

# Connectivity-Guided Adaptive Wavelet Transform Based Compression of Static and Dynamic Meshes

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## **Abstract:**

In this talk a Connectivity-Guided Adaptive Wavelet Transform based mesh compression algorithm will be presented. On the contrary to previous work, which processes the mesh models as 3D signals, the proposed method uses 2D image processing tools for compressing the mesh models. The 3D mesh is first transformed to 2D images on a regular grid structure by performing orthogonal projections onto the image plane. This operation is computationally simpler than parameterization. The neighborhood concept in projection images is different from 2D images because two connected vertex can be projected to isolated pixels. Connectivity data of the 3D mesh defines the inter-pixel correlations in the projection image. Thus the wavelet transforms used in image processing do not give good results on this representation. Connectivity-Guided Adaptive Wavelet Transform is defined to take advantage of inter-pixel correlations in the image-like representation. Using the proposed transform the pixels in the detail (high) subbands are predicted from their connected neighbors in the low-pass (lower) subbands of the wavelet transform.

The resulting wavelet data is encoded using either “Set Partitioning In Hierarchical Trees” (SPIHT) or JPEG2000. SPIHT approach is progressive because different resolutions of the mesh can be reconstructed from different partitions of SPIHT bitstream. On the other hand, JPEG2000 approach is a single rate coder. The quantization of the wavelet coefficients determines the quality of the reconstructed model in JPEG2000 approach. Simulations using different basis functions show that lazy wavelet basis gives better results. The results are improved using the Connectivity-Guided Adaptive Wavelet Transform with lazy wavelet filterbanks. SPIHT based algorithm is observed to be superior to JPEG2000 based mesh coder and MPEG-3DGC in rate-distortion. Better rate distortion can be achieved by using a better projection scheme. Furthermore, the dynamic extension of the proposed static mesh compression algorithm will be presented. The proposed method will use the basic idea behind MPEG video compression. Inter-vertex correlations between the vertices of each dynamic mesh frame are exploited. Some preliminary results of the proposed algorithm will be given.