Subdivision Curve Definition and Analysis Exercises

Definition by Box-splines

Determine the stencils for the binary univariate box-splines of degrees 3, 4 and 5

Determine the stencils for the quarternary (arity=4) box spline of degree 2.

Dubuc-Deslauriers interpolating refinements

Determine the masks for the binary 4-pt and 6-pt schemes

Determine the mask for the Dubuc-Deslauriers ternary 4-pt scheme

z-transform analysis of convergence

Making a difference mask

The z-transform approach to analysing continuity and convergence shows how, given a subdivision mask, a derived mask can be computed, which relates differences of the subdivided polygon to those of the original.

$$S'(z) = \frac{(1-z)}{(1-z^a)} S(z)$$

This form begs the question of whether $(1-z)S(z)$ is actually divisible without remainder by $(1-z^a)$. If it is not, then the above expression does not give a Laurent Polynomial.

- Prove that if a scheme S has constant precision, $(1-z)S(z)$ is exactly divisible by $(1-z^a)$
- Prove that if a scheme S has both constant precision and (functional) linear precision, we may construct derived schemes for both first and second differences.

Eigenanalysis

Carry out the odd and even eigenanalyses for [1,4,4,1]/5

Carry out the odd and even eigenanalyses for [-1,0,9,16,9,0,-1]/16