



UNIVERSITÀ DI PARMA

DIPARTIMENTO DI SCIENZE MATEMATICHE, FISICHE E INFORMATICHE

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SEMINARIO

CICLO DI SEMINARI BAT-MAT (Biscuits and Tea - Maths)

Dott. **Luca Desiderio**, ricercatore Università di Parma

Giovedì 12 maggio 2022, ore 14:30

Aula B, Plesso di Matematica/Informatica

**ACA based acceleration of the Energetic Galerkin BEM
for 2D wave propagation problems**

Tutti gli interessati sono invitati a partecipare

Organizzatori: Davide Addona, Paolo Baroni, Nicoletta Tardini

Abstract: *We consider scalar and vector wave propagation problems in 2D unbounded domains, reformulated in terms of space-time Boundary Integral Equations (BIEs). For their solution, we employ a weak formulation related to the energy of the system and we solve them by a Galerkin-type Boundary Element Method (BEM): this energetic approach allows to overcome the instabilities rising from the discretization of the standard weak formulation applied to this kind of integral problems. However it results that, when standard Lagrangian basis functions are considered, the BEM matrices have Toeplitz lower triangular block structure, where blocks are in general fully populated, and the overall memory cost of the energetic BEM is $O(M^2N)$, M and N being the number of the space degrees of freedom and the total number of time steps performed, respectively. This drawback prevents the application of such method to large scale realistic problems. As a possible remedy, we propose a fast technique based on the Adaptive Cross Approximation (ACA). The core of this procedure is the approximation of sufficiently large time blocks of the energetic BEM matrix through the ACA algorithm, which allows to compute only few of the original entries. This leads to reduced assembly time, which for the energetic BEM is generally relevant, coupled with reduced memory storage requirements. Additionally, the consequent acceleration of the matrix/vector multiplication together with a marching in time procedure, leads to remarkable reduction of the computational solution time. The effectiveness of the proposed method is theoretically demonstrated and several numerical results are presented and discussed.*

Alla fine del seminario verrà offerto un piccolo rinfresco in Common Room.