COSE436

Lecture 27:
Final Review

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Final Exam

- 12/19 (Thu) 15:00 ~ 16:15 (75 min)
  - Closed book, no internet, no calculator
  - 1-page (A4 size) hand-written cheat sheet is allowed
- Location
  - Aegineung 302
- Exam
  - Coverage : raster graphics pipeline AND everything after midterm exam
  - Understand core ideas
  - O/X questions, essay questions, calculation

Texture Mapping

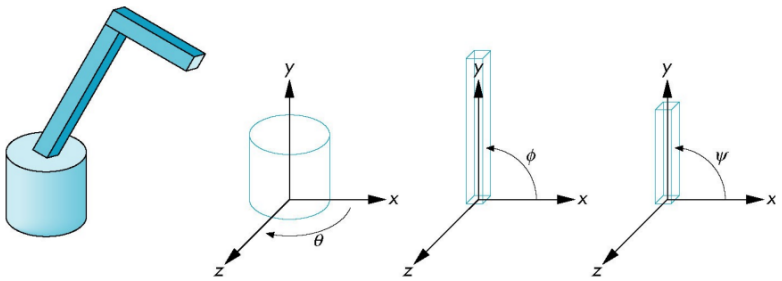
- Aliasing
  - What is aliasing? When does it occur?
  - How to avoid aliasing?
- Sampling/Reconstruction
- Mag/Min filtering
  - Zoom in
  - Zoom out

Blending/Buffers

- Opacity
- Depth peeling
  - What is it?
  - Algorithm
- Deferred shading
  - What is it?
  - How is it different from early depth test?

Hierarchical Models

- Matrix concatenation



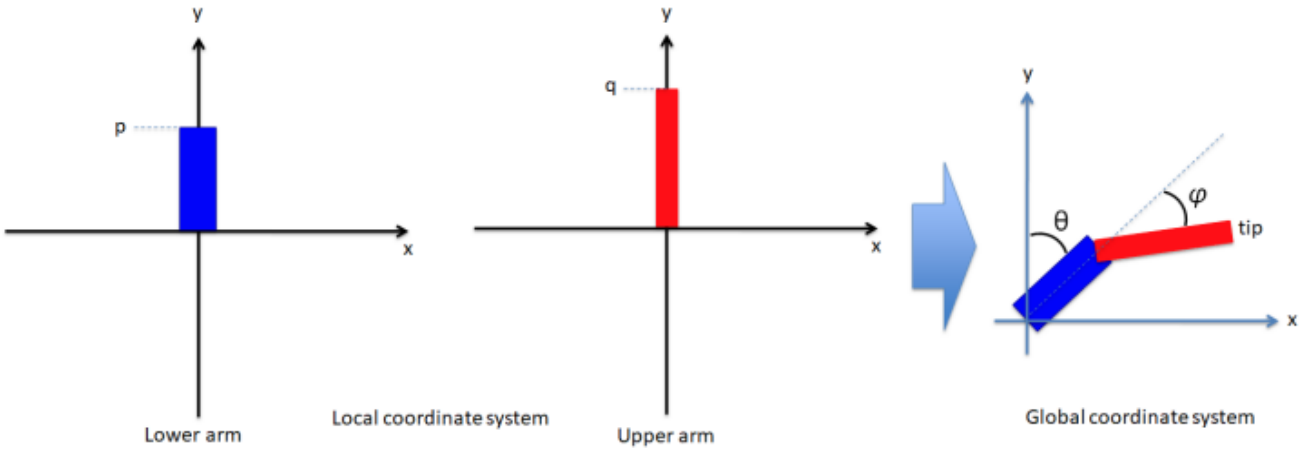
robot arm

parts in their own coodinate systems

- Rotation of base: $\mathbf{R}_b$
  - Apply $\mathbf{M} = \mathbf{R}_b$ to base
- Translate lower arm relative to base: $\mathbf{T}_{lu}$
- Rotate lower arm around joint: $\mathbf{R}_{lu}$
  - Apply $\mathbf{M} = \mathbf{R}_b \mathbf{T}_{lu} \mathbf{R}_{lu}$ to lower arm
- Translate upper arm relative to lower arm: $\mathbf{T}_{uu}$
- Rotate upper arm around joint: $\mathbf{R}_{uu}$
  - Apply $\mathbf{M} = \mathbf{R}_b \mathbf{T}_{lu} \mathbf{R}_{lu} \mathbf{T}_{uu} \mathbf{R}_{uu}$ to upper arm

Hierarchical Models

Q4. (8 pts) For given angles θ and φ for lower and upper robot arms defined in each local coordinate system, derive three 3x3 homogeneous transformation matrix ***A***, ***B***, and ***C*** to compute the location of the tip of the 2D robot arm in the global coordinate system shown below using hierarchical modeling method. The matrices should contain numbers, p, or/and sinusoidal functions of θ and φ only. Show your work.



