## VALPARAISO NUMERICO IV

Séptimo Encuentro de Análisis Numérico de Ecuaciones Diferenciales Parciales Facultad de Ingeniería, Pontificia Universidad Católica de Valparaíso, Diciembre 11–13, 2013

# Local multiple traces formulation: theoretical extensions and novel applications<sup>\*</sup>

#### <u>Carlos Jerez-Hanckes</u><sup> $\dagger$ </sup>

#### Abstract

We discuss new theoretical extensions and novel applications of the local Multiple Traces Formulation (MTF) introduced by Hiptmair & Jerez-Hanckes in 2012 [1]. The MTF was originally introduced as a set of Boundary Integral Equations to solve scattering problems for scatterers composed of heterogeneous structures with piecewise constant parameters. Numerical results were presented for 2D low-order local discretizations. In this talk, we will explore extensions of the MTF formalism to: (i) solve low and high-frequency 3D structures possessing screens, (ii) describe a domain decomposition algorithm; as well as (iii) analyze its application to neural propagation problems by coupling with Hodgin-Huxley equations and using implicit Euler and fixed point schemes.

Key words: boundary integral equations, wave scattering, Hodgin-Huxley equations Mathematics subject classifications (2010): 65N12, 65N38, 65R20

### References

- HIPTMAIR, R. AND JEREZ-HANCKES, C., Multiple traces boundary integral formulation for Helmholtz transmission problems. Adv. Comp. Math., vol. 37, pp. 39-91, (2012).
- [2] CLAEYS, X., HIPTMAIR, R. AND JEREZ-HANCKES, C., Multi-trace boundary integral equations. Direct and Inverse Problems in Wave Propagation and Applications, eds. Graham, I. G., Melenk, Langer, U., Sini, De Gruyter, Frankfurt, 2013.
- [3] HENRÍQUEZ, F., JEREZ-HANCKES, C. AND ALTERMATT, F., Boundary integral formulation for the electrical response of a nerve to an extracelullar stimulation. 35th Annual International Conference of the IEEE EMBS, Osaka, Japan, 3 - 7, July 2013.

<sup>\*</sup>This research was partially supported by Fondecyt Iniciación 11121166, Conicyt Anillo ACT 1118 and VRI UC Interdisciplina 52/2011.

<sup>&</sup>lt;sup>†</sup>Departament of Electrical Engineering, School of Engineering, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, Macul, Santiago, Chile, e-mail: cjerez@ing.puc.cl