Internship for Master 2 in Applied Mathematics
Electronic Circuit Simulation in Parallel

Context. One of the most costly operations during the time-domain simulation of electronic circuits, which are typically described by systems of nonlinear differential-algebraic equations, is the solution of large linear systems. These large linear systems arise in every iteration of the Newton process, which is executed for every time step. Although the structure of the linear systems is usually known for a given circuit, the numerical properties and conditioning may vary during the time domain integration. It is hence difficult to decide whether a direct or iterative solver should be used, and when an iterative solver is chosen, how efficient preconditioning can be done.

Objective. The objective of this project is to develop efficient preconditioning techniques for linear systems arising in circuit simulation. Here efficient means that the solution (and complete simulation) procedure including preconditioner computation should be faster than a direct solver, while still meeting accuracy requirements for the overall simulation result. The strategy is to apply domain decomposition methods which are natural parallel hybrid solvers [1].

About Mentor. Mentor Graphics is a leader in electronic design automation software. Mentor Graphics enables companies to develop better electronic products faster and more cost-effectively. Their innovative software products and solutions help engineers conquer design challenges in the increasingly complex worlds of board and chip design.

Candidate profile. The candidate should have a solid background in the numerical analysis of elliptic PDEs (variational theory of the Laplacian, Lax-Milgram theorem) and some programming experience, ideally in C++ or Python.

Practical information:
Location: Laboratoire J.L. Lions, University of Paris 6
Duration: 5 months

Contact:
Frédéric Nataf, Senior Scientist
Laboratoire J.L. Lions
E-mail: nataf@ann.jussieu.fr

Dr. Joost Rommes, Technical Lead, DSM/AMS Mentor Graphics, Grenoble, France
E-mail: joost_rommes@mentor.com

References