CS-174A Discussion 1C, Week 1

@ Xiao (Steven) Zeng

@ Instructor: Dr. Asish Law

@ Discussion 1C Github: https://github.com/NoctisZ/CS174A-1C-2020Fall (https://github.com/NoctisZ/CS174A-1C-2020Fall)

Outline

- Course Information
- Review of Lecture Content
- Q&A about Assignment 1
- Assignment 2

CS-174A Information

About Me:

- Xiao (Steven) Zeng, 2nd year Ph.D student in Computer Science, supervised by Prof. Demetri Terzopoulos
- Focus: Computer Vision and Graphics
- Office hours: Tuesday 1:00 PM - 3:00 PM. Access from **"Office Hours (All TAs)"** link in "Zoom Video Conferencing" on CCLE
- Email: stevennz@ucla.edu (mailto:stevennz@ucla.edu)

Tools

- CCLE
- Piazza (https://piazza.com/class/kfirp13mgg86zk (https://piazza.com/class/kfirp13mgg86zk)) -> A great routine source for asking questions in addition to office hours
- GitHub

Time of Midterm

- 11/3 7:00 - 8:30 PM PST on Syllabus
- **Subject to change!** Please wait to see more information next week

Survey on CCLE

- Github handle and timezone questionnaire under Week 0 section

- Will be close after Week 1
- 114 responses so far. Please fill out if you haven't
- If you don't fill out, we'll assume you are in the Pacific Time Zone

Review of Lecture Content

Parametric representation of line

- If P is a point on the line P_1P_2, then express the point P using: $P = \alpha_1 * P_1 + \alpha_2 * P_2$
- Useful link: https://tutorial.math.lamar.edu/classes/calciii/eqnsoflines.aspx (https://tutorial.math.lamar.edu/classes/calciii/eqnsoflines.aspx)

Affine function

- An **affine function** v defined on points in a homogeneous coordinate system is a function that maps a point in homogeneous coordinates to a real number
- It can be represented as a dot product:

$$v(\mathbf{c}) = \begin{bmatrix} a & b & c & d \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ 1 \end{bmatrix}$$

Affine combinition

- In a linear combinition of scalars/points/vectors where all coefficients sum to 1
- For a linear function such as $\alpha_1 * X_1 + \alpha_2 * X_2 + ... + \alpha_n * X_n$ where X_i can be scalars/points/vectors, $\sum_{i=1}^{n} a_i = 1$

Convex combinition

- In a linear combinition of scalars/points/vectors where all coefficients are non-negative and sum to 1
- Built on affine combinition
- For a linear function such as $\alpha_1 * X_1 + \alpha_2 * X_2 + ... + \alpha_n * X_n$ where X_i can be scalars/points/vectors, $\sum_{i=1}^{n} a_i = 1$ and $\alpha_i \geq 0$

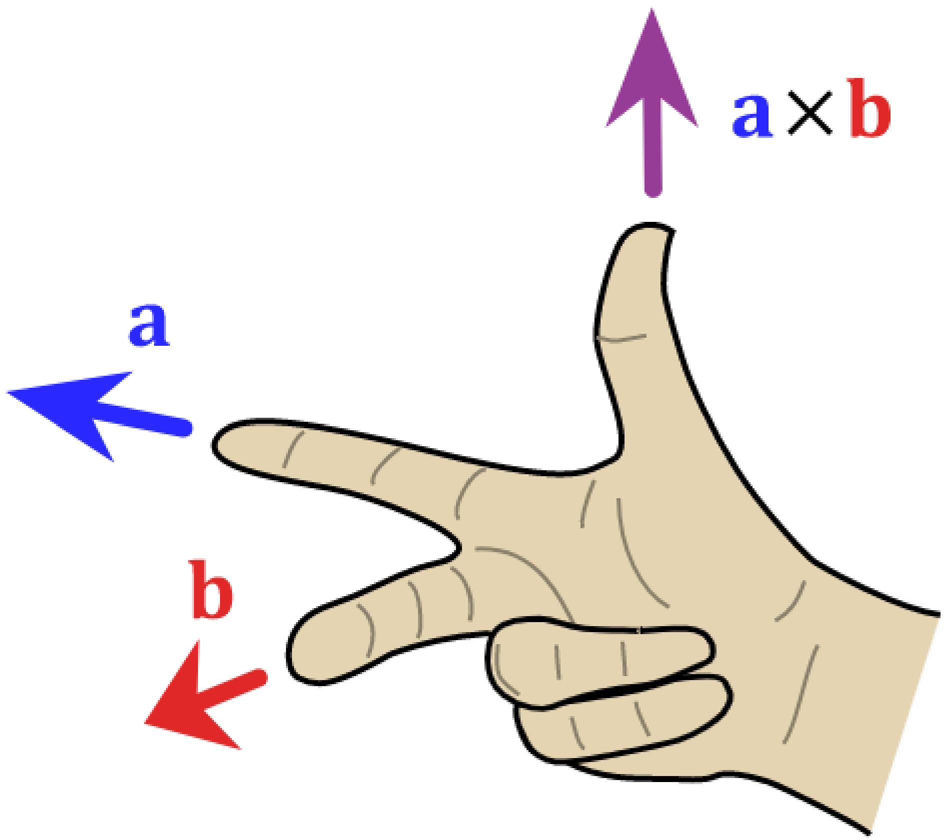
Cross Product

- For two vectors a and b, their cross product $|a \times b| = |a||b| sin(\theta)$
- It can also be expressed as their determinant:

