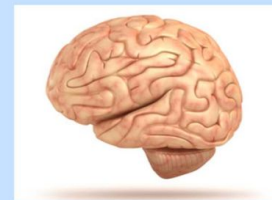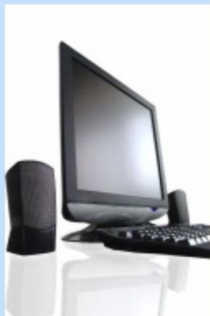# CS 498 VR

Lecture 5 - 1/31/2018

Slides here: go.illinois.edu/VRlect5
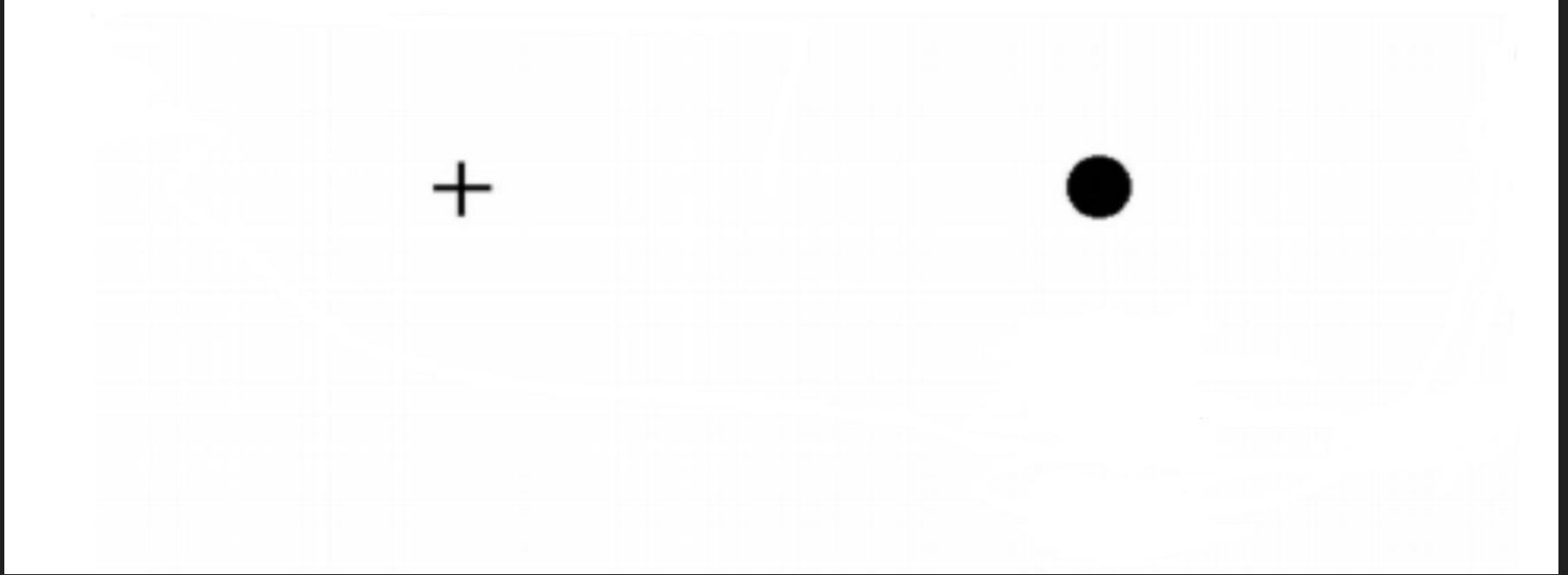
Review

- What is vection?

- What is the McGurk effect?

VR System: Hardware, Software and Perceptual Psychology

Do You Trust Your Vision?

