

SHOWCASE 22 Mathematics in Hollywood

Felix Kälberer, Matthias Nieser and Konrad Polthier

Triangle meshes are among the most commonly used data structures in computer animation for all kinds of shapes. Often meshed surfaces are created with a modeling software or alternatively obtained from digitizing physical shapes with a 3d scanner. Although meshes are very flexible data structures and allow easy processing, this flexibility sometimes appears to be a drawback when more structured grids are needed. For example, when two characters shall be morphed, that is, one character shall be deformed continuously into another character, then an identical structure of both of their meshes is needed in order to move one vertex to its corresponding vertex on the other mesh. If both meshes were obtained from a 3d scanner and have millions of triangles, then it is nearly impossible to automatically provide a pairing of the vertices from one mesh with the vertices of the other mesh.

The morphing of two characters is a key example where a structured grid, the same grid used for both characters, would be a tremendous help. The transition of one character to the other would just be a transition of the vertices of the first grid to the vertices of the second grid.

The algorithm QuadCover provides robust technique to convert a triangle mesh to a quadrilateral grid which is highly structured and adjusted to the underlying geometrical shapes. Generating such a coarse structure grid on one mesh and transferring this grid onto the second shape as well provides the basis for an effective morphing of two shapes.

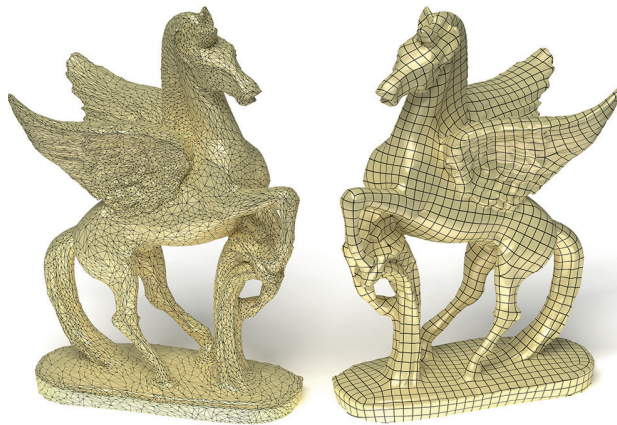


Figure 1. Automatic conversion of a triangle mesh (left) to a highly structured quadrilateral mesh (right)