CMSC 491A/691A
Artistic Rendering

Penny Rheingans
UMBC

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

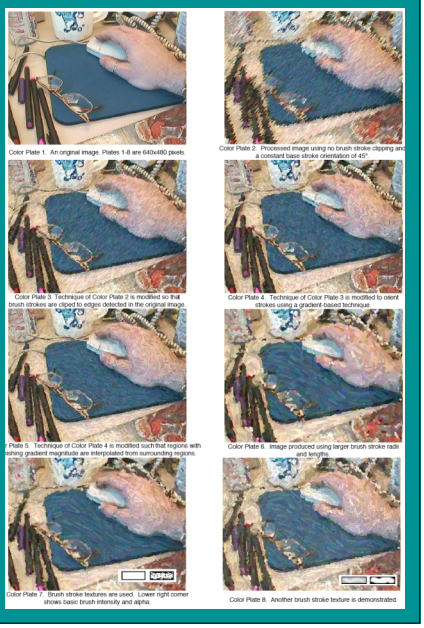
- Prereq:
  - cmsc 435: Introduction to computer graphics
  - Coreq OK
  - If neither, come talk to me
- No text, just lots of papers
- Office hours:
  - Tues 10-11:30;
  - by appt

Topics

- Artistic Image and Video Processing
- Rendering from 3D Models
  - Sihouettes 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

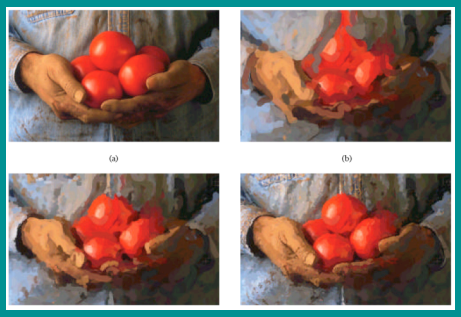
Artistic Image and Video Processing

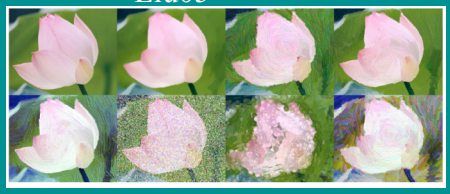
- Process image or video input to have an artistic appearance
- Key issues:
  - Mimic style
  - Identify features

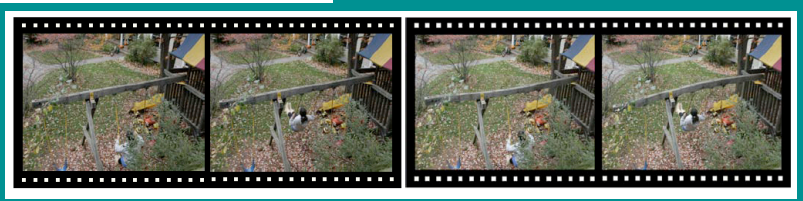


Artistic Image and Video Processing

- Papers
  - Litwinowicz97
  - Hertzmann98
  - Hays04
  - Liu05

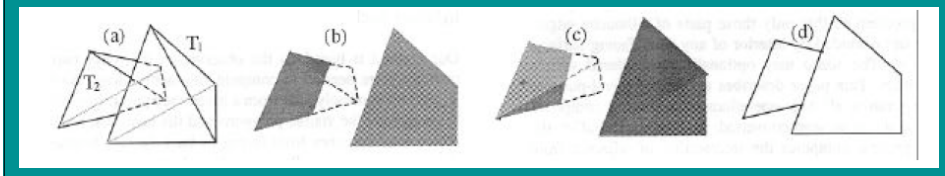






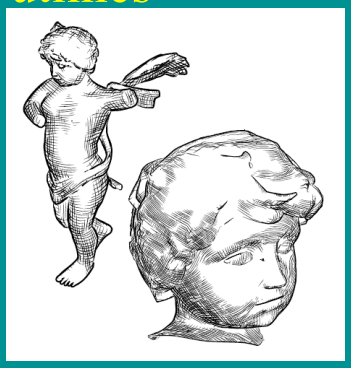
Silhouettes and Outlines

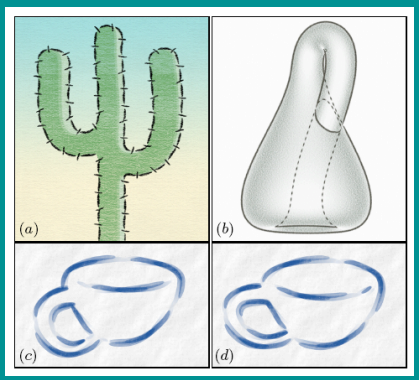
- Draw expressive silhouettes and outlines of objects
- Key issues:
  - Identifying silhouettes
  - Drawing stylized silhouettes

