CMSC 491A/691A
Artistic Rendering

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Announcements
• Questions
• Pick papers
• Media collection due Thurs
Computer Depiction

- Fredo Durand, NPAR 2002

Issues

- Intrinsic vs extrinsic characteristics
  - Different for different artistic traditions
- Primary vs secondary geometry
  - Local vs global consistency
- Depiction as optimization
  - Parameters for solving optimization
- Movement from 3D->2D and back

Computer Depiction (cont)

- Systems representation
  - Spatial
    - 3D->2D: Perspective, projection
    - 2D->2D: warping
    - 2D->3D: Camera control, modeling
  - Primitive
    - Continuous pts, discrete points, lines, regions
    - View independent vs view dependent
  - Attribute
    - 3D->2D: shading
    - 2D->3D: lit-sphere, 3D painting, shadows
  - Marks
    - Mostly 2D->2D
    - Coherence issues
Evaluating NPR: Eye Movement

- Santella and DeCarlo, NPAR 2004
- How to assess effects of abstraction and style?
  - Preference; Task performance
  - Eye movements

Evaluating NPR: Observation

- Isenberg, Neumann, Carpendale, Sousa, Jorge NPAR06
- Qualitative aspects of renderings
- Subjects:
  - domain experts, professional illustrators, illustration end users, npr researchers
- Procedure
  - Pile sorting task
  - Semi-structured interviews about preference and utility
  - Questionnaire
Evaluating NPR: Observation (2)

• Clusters
  – Same artist
  – Same technique
  – Similar LOD
  – Mixtures

Evaluating NPR: Observation (3)

• Interviews
  – Which images do you particularly like?
    • Seemed to assume illustration task
    • As likely to be computer-generated
  – In what context would you use these images?
  – Which would you use in university textbooks?
    • Mostly computer-generated
    • Detailed, realistic, shading, texture, traditional style, good 3D
  – Which would you use for children’s textbooks?
  – Which look most computer-generated/hand-drawn?
    • Hatching most likely to stand out as hand-drawn
    • Some computer-generated images stood out as hand-drawn
    • Spareness and variation made an image more like hand-drawn
Artistic Image and Video Processing

- Process image or video input to have an artistic appearance
- Key issues:
  - Mimic style
  - Identify features

Impressionist Video

- Processing Images and Video for an Impressionist Effect, Litwinowicz, SIGGRAPH97
- Image process video streams to look “impressionist”
- Use in film “What Dreams May Come”
- Addresses problems:
Impressionist Video (2)

- Process
  - Rendering strokes
    - Generate line w/length, thickness, orientation
    - Randomly perturb length, radius, color, theta
    - Clip to image edges and render
  - Orienting strokes
    - Orthogonal to color gradient
  - Maintaining coherence
    - Use optical flow to guide stroke movement
    - Fill in strokes when they get too sparse

Curved Brushes

- Painterly Rendering with Curved Brushes of Multiple Sizes, Hertzmann, SIGGRAPH98
- Use more flexible brush strokes to create more expressive style
- Parameters
  - Variable brush size
  - Curve strokes
Curved Brushes

- Style parameters
  - Approximation threshold
  - Brush sizes
  - Curvature filter
  - Blur factor
  - Min/max stroke lengths
  - Opacity
  - Grid size
  - Color jitter
- Combinations
  - Impressionist
  - Expressionist
  - Colorist wash
  - Pointillist

Painterly Animation

- Image and Video Based Painterly Animation, Hays and Essa, NPAR04
- Builds on Litwinowicz97, Hertzmann98, combining elements to make a more robust system
- Adds user specified motions, stroke height maps
Painterly Animation (2)

Motion Magnification

- Motion Magnification, Liu, Torralba, Freeman, Durand, and Adelson, SIGGRAPH05
- Identify interesting motions and magnification
  - Register images
  - Cluster feature point trajectories
  - Segment motion into layers
  - Magnify motion of layer
  - Render
Motion Magnification (2)