Blind spot in each eye

Psychophysics - Just Noticeable Difference

Difference Threshold

The smallest amount of change in a physical stimulus that a person can detect. This is also called the "just noticeable difference."
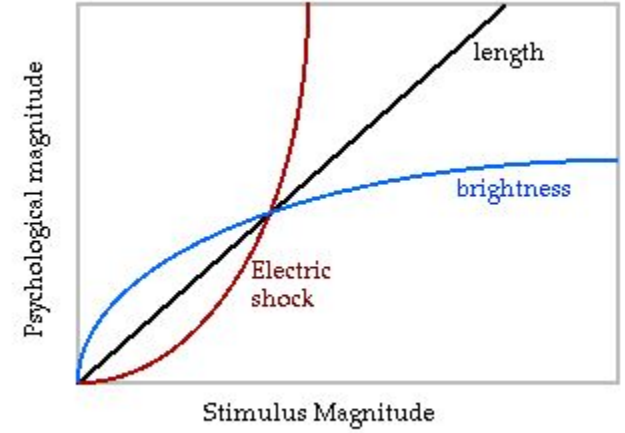
If someone turns the music up slowly, at what point do you notice it has become louder?

If you hold a handful of sand, and someone adds one grain at a time to the pile, when do you notice it has become heavier?

If your best friend trims a half inch off of their hair, will you notice the difference?

Psychophysics - Steven's Power Law
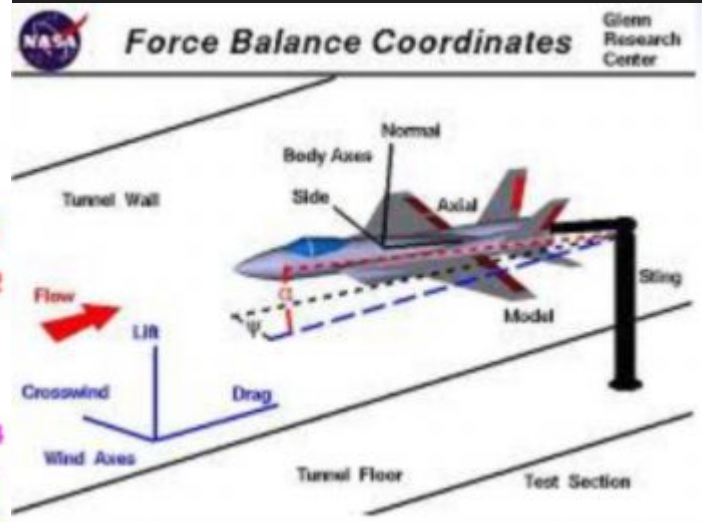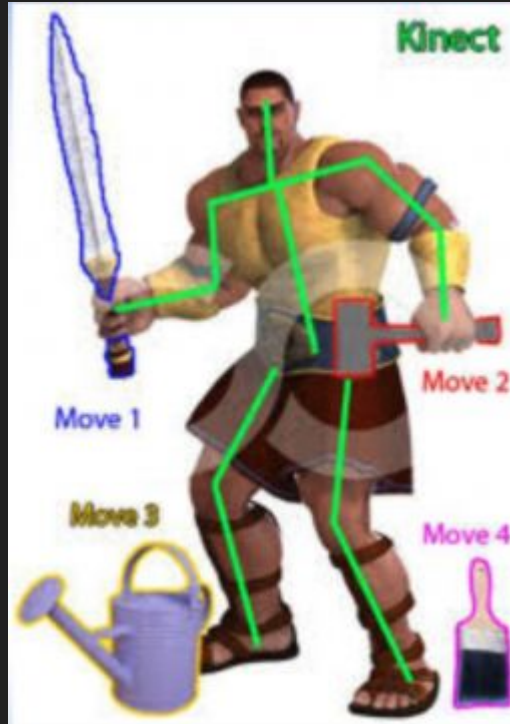
Perceived magnitude

