DPG PROGRESS AT ODEN

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ABSTRACT

I will give a progress report on three DPG related research subjects that we are currently pursuing in my group.

First, I will report on extensive numerical experiments for the *double adaptivity method* in context of 2D *confusion* problem and higher order elements. I will outline two different codes that we have built, the first one based on two independent data structures and the use of pointers, and the second one based on a single data structure but the use of weakly conforming elements that are not covered by the theory. This is a joint work with Jacob Salazar [1].

Then I will report on a stability and convergence analysis for acoustic and Maxwell waveguide problems and the *full envelope approximation*. The use of the exponential ansatz results in modified acoustics and Maxwell problems that are solved with the DPG method based on the ultraweak formulation. This is a joint work with Markus Melenk and Stefan Henneking [2].

Finally, I will report some preliminary numerical results on combining the DPG method with my old *automatic hp-adaptivity* scheme [3]. Utilizing the ultraweak DPG method, we replace the globally *hp*-refined grid, with an *hp*-refined grid based on DPG residual estimate, and the *Projection-Based (PB) interpolation* with just L^2-projections. This work is being done with Jonathan Zhang.

References

[1] Salazar, J. and Demkowicz, L., *The double adaptivity paradigm: conforming vs. weakly conforming test functions*, Oden Institute Report 2021/15, submitted.

[2] Melenk, M., Demkowicz, L. and Henneking, S., *Convergence of full envelope DPG method for waveguide problems*, in preparation.

[3] Demkowicz, L. *Computing with hp Finite Elements*, Chapman & Hall/CRC Press, Taylor and Francis, Boca Raton 2006.

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