CMSC 491A/691A
Artistic Rendering

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Artistic Rendering

• Computer-generated images in a style similar to some artistic media or style
• Also called non-photorealistic rendering (NPR)
• Different emphases
  – Mimic style
  – Accomplish purpose
Administrivia

• Prereq:
  – cmsc 435: Introduction to computer graphics
  – Coreq OK
  – If neither, come talk to me
• No text, just lots of papers
• Office hours:
  – Tues 10-11:30;
  – by appt

Topics

• Artistic Image and Video Processing
• Rendering from 3D Models
  – Silhouettes and Outlines
  – Shading and Texturing
  – Geometry and Perspective
• Specific Media: Algorithms, Simulation
• Illustration, esp Visualization
• Animation and Real-time Artistic Rendering
• Systems and Strategies
• Abstraction
• Learning/Specifying Styles
Artistic Image and Video Processing

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

Artistic Image and Video Processing

• Papers
  – Litwinowicz97
  – Hertzmann98
  – Hays04
  – Liu05
Silhouettes and Outlines

- Draw expressive silhouettes and outlines of objects
- Key issues:
  - Identifying silhouettes
  - Drawing stylized silhouettes

Silhouettes and Outlines

- Papers
  - Raskar99
  - Hertzmann00
  - DeCarlo03
  - Kalnins03
Shading and Texturing

• Generating appropriate tone and texture
• Key issues:
  – Matching tone representing shaded surfaces
  – Using strokes appropriate to style
  – Matching desired textures
  – Using tone and texture to clarify shape

Papers
– Winkenbach94
– Meier96
– Salisbury97
– Rusinkiewicz06
Geometry and Perspective

- Use non-rigid geometry or non-linear perspective
- Key issues:
  - Capturing key geometric features
  - Overcoming obscuration
  - Preserving relationships

Geometry and Perspective

- Papers
  - Rademacher99
  - Singh02
  - Takahashi02
Specific Media: Algorithms

- Mimic appearance of a media/style
- Issues
  - Define appearance rules/characteristics
  - Automate steps in creation

Specific Media: Algorithms

- Papers
  - Stippling: Deussen00
  - Mosaic: Hausner01
  - Batik: Wyvill04
Specific Media: Physical Simulation

• Create image through physical simulation of process of creation

• Issues
  – Model physical properties of surface and art supplies
  – Accurately model mechanism of transfer and accumulation

Specific Media: Physical Simulation

• Papers
  – Watercolor: Curtis97
  – Pencil: Sousa00
  – Crayon: Rudolf05
Illustration

• Create images in style of scientific or technical illustration

• Issues:
  – Clearly convey shape
  – Abstract away unnecessary detail

Illustration

• Papers
  – Tone/silhouettes: Gooch98
  – Route maps: Agrawala01
  – Assembly instructions: Agrawala03
Illustrative Visualization

- Create illustration-style images from data
- Issues:
  - Identify features of interest
  - Render features in expressive style

Illustrative Visualization

- Papers
  - Lines from 2D flows: Turk96
  - Lines from volumes: Burns05
  - Flow volumes: Rheingans01
  - Flow illustration: Joshi05
  - Additional papers TBA
Animation and Real-time AR

- Generate artistic renderings fast enough for interactive rates
- Issues
  - Ensure frame-to-frame coherence
  - Pre-build stroke textures
  - Exploit hardware

Animation and Real-time AR

- Papers:
  - Kowalski01
  - Praun01
  - Bousseau06
Systems and Strategies

• Analyze AR systems and unifying strategies
• Issues
  – Address implementation issue
  – Identify unifying concepts

Systems and Strategies

• Papers:
  – Kalnins02
  – Hertzmann03
Abstraction

• Derive meaningful abstractions of dense models

• Issues:
  – Identify most important features
  – Direct attention to most important features

Abstraction

• Papers:
  – Sketch: Sousa03
  – Motion: Nienhaus05
  – Video: Winnemoller06
Learning/Specifying Styles

- Learn new styles or compactly specify appearance
- Issues:
  - Capture characteristics and mechanism of styles
  - Parameterize styles

Learning/Specifying Styles

- Papers:
  - Hertzmann01
  - Lum05
  - Lu05
  - Shugrina06
Assignments

• Paper presentations (2) -- 15%
• Media Collection -- 5%
• Media Specification -- 15%
• Project -- 65%

Paper presentations

• Pick two papers from reading list to present to class
  – Conference style
  – 25 minutes
• Submit one thoughtful question per paper
• Participate in discussions of papers
• Review three paper drafts from class projects
Media Collection

• Collect 10 examples of different artistic media or styles
• Show-and-tell with class
• Turn in list of styles
• Double points for unique media/styles

Media Specification

• Describe the characteristics of a media/style
• Each specification should include
  – description of the characteristics of the media/style
  – a citation for an analytic or how-to book about the media/style
  – a representative artist
  – a representative picture.
• Be prepared to present your media specification to the class for group analysis.
• May choose a style related to your project or not
Project

- Original research in artistic rendering
- Phases
  - Proposal
  - Annotated bibliography
  - Alpha, beta, final release
  - Draft, final paper
  - Presentation to class
- Projects may be individual or group