Waveform relaxation methods (M. Gander)

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Waveform relaxation is a class of algorithms to solve very large systems of ordinary differential equations (ODEs) on parallel computers. The method has been invented in the early eighties to simulate large scale circuits that exceeded the capacities of a single computer. Our first presentation will be by one of the inventors of Waveform Relaxation and he will talk about the exciting time of the invention.

In the decade that followed the invention, many people have worked on waveform relaxation and a quite general convergence analysis for the classical algorithm has been established by linking it to a century old method of proving existence and uniqueness of solutions of ODEs, namely the Picard-Lindeloef iteration. This analysis showed that the convergence rate of the algorithm is quite slow in general, although time windowing can make it into an acceptable parallel algorithm.

Emphasis has now shifted in waveform relaxation research. Two main directions are apparent: first, the algorithm is used to tackle problems for which no or only few other algorithms are known and where the relaxation makes the problem accessible to standard ODE solvers. Second people started to investigate why the convergence of the classical algorithm is slow. The main reasons have been identified and powerful remedies are being developed. This mini-symposium will feature talks in both those areas.