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Vakgroep: **Technische Stromingsleer**

In het kader van zijn doctoraalopdracht zal

Ruben Boere

een voordracht houden getiteld:

Projection schemes for wave propagation.

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Samenvatting:
In the last decades there has been a lot of activity in Computational Aeroacoustics (CAA) aimed at reducing noise of machines like airplanes, wind turbines and hairdryers. Part of CAA is the modeling of sound propagation through inhomogeneous media, e.g. turbulent flow fields. Numerical methods used to describe sound waves always have errors, which can be expressed in terms of dispersion (wave speeds error) and dissipation (damping). To be able to predict sound propagation over relatively large distances it is important that dispersion and dissipation are extremely small. The following important steps have been taken in the development of numerical methods for wave propagation:

- Tam & Webb [J. Comput. Phys. **107** (1993)] used optimized finite difference schemes to obtain Dispersion Relation Preserving (DRP) schemes, which have no dissipation and little dispersion. Unfortunately, computations with DRP schemes need relatively many neighboring points and uniform meshes.
- Shu & Atkins [AIAA J. **36** (1997)] have introduced Discontinuous Galerkin (DG) finite element methods in CAA. DG schemes are very compact, can be used on unstructured non-uniform grids and have superconvergent dispersion and dissipation properties in terms of mesh-size wave-length ratio.
- In 2005 these two ideas have been combined by our group into optimized DG schemes, called projection schemes [submitted to Math. Comp. (2006)]. This optimization is performed by demanding that projections of elementary waves on the basis functions used with DG schemes are optimally propagated, by using the structure of DG schemes with redefined matrices. Projection schemes have already been applied to the 1D linear advection equation on uniform grids. These new schemes are very compact and have equal dispersion and less dissipation than DG schemes.

The present investigation aims at:

- Extension to 2D uniform meshes
- Extension to non-uniform meshes in 1D

Examencommissie:

Prof.dr.ir. H.W.M. Hoeijmakers (afstudeerdocent)

Dr.ir. R. Hagmeijer (mentor)

Prof.dr.ir. J.J.W. van der Vegt (mentor)

Dr.ir. Y.H. Wijnant (extern lid)

Ir. H. de Vries

De afstudeerdocent,

____
(handtekening)

d.d. ________________