vs actual magnitude
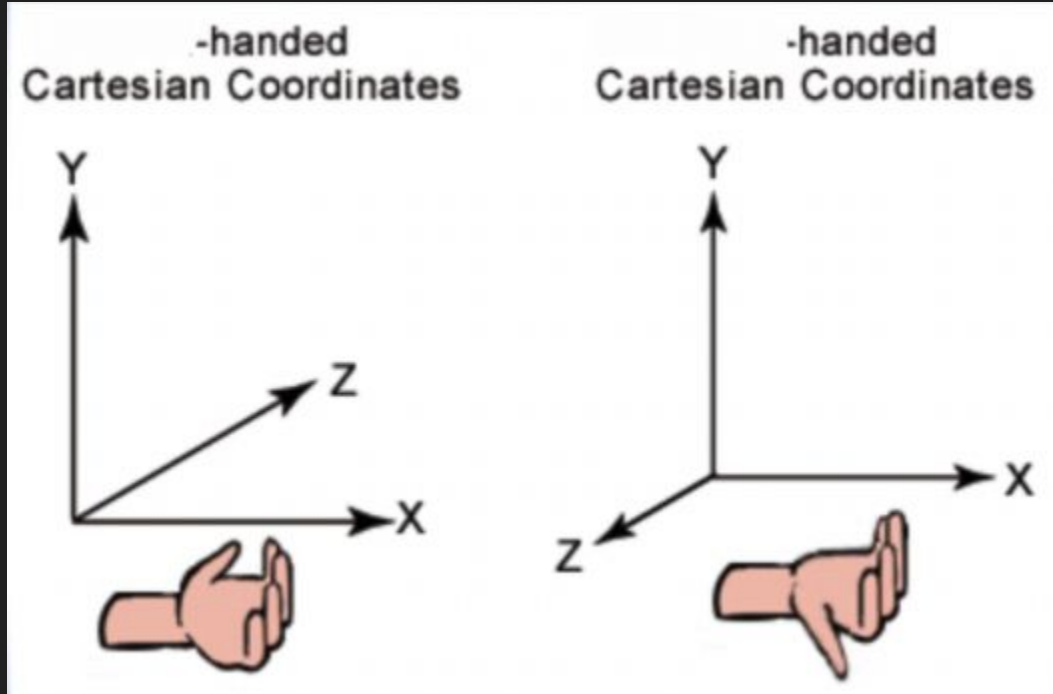
Adaptation! A trap for VR developers...

