Realistic Modeling for Facial Animation

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Overview

► Desire
  ▪ A realistic model of a human face that can be easily animated.

► Problem
  ▪ Creating facial animation models is tedious and cumbersome, requiring a great deal of user input.

► Solution
  ▪ Automate it!
Method

► Two-part Approach

- Adapt a generic face mesh to range and reflectance data.
  - Find the facial features from scanner input.
  - Map it to the generic face mesh.
- Extend the mesh to a functional physics-based model capable of facial expression.
Image Processing

- Input: Range & Reflectance Scan
  - Acquired from cylindrical scanner.
  - Problem: Laser disperses in places such as hair and chin.

- Solution: Interpolate the values from nearest neighbors.
  - This still leads to awkward hair representations (shown later).
Generic Mesh Adaptation

► Get a cylindrical representation of the generic facial mesh, then map it to the LaPlacian field of the range data.
► Match features corresponding to the dark lines:
“Heidi” Example
Estimating “Relaxed” Model

- Optimal facial expression is a neutral one.
- “Heidi” is smiling with her mouth open, how do we get the relaxed model?
  - Map the mesh without locating the mouth contour, then adjust the mesh back to the neutral position.
  - But how does the algorithm know which feature to ignore?
The Dynamic Skin & Muscle Model

- Faces on the mesh are complex models of human tissue.

- Tissue and muscle forces are modeled properly so one that movement propagates correctly throughout the face.
Skin Incompressibility & Skull Deformation Constraint

Skin is incompressible, so a constraint is used to ensure the skin volume doesn’t magically increase or decrease.

An important addition to the physical model is a constraint to prevent skin from penetrating the skull.
Other Head Components

- Eyes, Eyelids, Teeth, Hair, Neck, and Bust are all added to the final geometric model.
  - Eyelid texture is synthesized based on the interpolation algorithm from earlier.
Results
Results
Questions?