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ON A DISCONTINUOUS GALERKIN METHOD AND ITS EXTENSION TO NUMERICAL MODEL COUPLING

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Recently, numerical predictions have made a vigorous entry into design and analysis offices. However, carrying out such simulations on small-wavelength problems, such as mid- and high-frequency acoustic and vibration problems, remains a challenge. In this case, finite element techniques, which are well-established tools for larger-wavelength problems, are hampered by pollution errors and their computation costs are prohibitive.

Our first answer is a Trefftz Discontinuous Galerkin method (TDG) which could pave the way for promising solutions to such small-wavelength problems. This TDG method, which was initially introduced for quasi-static linear problems in [1], has been extended to vibrations and acoustics in [2] as the "Variational Theory of Complex Rays" for mid- and high-frequency problems, then further developed over the years. Its most recent application [3] addresses high-Péclet advection-diffusion problems. This general TDG method, among the classical DG methods [5], can be viewed as the Trefftz version of Baumann-Oden?s DG formulation [4]. In this presentation , we introduce new extensions called Weak-Trefftz DG methods, which can be used to couple different types of numerical models, including classical FE models. They also overcome some limitations of the TGD method. The state of the art will be illustrated by several examples, including engineering problems.

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