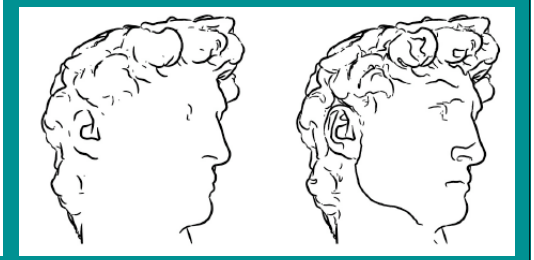


Silhouettes and Outlines

- Papers
  - Raskar99
  - Hertzmann00
  - DeCarlo03
  - Kalnins03

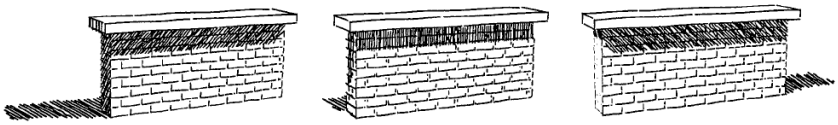






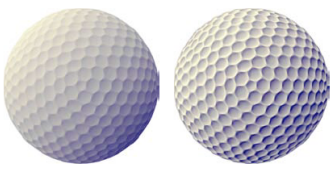
Shading and Texturing

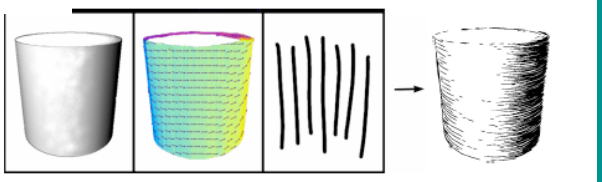
- Generating appropriate tone and texture
- Key issues:
  - Matching tone representing shaded surfaces
  - Using strokes appropriate to style
  - Matching desired textures
  - Using tone and texture to clarify shape



Shading and Texturing

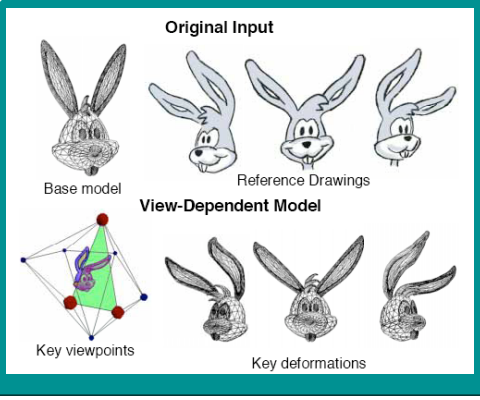
- Papers
  - Winkenbach94
  - Meier96
  - Salisbury97
  - Rusinkiewicz06





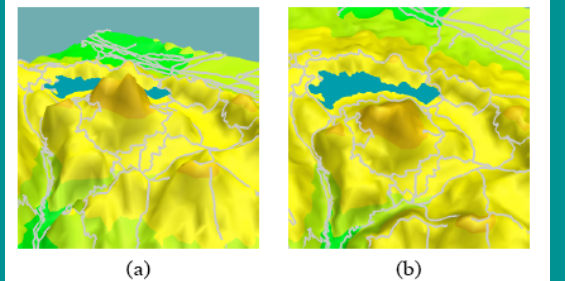
Geometry and Perspective

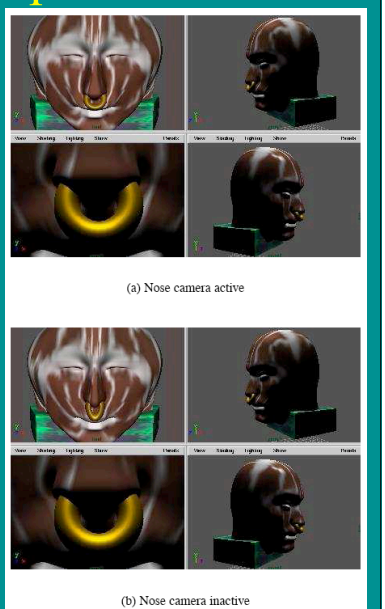
- Use non-rigid geometry or non-linear perspective
- Key issues:
  - Capturing key geometric features
  - Overcoming obscuration
  - Preserving relationships



