

---

# SANTIAGO NUMÉRICO II

Quinto Encuentro de Análisis Numérico de Ecuaciones Diferenciales Parciales  
Facultad de Matemáticas, Pontificia Universidad Católica de Chile, Diciembre 9–11, 2010

---

## An a priori error analysis of the local discontinuous Galerkin method for Signorini type problems \*

ROMMEL BUSTINZA <sup>†</sup> FRANCISCO-JAVIER SAYAS <sup>‡</sup>

### Abstract

In this talk we propose and analyze a local discontinuous Galerkin method for an elliptic variational inequality of the first kind that corresponds to a Poisson equation with Signorini type condition on part of the boundary. The method uses piecewise polynomials of degree one for the field variable and of degree zero or one for the approximation of its gradient. We show optimal convergence for the method and illustrate it with some numerical experiments.

### References

- [1] D.N. ARNOLD, F. BREZZI, B. COCKBURN, AND L.D. MARINI: *Unified analysis of discontinuous Galerkin methods for elliptic problems*. SIAM Journal on Numerical Analysis, vol. 39, 5, pp. 1749-1779, (2001).
- [2] K. ATKINSON, AND W. HAN: *Theoretical Numerical Analysis. A functional analysis framework*. Springer-Verlag, New York, (Second edition), 2005.
- [3] R. BUSTINZA, G.N. GATICA, AND F.-J. SAYAS: *On the coupling of local discontinuous Galerkin and boundary element methods for nonlinear exterior transmission problems*. IMA Journal of Numerical Analysis, vol. 28, pp. 225-244, (2008).
- [4] P. CASTILLO, B. COCKBURN, I. PERUGIA, AND D. SCHÖTZAU: *An a priori error analysis of the local discontinuous Galerkin method for elliptic problems*. SIAM Journal on Numerical Analysis, vol. 38, 5, pp. 1676-1706, (2000).

---

\*This research was partially supported by FONDECYT project No. 1080168 and BASAL project CMM, Universidad de Chile, by Centro de Investigación en Ingeniería Matemática (CI<sup>2</sup>MA), Universidad de Concepción, and by MEC/FEDER Project MTM2007–63204 and Gobierno de Aragón (Grupo PDIE).

<sup>†</sup>CI<sup>2</sup>MA and Departamento de Ingeniería Matemática, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción, Casilla 160-C, Concepción, Chile, e-mail: [rbustinz@ing-mat.udec.cl](mailto:rbustinz@ing-mat.udec.cl)

<sup>‡</sup>Department of Mathematical Sciences, University of Delaware, Newark, DE, USA, e-mail: [fjsayas@math.udel.edu](mailto:fjsayas@math.udel.edu)