ENO-related techniques in 2D

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In the late 80's, ENO (essentially non oscillatory) schemes have been developed by A. Harten. These schemes produce smooth reconstructions of functions from discrete data, e.g. point values or cell averages of a function. While similar linear schemes only allow good reconstructions in smooth regions, sufficiently far away from singularities of the underlying function, the nonlinear ENO procedure works well in a much larger region. An additional technique, also proposed by Harten, is the so called subcell resolution technique, which enlarges the region of good approximation for an ENO scheme to an optimal extent (but, on the other hand, also brings up serious questions of stability). This good resolution of singularities makes ENO and subcell resolution techniques especially interesting for the use in numerical schemes for conservation laws (mainly in connection with finite volume schemes).

Very much in the spirit of wavelet theory, ENO schemes can also be used to construct nonlinear multiresolution analyses. Then, the interesting features of ENO and subcell resolution promise an even smaller number of relevant detail coefficients close to the singularities of a function. Equipped with efficient coding strategies, these ENO multiresolution analyses seem to be very interesting also for the compression of images, since the edges in an image correspond to curves of singularities of a function in 2D.

The main questions which are addressed in this project are:

- Stability of ENO reconstruction with subcell resolution
- Efficient coding strategies fitted to the features of ENO and subcell resolution
- Extension of ENO to 2D; compression of images
- Application of ENO schemes to conservation laws

For further efficient collaboration, a meeting of the participants in Valencia is intended.