Creating Virtual Worlds (Ch.3)
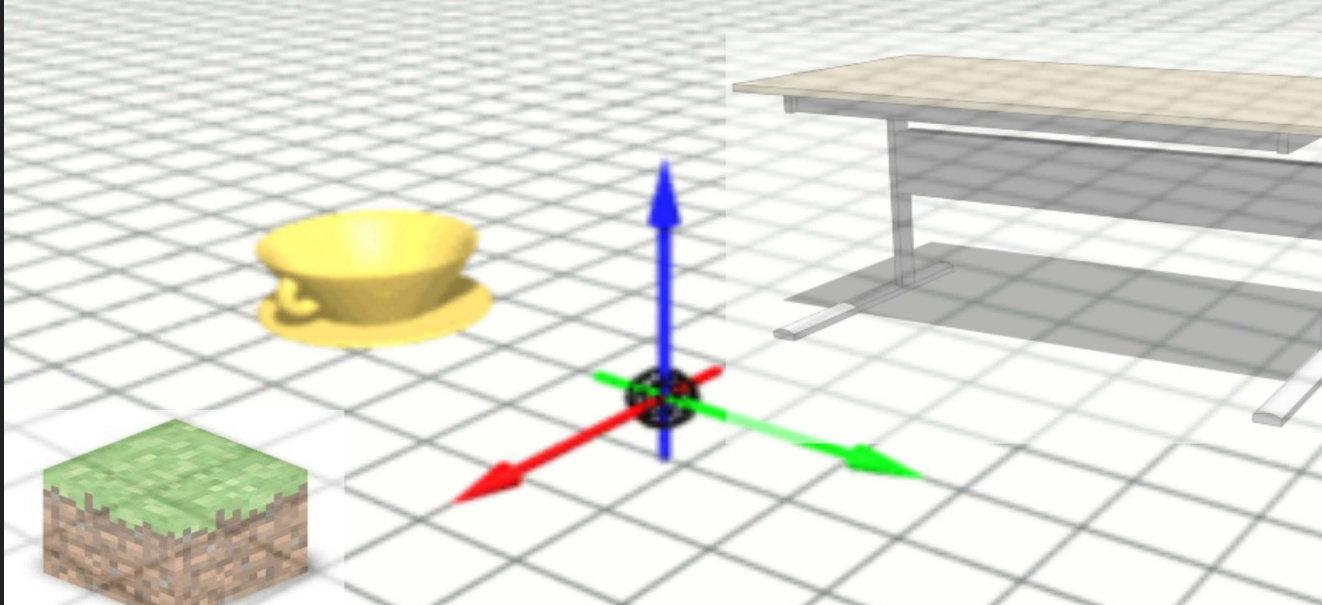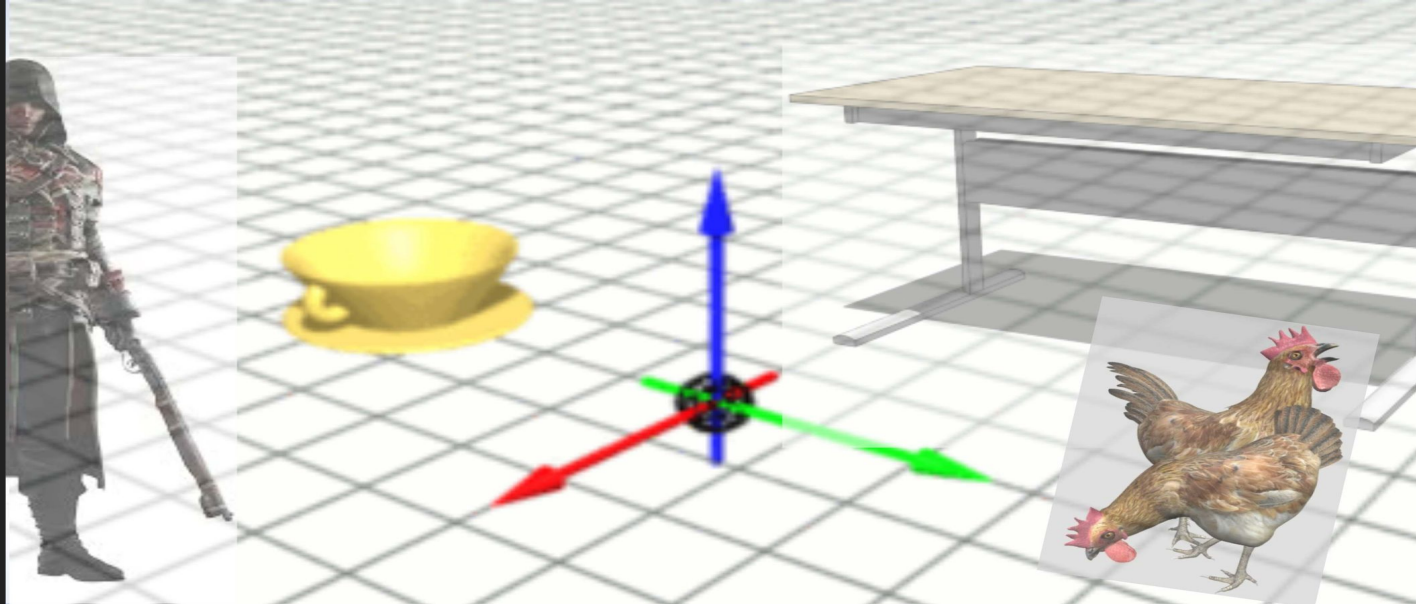
Geometric Modeling

