A fresh look at artificial dissipation and entropy production

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The first idea of von Neumann back in the 1940's of a finite difference schemes for nonlinear hyperbolic conservation laws rested on an unstable central difference which was stabilized by an artificial dissipation term. In the mid-50's Courant, Isaacson and Rees paved the way towards upwind discretizations which no longer needed *artificial* (although they included *numerical*) dissipation. Although a central scheme with artificial dissipation was the most successfull method applied in aerodynamic calculations during the 1980's, researchers found the handling of the parameters in thoses methods unsatisfactory and high resolution discretizations with inbuild stabilization terms took over and were analyzed in detail. In the last years the image processing community has developed nonlinear anisotropic diffusion equuations to denoise images and to sharpen fronts occuring in the grey levels. We give an overview over the methods used and describe the application of the new dissipation models within discretizations of hyperbolic partial differential equations.

References

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