, is very challenging for many reasons. We will present the equations of such model: elliptic PDEs with nonstandard transmission conditions between subdomains, on the cell membranes and cell-to-cell interfaces. The transmission conditions describe local cell electrophysiology (EP), and are based on cardiac EP models. Our aim is to copmute approximate solutions for a large number of cells, by resorting to parallel computing. Hence, we first designed a finite volume methods to discretize the problem, because they explicitly take into account the non-standard transmission conditions.
On the poster, we will present the model, our resault on existence of solutions to the equations, explain the construction of the finite volume scheme, and give some results on its approximate properties. We are currently developing a prototype implementation of the method, and may presents some very preliminary numerical illustration.

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