Geometric Modeling

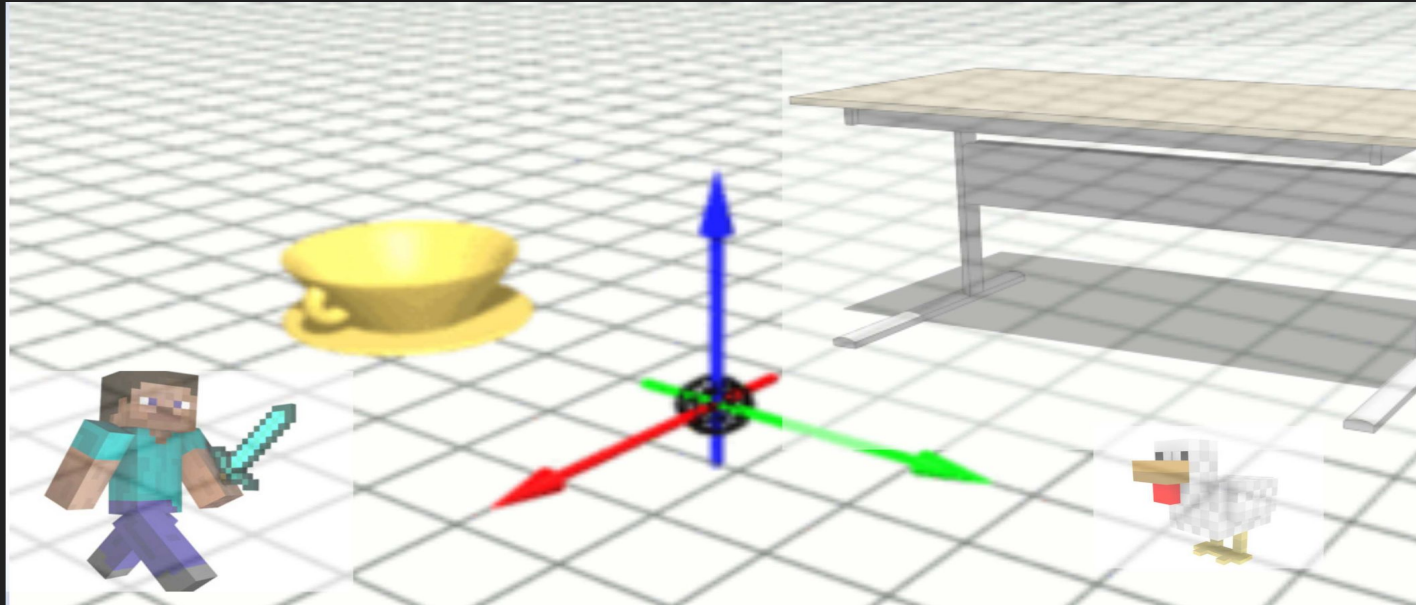# Static vs Dynamic Models

Stationary objects:

Static vs Dynamic Models
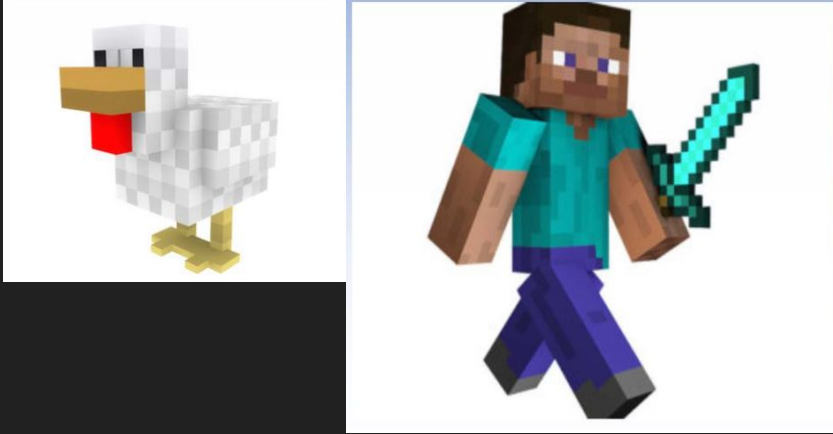
Movable objects:

Static vs Dynamic Models

Movable objects:

