Art Nova: Touch-Enabled 3D Model Design

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What is Art Nova?

• A 3D sculpting and painting program
• Uses VR technology
• Based off of inTouch
System Overview

Figure 2. System Architecture.
Tools

• Move object (claw)
• Paint (paint brush)
• Deform (suction cup)
• Viewpoint repositioning:
  – Automatic repositioning
    – allows user to move selected point to center of screen
  – Flying mode – rotate camera using the haptics device
(original) inTouch Painting Method for solid colors

- Stroke broken down into 3-space vectors (stroke segments)
- The force of the user is computed at stroke end points
  - used to determine brush size
- Brush radius + vector = 3D volume
- Last triangle is painted first
- Followed by neighboring triangles within 3D volume
- Repeat previous two steps.
inTouch painting triangles

\[ D = \frac{\| p_w - q \|}{R_s(q)}, \]

- \( p_w \) = point in world-space
- \( p_t \) = texel
- \( q \) = nearest point along paint stroke
- \( R_s(q) \) = stroke radius at \( q \)

- Compute \( p_t \) by blending painting color and background based on \( D \).
Problems

- Stroke along a curved surface is represented as a vector
  - Can produce artifacts on long strokes
  - Usually strokes short enough not to cause problems
ArtNova Painting Textures

- Compute world position: $p(w)$
- Compute nearest neighbor on stroke: $q$
- Compute texture look-ups $s$ and $t$
- $s =$ length along stroke: add the total length of all previous stroke segments to $||q-p(v)||$
- $t =$ signed distance from stroke
  - $n$ is the normal for the triangle containing $p(w)$
  
  $$((p_w - p_v) \times \vec{v}) \cdot \vec{n}$$
Figure 4. Texture painting.
Textures meeting

Figure 5. Cuts of beef indicated by different textures using ArtNova.