

Matlab tools for HDG in three dimensions: scripts for testing

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September 2, 2014

- The code uses the Parallel Toolbox if this is installed. (Nothing has to be done if it is not.) To activate the toolbox, type

```
matlabpool open
```

At the end of the session, type

```
matlabpool close
```

- The experiments of Section 8 Tables 1–3 can be replicated typing

```
scriptHDG3dhmethod
```

with the following choice of a parameter `n` that is asked to the user:

- use `n=1` to get Table 1
- use `n=2` to get Table 2
- use `n=3` to get Table 3

- The experiment of Section 8 Table 4 can be reproduced typing

```
scriptHDG3dkmethod
```

and choosing `n=1`.

- Other experiments for the h –method (refinement of the tetrahedrization) can be carried out using

```
scriptHDG3dhmethod
```

and choosing `n=0`. The user will be requested the following parameters:

- the polynomial degree k ($k \leq 3$)

- a choice of exact solution: \mathbb{P}_1 , \mathbb{P}_2 , \mathbb{P}_3 or smooth solution
- a choice between using constant or variable coefficients in the problem
- a choice of domain: the chimney domain described in Section 8, a cube with Dirichlet BC on all faces, and a Fichera corner domain with quasiuniform tetrahedrizations and mixed BC
- Other experiments for the k -method (fixed tetrahedrization, increase of polynomial degree) can be carried out using

`scriptHDG3dkmethod`

and choosing `n=0`. The user will be requested the following parameters:

- a choice of exact solution: \mathbb{P}_1 , \mathbb{P}_2 , \mathbb{P}_3 or smooth solution
- a choice between using constant or variable coefficients in the problem
- a choice of domain: the chimney domain described in Section 8, a cube with Dirichlet BC on all faces, and a Fichera corner domain with quasiuniform tetrahedrizations and mixed BC
- a choice of which tetrahedrization to use (an index from 1 to 4, 1 being the coarsest partition)
- Additionally, we are providing a script to test the HDG method for convection-diffusion problems. Typing

`scriptHDG3dCD`

will give the user several options to choose

- the polynomial degree k ($k \leq 3$)
- a choice of exact solution: \mathbb{P}_1 , \mathbb{P}_2 , \mathbb{P}_3 or smooth solution
- a choice between using constant or variable coefficients in the problem

The domain is always a cube and Dirichlet BC are imposed in all faces of it.