

# UNFITTED MHDG METHOD FOR ELLIPTIC INTERFACE PROBLEMS

Jiang Zhu<sup>1</sup> and Héctor A. Vargas<sup>2</sup>

<sup>1</sup> National Laboratory for Scientific Computing (LNCC), Av. Getúlio Vargas 333 25651-075  
Petropolis, RJ Brazil, jiang@lncc.br

<sup>2</sup> National Laboratory for Scientific Computing (LNCC), Av. Getúlio Vargas 333 25651-075  
Petropolis, RJ Brazil, vargaspo@lncc.br

**Key words:** *Elliptic interface problems, Mixed hybrid discontinuous Galerkin method, Unfitted interface method.*

In this work, a mixed hybrid discontinuous Galerkin (MHDG) finite element method is proposed to solve the elliptic interface problems. We introduce the discontinuous base functions (unnecessary to satisfy the jump conditions) on those elements which are cut across by interface. Unlike to the immersed interface methods (IIM), the two jump conditions are enforced weakly by the MHDG variational formulations. So, our unfitted interface MHDG can be applied more easily than IIM to general cases when the exact jump base function cannot be constructed. Besides those advantages of the MHDG, we should emphasize also that our method is clean and has no parameter as the Nitsche's penalty method. Therefore, our method is robust and efficient for interface problems. The main idea of the unfitted interface MHDG has been introduced firstly by the authors in [4].

## REFERENCES

- [1] L. N. T. Huynh, N. C. Nguyen, J. Peraire, and B. C. Khoo. A high-order hybridizable discontinuous Galerkin method for elliptic interface problems. *Int. J. Numer. Methods Engng.*, 93(2):183-200, 2012.
- [2] A. Hansbo and P. Hansbo. An unfitted finite element method, based on Nitsche's method for elliptic interface problems. *Comput. Methods Appl. Mech. Engrg.*, 191(47):5537-5552, 2002.
- [3] H. Egger and J. Schöberl. A hybrid mixed discontinuous Galerkin finite-element method for convection-diffusion problems. *IMA J. Numer. Anal.*, 30:1206-1234, 2010.
- [4] J. Zhu and H. A. Vargas. A mixed hybrid discontinuous Galerkin method for convection-diffusion interface problem. *The Second International Conference on En-*

gineering and Computational Mathematics (ECM2013), The Hong Kong Polytechnic University, December 16-18, 2013.