Location of the tip of the robot arm = $\boldsymbol{ABC}\begin{pmatrix}0\\q\\1\end{pmatrix}$

Curves & Surfaces

- Continuity, Bezier, B-spline

Q3. (15 pts) Parametric Curves:

What are the four control points $\mathbf{P}_0$, $\mathbf{P}_1$, $\mathbf{P}_2$, $\mathbf{P}_3$ of 2D cubic Bezier curve p(u) satisfying the following properties? Show your work.

$$p(0) = (1,1),\ p'(0) = (6,9),\ p''(0) = (6,-18),\ p'(1) = (3,-6)$$

Hint: $p'(0) = (\mathbf{P}_1 - \mathbf{P}_0)/(1/3)$, $p'(1) = (\mathbf{P}_3 - \mathbf{P}_2)/(1/3)$

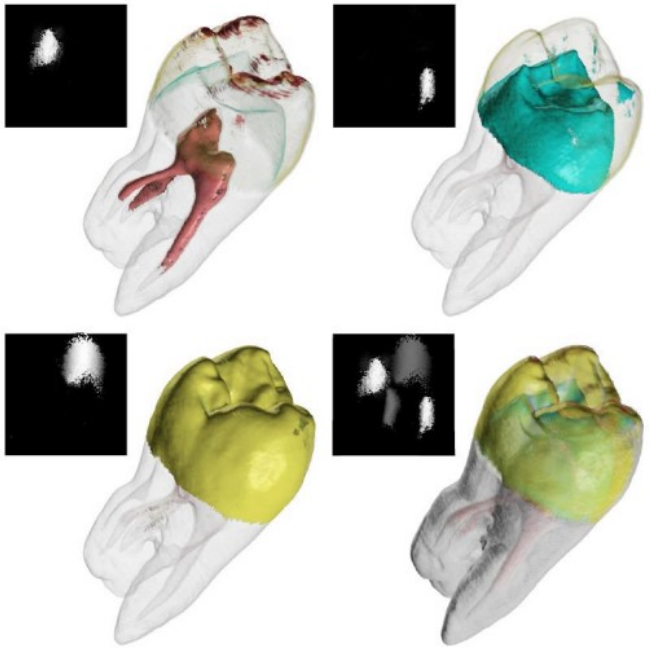
Ray Tracing

- Algorithm
- Ray-surface intersection
- Shadow
- Recursive ray tracing
- Antialiasing
- Depth of field

Volume Rendering

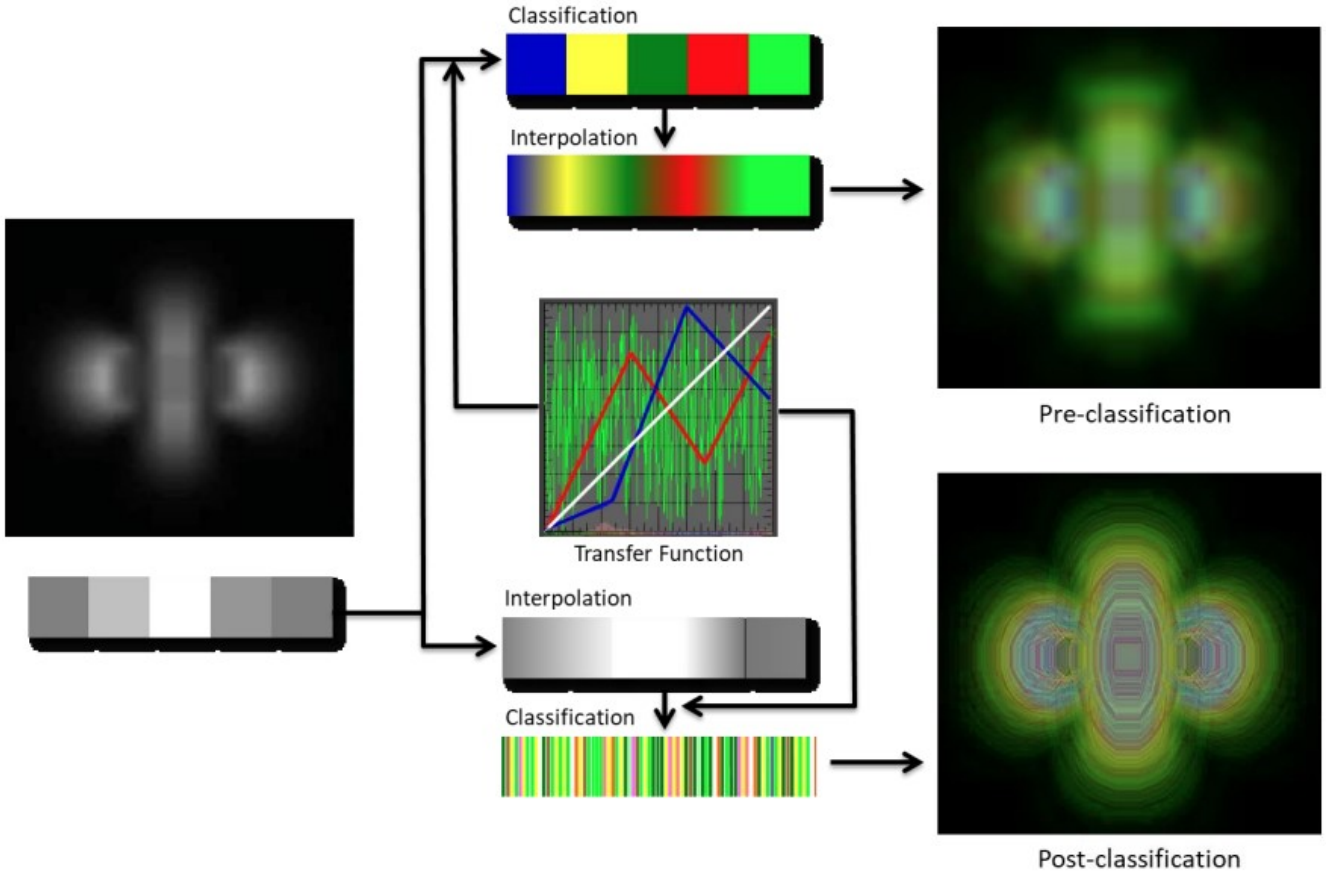
- Ray casting
- Volume rendering integral
- Transfer function
  - 1D, 2D

