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Existence of MRA Tight Frames on NURBS. Preliminary report.

The Non-Uniform Rational B-Splines (NURBS) provide a powerful tool in CAD/CAM industry for modeling. The wavelets provide an excellent analysis tool in many applications, such as image processing and multiresolution curves and surfaces. There have been some efforts in constructing wavelets on NURBS such as semi-orthogonal NURBlets investigated by Chui and Lian. In this paper, we are interested in constructing compactly supported wavelet tight frames on NURBS based on the theory of the MRA tight frames on the non-uniform B-splines developed by Chui, He, and Stockler. It is well-known that in order to construct wavelets on NURBS, the multiresolution structure must be built on NURBS. Chui and Lian found the condition for the NURBS bases to have a multiresolution structure. Our MRA tight frame construction is established on this multiresolution structure for linear NURBS.

The weights for the NURBS basis functions play an important role in determining the existence of MRA tight frames on NURBS. We compare the tight frames on the non-uniform B-splines and the tight frames on the NURBS using the same knot sequences. We observe that though for any (positive) weights the tight frames exist, certain condition must be satisfied. Several examples will be presented. (Received September 10, 2007)