CSC Seminar

SPEAKER

Wil Schilders

TU Eindhoven, Department of Mathematics and Computer Science

Hans Fischer senior fellow, TU München – Institute for Advanced Study

President of the International Council for Industrial and Applied Mathematics

TITLE

Vector extrapolation for accelerating the simulation of practical problems

ABSTRACT

In the 1990s, when working at Philips Research, we were faced with slow convergence of Gummel's method (basically nonlinear block Gauss-Seidel) when simulating semiconductor devices. At that time, several papers were published on so-called vector extrapolation techniques, generalisations of the well-known Aitken and Steffensen methods for scalar sequences. We started to use the reduced rank extrapolation method (RRE), and it turned out to be extremely effective to speed up Gummel's method. Later, we also used RRE in other applications within Philips, for example in glass blowing processes.

Strangely enough, vector extrapolation is not widely known, it is also not part of the curriculum in scientific computing. However, it would be good if more researchers would know about this method, as it can help a lot, not only in speeding up iterative methods, but also in getting rid of the dependence on special well-chosen parameters.

In this talk, we will give a brief introduction to vector extrapolation, starting from the Aitken and Steffensen methods, and generalising these to the case of sequences of vectors. Some useful results will be summarised, mainly based on work of Avram Sidi. Next, the application to semiconductor device simulation will be discussed. Finally, a recent application to the iterative solution of Ricatti and Lyapunov equations will be discussed, building on work that was performed in Magdeburg.

Tuesday, February 19, 2024 at 1:30 pm
seminar room Prigogine