# Reconstruct in a triangle MCV cell

Attention! The cell center must be set on the center of vertices coordinate center, i.e. we have 3 vertices ,, on cell , then

4th order scheme:

We have polynomial

For a point on cell

where , and is the number of points on cell, in a 4th order scheme

We write the equations to matrix form

Therefore

Calculating derivate by polynomial , yield

Write above formula into matrix form

where are the derivate on each point on cell, and

It’s clear

Because of above derivate is based on the local coordinate, we need to transform it to an absolute Cartesian coordinate.

In matrix form

therefore

because

therefore

For all of points on cell

Roe Riemann solver

1. 必须把单元中心打在坐标的中心点，否则面积计算不正确，面积计算只能有2阶精度，模式计算只能有1阶精度
2. 必须做单元面的修正，参见陈春刚在Quarterly Journal of the Royal Meteorological Society的文章（Chen,2014）式（27）-（29），否则通量计算不正确，模式只能有2阶精度
3. 必须用Roe格式黎曼解，否则用LLF方法黎曼解会在山脉附近会产生振荡

# Integration on edges

i.e. 4th order scheme

Write above formula in matrix form

The elements of are the length of segmentations from the 1st vertex to point No.1,2,3,4 on edge in physical space

# 2 Dimensional WENO

There are three adjacent triangle cells in the major triangle, correspondence totally 4 reconstruction polynomials

Set represents number of reconstruction polynomials, and is number of terms in each polynomial. For 4th order scheme with 4 WENO stencil, ,

Combining 4 polynomials to single WENO reconstruction polynomial with weights.

Where are the WENO weights.

In the local cartesian coordinate set ,

Where represents stencil number

Note, the subscribe in represents transpose of matrix/vector.

Here we need to determine by 2 dimensional WENO

According to section 1

Where is point number in a cell, and for full rank matrix.