3D Primitives vs 2D Boundary Representations

3D Primitives

2D Primitives
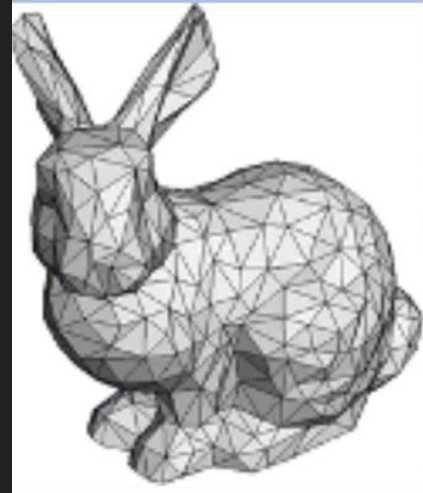
Transforming Rigid Bodies

Movable Objects (click to view)

Perception of stationarity →
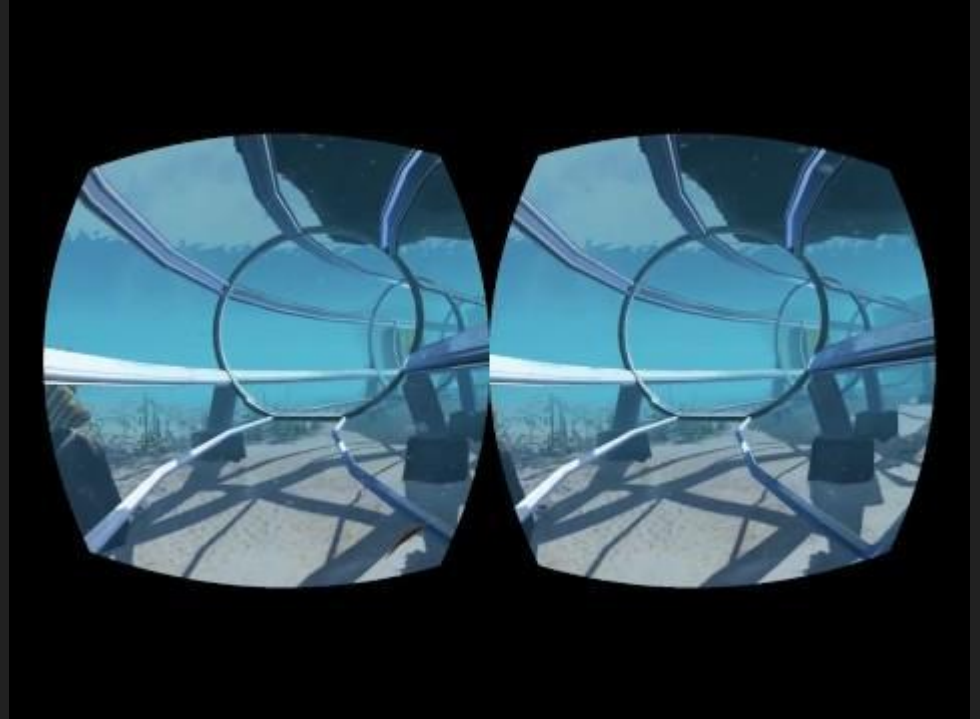
Rigid Body Transformations
Degrees of Freedom?

	2D	3D
Easy Translation		
More Difficult Rotation		
Most Difficult Rotation + Translation		

3D Translations

2D Linear Transformations
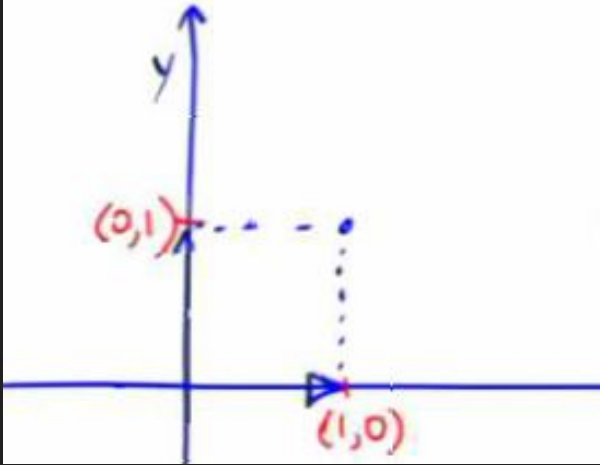
2D Linear Transformations: Example