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

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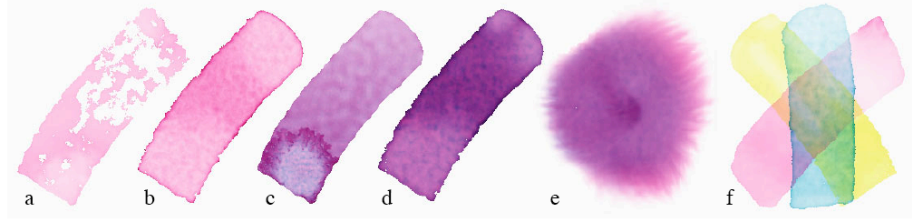
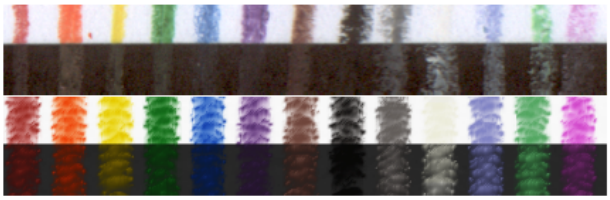
Specific Media: Physical Simulation

- 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



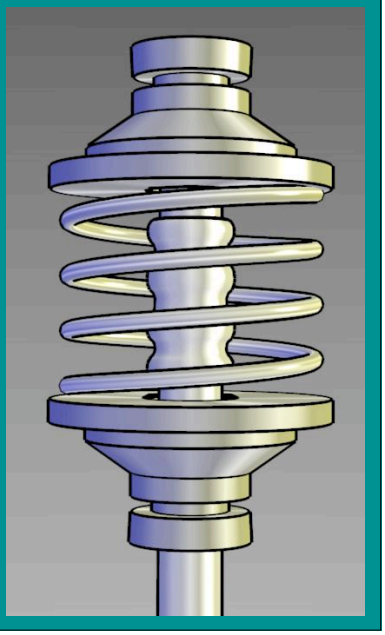
Specific Media: Physical Simulation

- Papers
  - Watercolor: Curtis97
  - Pencil: Sousa00
  - Crayon: Rudolf05



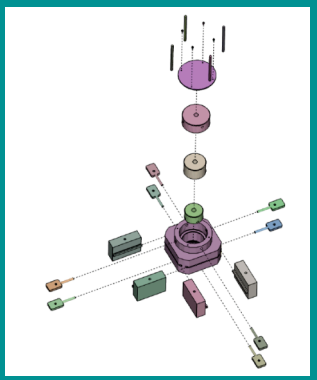
Illustration

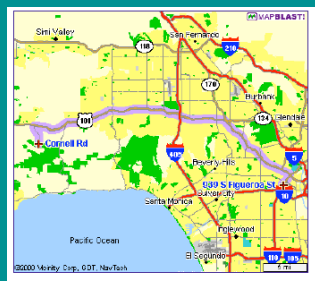
- Create images in style of scientific or technical illustration
- Issues:
  - Clearly convey shape
  - Abstract away unnecessary detail

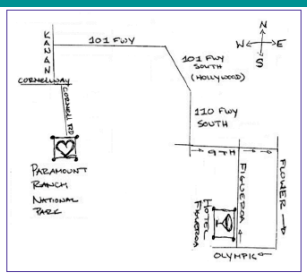


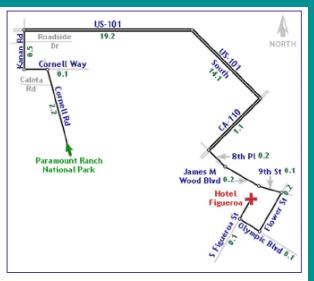
Illustration

- Papers
  - Tone/silhouettes: Gooch98
  - Route maps: Agrawala01
  - Assembly instructions: Agrawala03



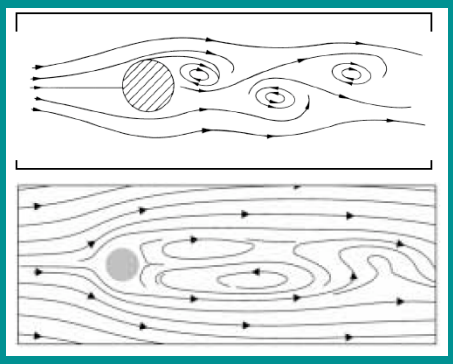






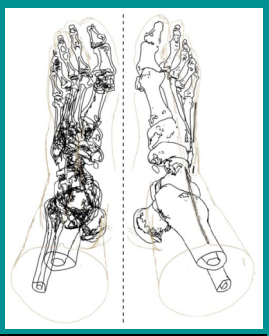
Illustrative Visualization

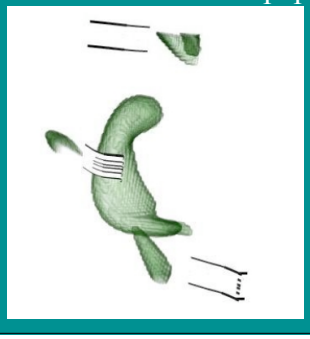
- Create illustration-style images from data
- Issues:
  - Identify features of interest
  - Render features in expressive style

