Constructing Hamiltonian Triangle Strips on Quadrilateral Meshes

Gabriel Taubin
Pervasive Computing Solutions
IBM T. J. Watson Research Center
P.O.Box 704, Yorktown Heights, NY 10598
taubin@us.ibm.com

Because of their improved numerical properties, quadrilateral meshes have become a popular representation for finite elements computations and computer animation. In this paper we address the problem of optimally representing quadrilateral meshes as generalized triangle strips (with one swap bit per triangle). This is important because 3D rendering hardware is optimized for rendering triangle meshes transmitted from the CPU to the GPU in the form of triangle strips. We describe simple linear time and space constructive algorithms, where each quadrilateral face is split along one of its two diagonals and the resulting triangles are linked along the original mesh edges. We show that with these algorithms every connected manifold quadrilateral mesh without boundary can be optimally represented as a single Hamiltonian generalized triangle strip cycle in multiple ways, and we discuss simple strategies to tailor the construction for transparent vertex caching.