
Algorithms, Data Structures and Computing Platforms in Numerical Electromagnetics

Speaker: Prof. Amedeo CAPOZZOLI

(Universita' di Napoli Federico II, Napoli, Italy)

Date: 09 November 2017 @ 12:00

Location: Room Garda – Polo Scientifico F. Ferrari – Povo

Note: The seminar will be held in English

Contact: Prof. Andrea MASSA (andrea.massa@unitn.it)



Abstract:

The solution of many electromagnetic problems requires the use of advanced numerical tools able to analyse and synthesize complex systems with unprecedented accuracies and processing times. Indeed, when the working scenario becomes cumbersome, approaching as much as possible what happens in reality, the massive exploitation of numerical computing turns to be mandatory. Indeed, the use of simplified models that unburden the numerical analysis sacrificing accuracy becomes unacceptable when high performance is pursued, since, even if they provide excellent results at the design stage, in practice they lead to poor practical results as arising after the experimental testing. Obviously, when keeping complexity, computing times grow, until making unaffordable the analysis and, particularly, the synthesis of the system. This occurs because, typically, the synthesis requires the repeated calculation of the electromagnetic response of the system to make the optimization process behind the design possible.

To face the problem, the following policies can be pursued:

- 1) Using smart algorithms able to reduce the computational complexity of the numerical process;
- 2) Using data structures contributing to the mitigation of the computational complexity;
- 3) Using high performance, massively parallel computing platforms.

The three above points cannot be faced independently, since, to be successful, the development, the set up and the implementation of a numerical code requires a global point of view, based on a solution scheme wherein the algorithms and the data structure conform to the underlying chosen hardware to fully profit of its potentialities. When the numerical code is designed according to this philosophy, dramatically superior performance is achieved.

The Lecture will show the use of algorithms, data structures and computing platforms for some hot problems in numerical electromagnetics as antenna synthesis and RCS computation of complex objects. The results will show the achievable performance boost.

About the Speaker (short bio):

Prof. Amedeo Capozzoli received the “Laurea” degree (summa cum laude) in Electronic Engineering and the Ph.D. degree in Electronic Engineering and Computer Science from Università di Napoli Federico II, Naples, Italy, respectively. Since January 2005, he has been Associate Professor of Electromagnetic Fields at Università di Napoli Federico II. Since the academic year 2012/2013 he is professor of Electromagnetic Fields and Circuits at the Italian Air Force Academy.

His research interests include, among others, methods to extract synthetic information on systems of sources or scatterers from field data, Adaptive Optics in Optical Astronomy, Antenna Synthesis and Diagnosis, fast Numerical Methods in Electromagnetics, GPU Computing in Electromagnetics, advanced measurement approaches in Electromagnetics, Inverse Problems and Remote Sensing.

Additional Notes:

Additional information can be found at www.eledia.org