CPSC 314
Computer Graphics

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Projection contd…
Midterm analysis

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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)

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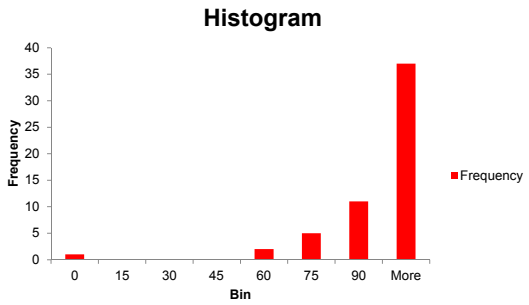
Assignment 1

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



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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

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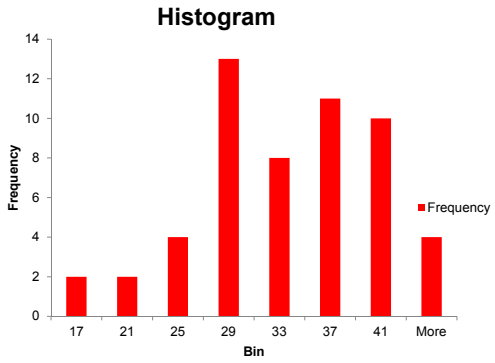
Midterm : raw scores

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



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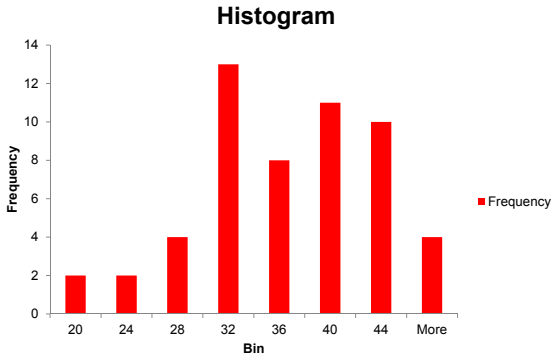
Midterm 1: final grade with 3 grace marks

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



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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

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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

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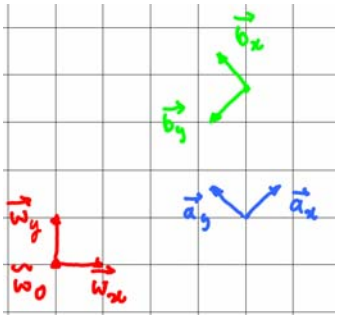
Q7 Interpret transformations

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

$$\underline{\tilde{a}} = \underline{\tilde{w}} \begin{pmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 4 \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\underline{\tilde{b}} = \underline{\tilde{w}} \begin{pmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 4 \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 1 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & -1 & 2 \\ 1 & 0 & 2 \\ 0 & 0 & 1 \end{pmatrix}$$



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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.

$\underline{M} = \begin{bmatrix} 1 & & \\ & -1 & \\ & & 1 \end{bmatrix}$

$\underline{S} = \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & \sqrt{2} \\ \cdot & 1 & \cdot \\ -1/\sqrt{2} & 1/\sqrt{2} & \sqrt{2} \\ \cdot & \cdot & 1 \end{bmatrix}$

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Projection

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

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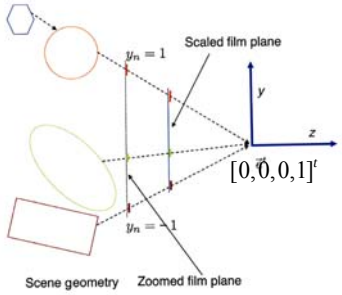
Scale factor *n*



- Controlling aspect ratio of film space

$$\begin{bmatrix} x_n w_n \\ y_n w_n \\ - \\ w_n \end{bmatrix} = \begin{bmatrix} -n & 0 & 0 & 0 \\ 0 & -n & 0 & 0 \\ - & - & - & - \\ 0 & 0 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_e \\ y_e \\ z_e \\ 1 \end{bmatrix} \Rightarrow \begin{bmatrix} x_n w_n \\ y_n w_n \\ - \\ w_n \end{bmatrix} = \begin{bmatrix} s_x & 0 & 0 & 0 \\ 0 & s_y & 0 & 0 \\ - & - & - & - \\ 0 & 0 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_e \\ y_e \\ z_e \\ 1 \end{bmatrix}$$

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