CPSC 314
Computer Graphics
Dinesh K. Pai

Projection contd…
Midterm analysis

Today

- Announcement: Assignment 3 will be on lighting, which we will cover after reading week. But we will make the assignment available earlier, in case some of you want to get started.
- Assignment 1 spotlight
- Assignment 1 analysis
- Midterm 1 analysis
- Cameras and projections (Chapter 10 of text)
Assignment 1

- Median = 93.
- Connect has some issues, we’re investigating

Midterm 1

- You can download your exams from the link on the course web page (look for “Handback”)
- Raw marks include accommodations made for this exam (ONLY)
  - Very generous partial credits
  - Rounded up ½ marks for each question
- On top of this, added 3 marks (6%) to adjust the curve
Midterm: raw scores

- Median = 33 (66%), Max = 45 (90%)

Midterm 1: final grade with 3 grace marks

- Median = 36 (72%), Max = 48 (96%)
Details and Pointers

- **Q1. Fill in the blank**
  - Answer key: 5, 12, 9, 3, 2, 10, 13, 7
- **Q2 Uniform and In (most did ok)**
  - Uniform: same for all vertices
  - In: per vertex attribute
- **Q3 GLUT, GLEW, GLM**
  - big surprise: many had no idea
  - Read L4, Textbook Appendix A

Details, contd…

- **Q4 Orthonormal basis**
  - Read L3, Textbook p. 15. Try to be precise, esp. if question says “mathematically” or “define”
  - Many forgot “normal” part
- **Q5 Basic pinhole projection matrix**
  - Read L13 (last page), Textbook p. 91
  - More general models later in the book also ok
- **Q6 transformations about coord axes**
  - Most got these right
  - Part 3: some go order wrong, but only 0.5 off (and benefit of rounding up). Some forgot to multiply.
  - Part 4: notice that rotation by 0 about *any* axis = Identity
Q7 Interpret transformations

- Most got (a), and at least one part of (b).
- Got partial marks, rounded up

\[
\begin{pmatrix}
\frac{1}{3} & \frac{1}{3} \\
\frac{1}{3} & \frac{1}{3}
\end{pmatrix}
\]

\[
\begin{pmatrix}
0 & 1 \\
0 & 1
\end{pmatrix}
\]

Q8 Knowledge Transfer (mirror)

- This is an instance of doMtoOwrtA
  - Read p. 46 of book, and L12
  - Plus very strong hint in L14, slide 8 to review this
  - Main difference: M is now reflection, A is called S
- Details
  - (a) Most got some version Later parts assumed M correct
  - (b) Most got this
  - (c) Many didn’t, or even write symbolic answer! Just writing S M S^{-1} got 3/5.
Projection

- Review basis pinhole project and scaling from L13 and L14
- These can be generalized to different aspect ratios and even shifting image plane

Scale factor $n$

- Controlling aspect ratio of film space

\[
\begin{bmatrix}
  x_n w_n \\
  y_n w_n \\
  -
\end{bmatrix} =
\begin{bmatrix}
  -n & 0 & 0 & 0 \\
  0 & -n & 0 & 0 \\
  0 & 0 & -1 & 0
\end{bmatrix}
\begin{bmatrix}
  x_r \\
  y_r \\
  z_r
\end{bmatrix}
\]

\[
\begin{bmatrix}
  x_n w_n \\
  y_n w_n \\
  -
\end{bmatrix} =
\begin{bmatrix}
  s_x & 0 & 0 & 0 \\
  0 & s_y & 0 & 0 \\
  0 & 0 & -1 & 0
\end{bmatrix}
\begin{bmatrix}
  x_r \\
  y_r \\
  z_r
\end{bmatrix}
\]