2D Linear Transformations: Example

Draw a polygon that IS NOT a result of linear transformation of our starting square

2D Rotations

2x2 matrix has 4 DOFs

1. No Scaling
2. No Shearing
3. The determinant of the rotation matrix should be +1 or -1

2D Rotations

3D Rotations
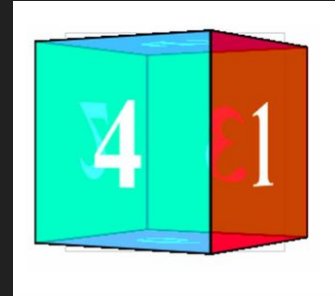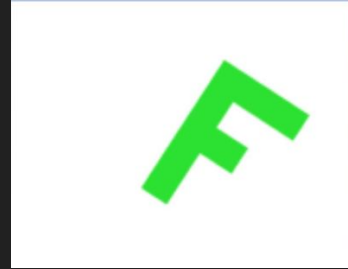
3x3 matrix has 9 DOFs

1. No Scaling
2. No Shearing
3. The determinant of the rotation matrix should be +1 or -1

2D and 3D Matrices: Linear Transformations

3D Picture Box

2D Linear Transformations: Compositions

M1

M2

M_{12}
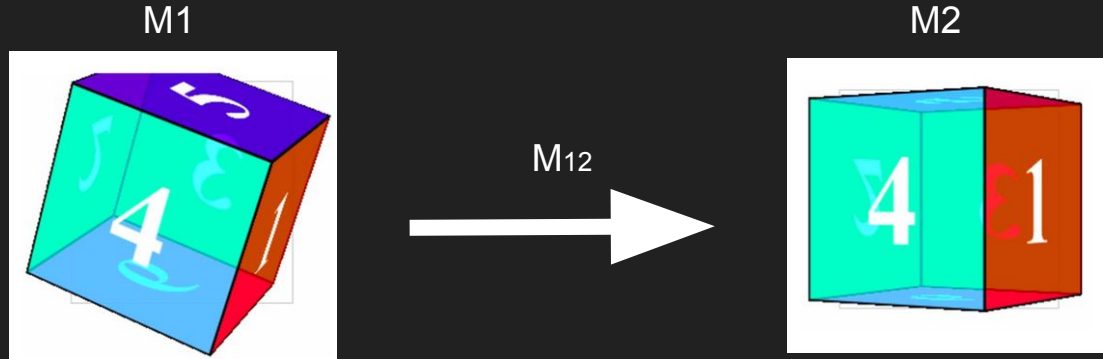
M1 - Current Frame

M12 - transformation from M1 to M2

Then $M2 = M_{12} M1$

2D Linear Transformations: Compositions

1. Order of multiplication matters?

2. Which one gets applied first

Linear Transformation online toy

2D Linear Transformations: Inverses

1. Definition

2. Stretch

3. Shear

4. Rotation

5. Composition

Review

1. Write down the 2D transformation matrix of rotating 30 degrees counterclockwise

2. Write down the 2D transformation matrix that translates point (3, 2) to (-1, 4)

3. Write down the matrix that first translates point (3, 2) to (-1, 4) then rotates 30 degrees counterclockwise

4. Assuming the answer for question 1 is M_1 and the answer for question 2 is M_2, what is the inverse of the matrix in question 3?

Announcements

- MP 1 - Part 1.1 & Part 1.2 was due Monday

- MP 1 - Part 2.1 & Part 2.2 is due Feb 5th

- NEXT LECTURE: CLASS PROJECT PRESENTATIONS (and some material)

- You will have 1 week after to decide what project you want to work on and submit a survey with your preferences