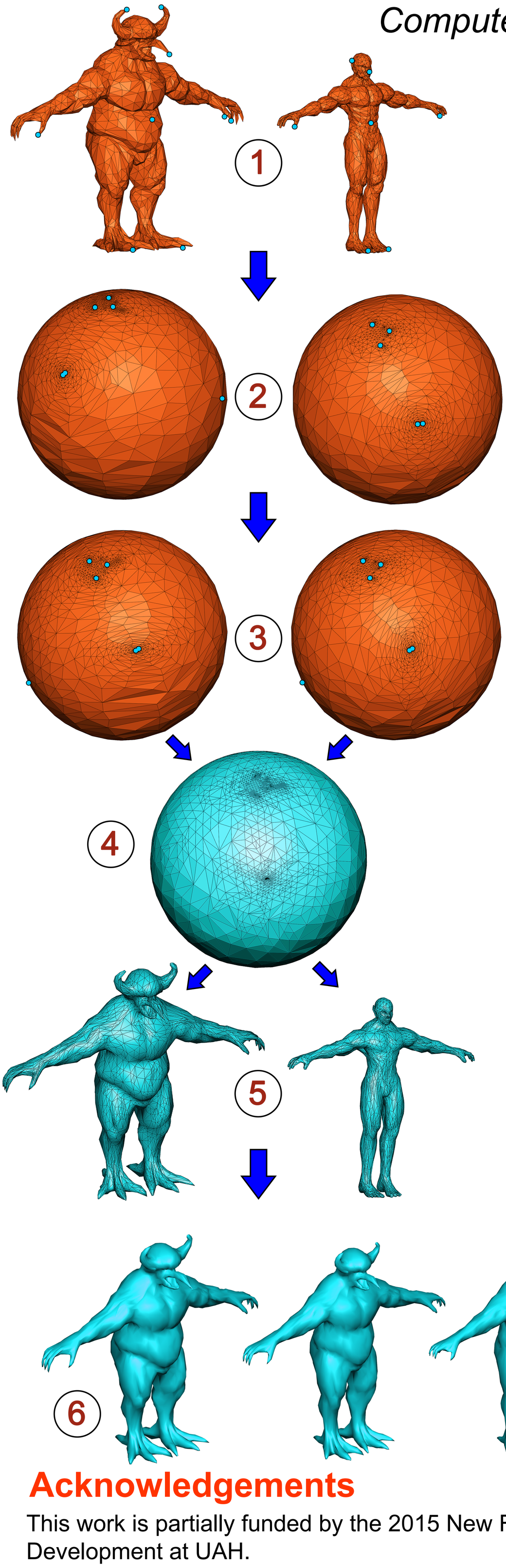
COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Research Horizons Day
April 7, 2015

Research Horizons Day

Feature Aligned 3D Mesh Morphing

Sabin Timalsena, Chao Peng
Computer Science Department



Overview

Our research is about geometry morphing between two closed genus-0 meshes using spherical parametrization.

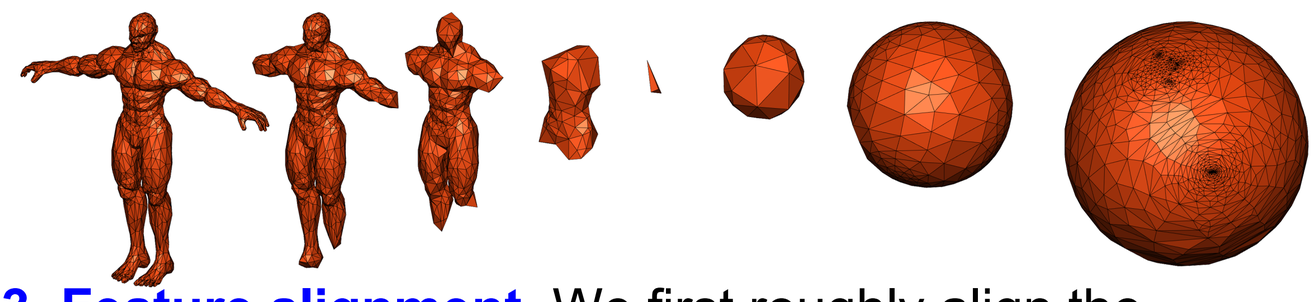
Applications

Animation, Gaming, Design, Visual Effects

Steps in Morphing

1. Input. We take two closed genus-0 meshes as input.

2. Parametrization. We use a **progressive scheme** to **simplify** the model down to a tetrahedron, then **reinsert** all vertices one by one to form a spherical embedding, **minimizing** distortion at each step.



3. Feature alignment. We first roughly align the parametrization using rotation (least squares) and then precisely align them using **Radial Basis Functions** according to user-selected **control points**.

4. Generation of a Supermesh. A new **topologized mesh** is generated, which can well approximate both source and target meshes.

5. Remeshing. Both the source and target meshes are remeshed to have the same number of vertices and connectivity as the supermesh.

6. Morphing. We animate moprhing by linearly interpolating between corresponding vertex positions in the remeshed source/target meshes.

Findings

1. Ease of parameterization is achieved by flattening or “rounding” the mesh during simplification.

2. For quality remeshing, one needs to avoid thin/small triangles in the parameterizations. Achieved by minimizing angle/area distortion and aspect ratio.

3. Too many control points for feature alignment can distort the meshes too much and cause artifacts.

Acknowledgements

This work is partially funded by the 2015 New Faculty Research Program from the Office of Research and Economic Development at UAH.