
Modern Compiler Technology to Optimize Code from Ionic Models

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Résumé

The MLIR compiler framework is a novel compiler infrastructure that eases the process of developing new interacting compiler transformations and intermediate representations, built as part of the LLVM framework. In this talk, I will present our experience using MLIR within the MICROCARD (<https://microcard.eu/>), a European project aimed at building and simulating cardiac electrophysiology using whole-heart models. The project builds on the existing open-source openCARP project (opencarp.org), a cardiac electrophysiology simulator for in-silico experiments. OpenCARP includes a solver and the ionic model component describing ionic transmembrane currents, as ordinary differential equations (ODEs). They are provided using a DSL (domain-specific language) for ODEs named easyML. This talk will cover how we have used the MLIR infrastructure, its dialects, and transformations to drive forward the study of ionic models, and accelerate the execution of multi-cell systems.

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