Computer Graphics

Lecture 17
Object Order Rendering
Viewing Transformations - 1
Announcements

• HW3 is out; Canvas is set up with everything that's left
• "Midterm" exam is out two weeks from today
  • Takehome; 20% of your grade, inspired by HW
  • Upshot: if you got HW problems wrong, make sure you know how to get them right. You have 2 weeks, so now's the time to start reviewing.
  • Aiming for quick grading turnaround on HW2 and HW3
• Final project proposals are due two weeks from today
  • Details out on Canvas
for each object:

for each pixel:
  if object affects pixel
  modify pixel
Object Order Rendering: The Secret Sauce

Build a transformation (matrix!)

that maps geometry from 3D scene model to 2D pixel coords.

Camera: parallel vs persp?
position?
 focal length $ightarrow$ FOV

Screen: resolution aspect
Viewing Transformations

A standard sequence of transforms to go from object (model) space to screen (image) space

see notes
Viewing Transformations

A standard sequence of transforms to go from object (model) space to screen (image) space
A Wireframe Rendering Algorithm

Input: a set of line segments

1. Form $M_{up}$, $M_{proj}$, $M_{cam}$, $M_{model}$

2. $M_{e} = M_{up} \cdot M_{proj} \cdot M_{cam} \cdot M_{model}$

   $\uparrow$        $\uparrow$        $\uparrow$        $\uparrow$
   pixels          NDC          cam          world          object

3. For each line seg. $\overrightarrow{a_i}$ - $\overrightarrow{b_i}$
   $p = M_{a_i}$
   $q = M_{b_i}$
   draw_line($p$, $q$)
Viewing Transformations: Minimalist Edition

Let's do nothing and see how this works out...
Viewing Transformations: Minimalist Edition

Task 1: Find a **viewport transformation** that puts the cube in the center of the image.
Viewing Transformations: Minimalist Edition

Task 2: Build a **model transformation** that centers a 40x40 cube at x=0, y=1, z=-4, rotated 30 degrees around the **y** axis.