

## **Mixed finite element solution of a semi-conductor problem by Dissection sparse direct solver**

*Atsushi Suzuki, Cybermedia Center, Osaka University*

The drift-diffusion system describes state of electrostatic potential and electron/hole concentrations inside the semi-conductor device. The current density of electron/hole is expressed as gradient of the Slotboom variable with diffusion coefficient depending on the electrostatic potential exponentially. Finite volume method with Scharfetter-Gummel scheme where the flux is approximated by a piecewise constant and the electrostatic potential by piecewise linear in the control volume is widely used.

In this talk, a mixed finite element approximation for the system of current density and concentrations of electron/hole is considered, where current conservation is satisfied as finite volume method. The stiffness matrix is indefinite due to the mixed system and is unsymmetric due to exponentially nonlinear diffusion coefficient. However, Dissection direct solver can perform factorization of such system with an appropriate scaling pre-processing.