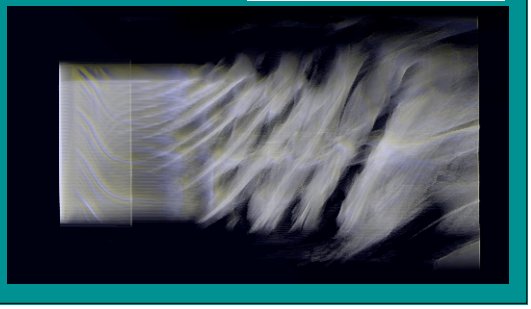


Illustrative Visualization

- Papers
  - Lines from 2D flows: Turk96
  - Lines from volumes: Burns05
  - Flow volumes: Rheingans01
  - Flow illustration: Joshi05
  - Additional papers TBA

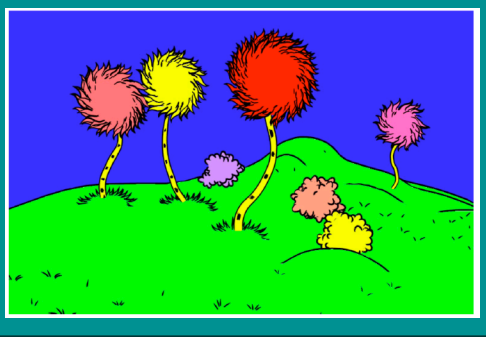






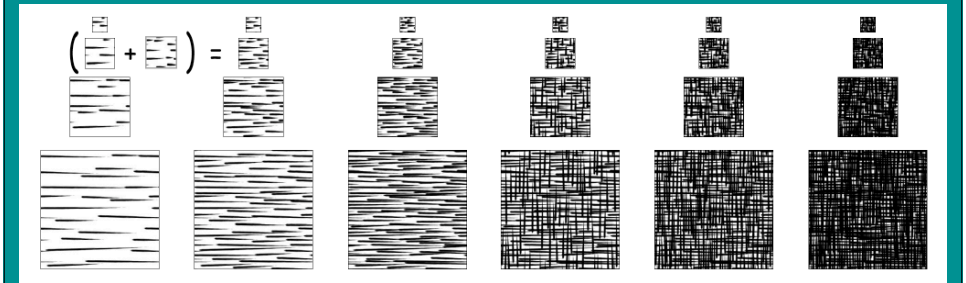
Animation and Real-time AR

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



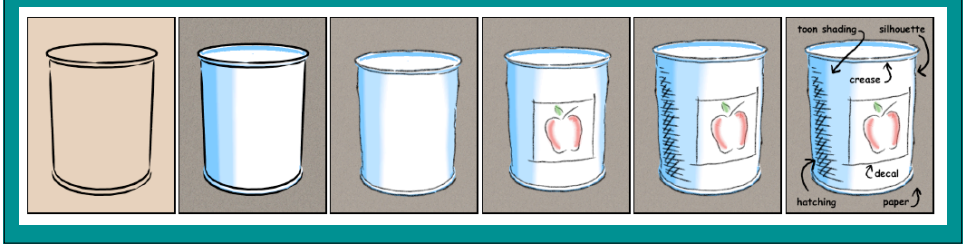
Animation and Real-time AR

- 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

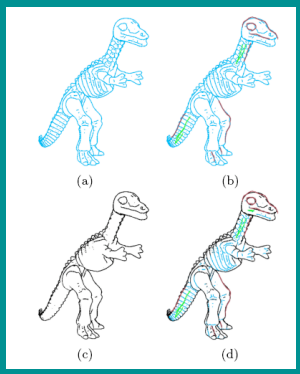
- Papers:
  - Sketch: Sousa03
  - Motion: Nienhaus05
  - Video: Winnemoller06

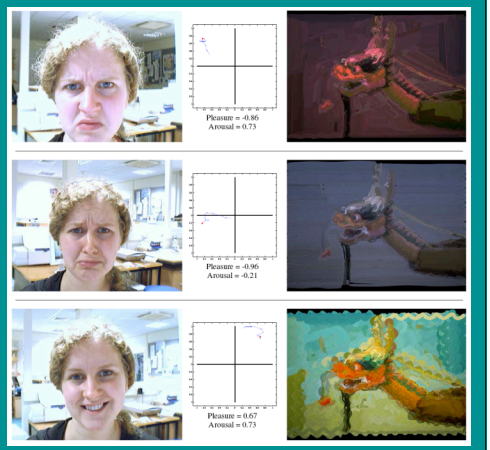
Learning/Specifying Styles

- 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