Mesh Morphing

Introduction

Many CAE and simulation based software systems use triangular or quadrangular meshes generated for the exact CAD model for performing various analysis such as crash analysis, flow analysis, structural analysis, thermal analysis etc. In most cases mesh generated from scanned data is used for the same.

The process of generating high quality mesh from the model or scanned data is tedious and time consuming and may not be very accurate. Mesh morphing allows us to modify the shape of model by working on the mesh, without returning to the CAD system.

Challenges

- Maintaining curvature of the mesh while morphing the mesh
- Optimizing the performance while handling large meshes

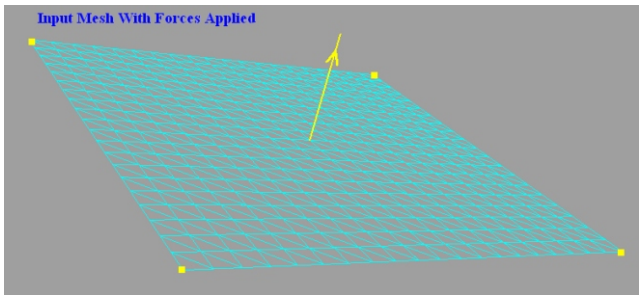
Highlights

- User friendly
- Optimized performance
- Ability to handle very large meshes
- Maintains curvature of the mesh

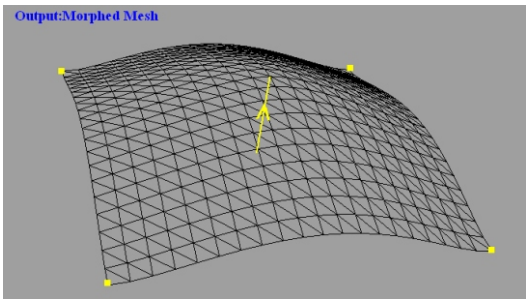
Solution

Basically, the solution for morphing involves maintaining deviation between the curvature, as well as the difference between vector of original mesh and morphed mesh, minimum.

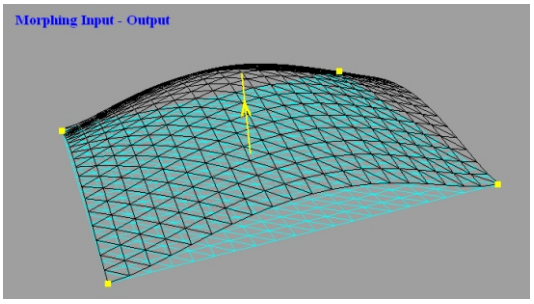
A stiffness matrix has been devised to maintain a curvature. The value of stiffness matrix varies depending upon the material properties of mesh. Sparse Matrix approach used to represent the energy equation of morphing helps to make morphing operation faster.



Input Mesh with Force Applied



Output Morphed Mesh



Morphing Input-Output

Conclusion

Prescient developed the mesh morphing functionality that greatly helps the clients to morph their meshes and get accurate results maintaining surface curvatures.