Mostly accurate isolation of all material boundaries



Volume Rendering

- Pre-integration, Pre-/Post-classification



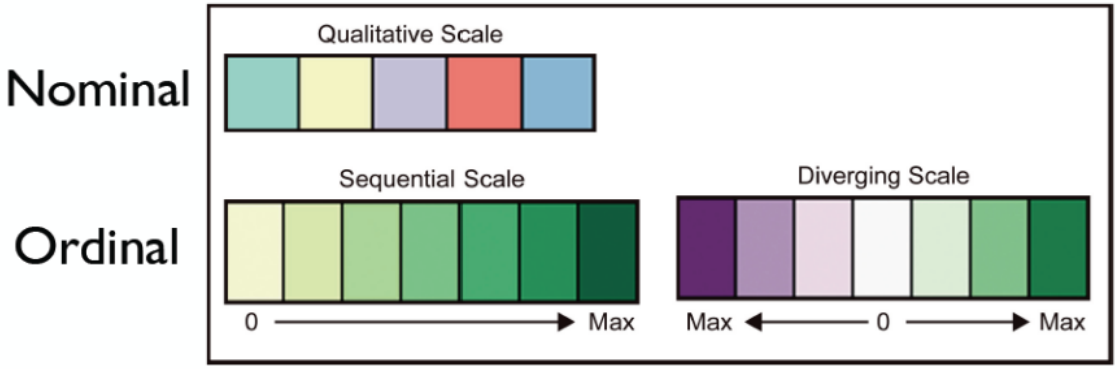
Visualization Pipeline

- Definitions
  - Sink, source, filter
  - Event-driven, demand-driven
  - Out-of-core streaming
  - Parallelism

T	F	
	O	In visualization pipeline, sink is the data generator, such as file I/O.

Scalar Visualization

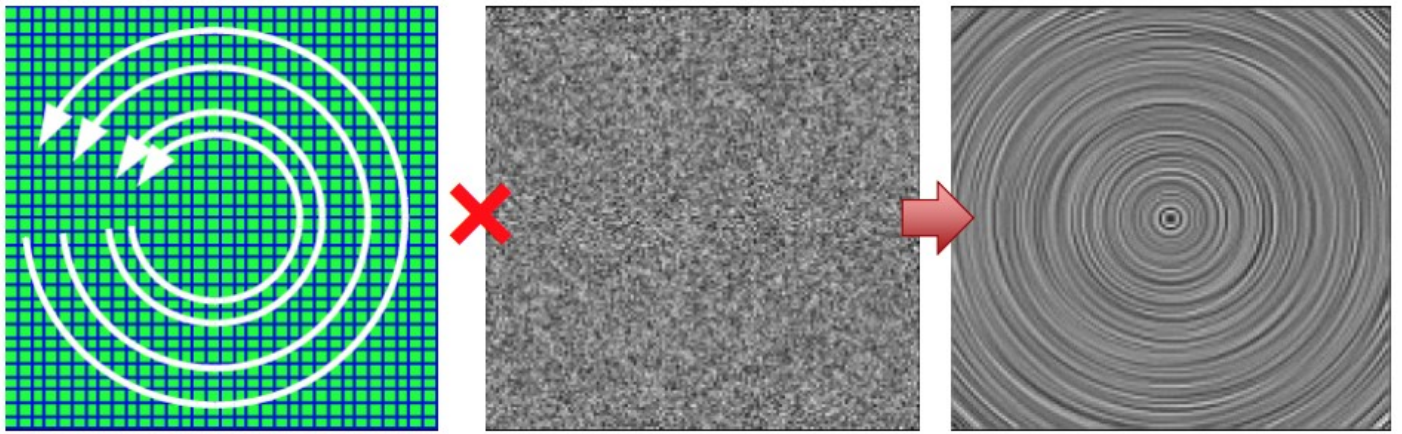
- Color map
  - Nominal, ordinal (sequential, diverging)
  - Rainbow color map



T	F	
	o	Rainbow color map is perceptually ordered.

Vector Visualization

- Curl, divergence
- Glyphs, color coding, streamline, texture-based
  - LIC



Questions?

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