$$\mathbf{a} \times \mathbf{b} = (a_y b_z - a_z b_y)\mathbf{i} + (a_z b_x - a_x b_z)\mathbf{j} + (a_x b_y - a_y b_x)\mathbf{k}$$

$$\mathbf{a} \times \mathbf{b} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix}$$

- Its geometric meaning:



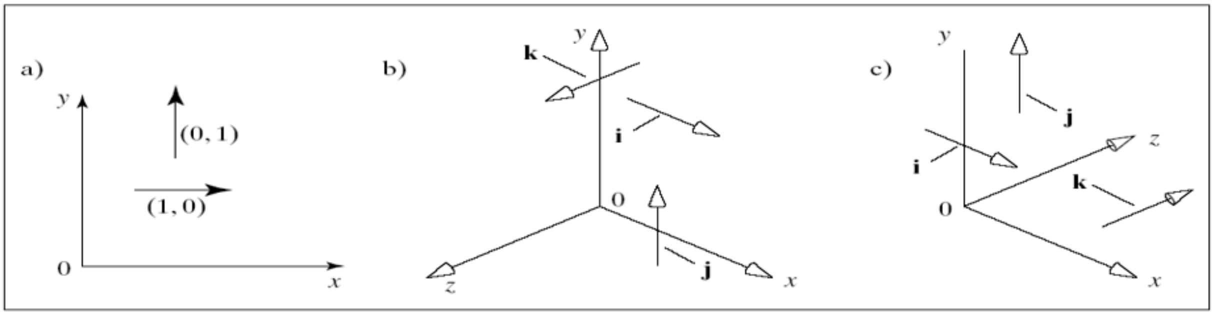
- Useful link: https://www.mathsisfun.com/algebra/vectors-cross-product.html (https://www.mathsisfun.com/algebra/vectors-cross-product.html)

Left-hand vs. right-hand coordinate system

- In this class, we will mostly use the right-hand coordiante system (eg. in assignment 2)

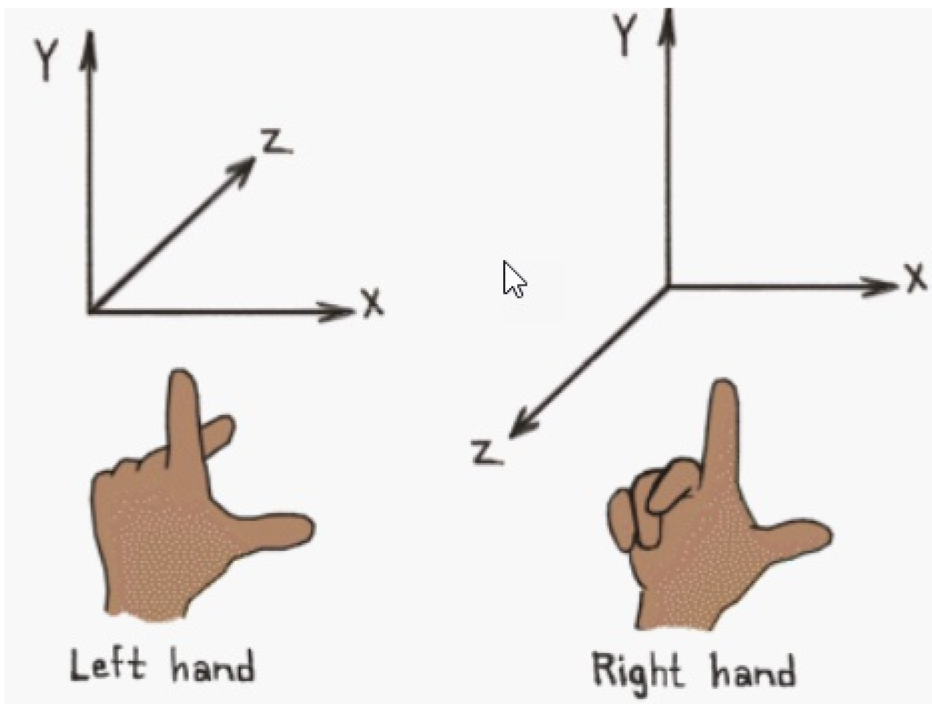
```
i = (1,0)
j = (0,1)
```

```
i = (1,0,0)
j = (0,1,0)
k = (0,0,1)
```



Right handed Left handed

- Another example:



Q&A about Assignment 1

- Only need to follow the instruction to clone the assignment, set up the environment, modify it, and push the changes to your Github repo.
- No need to care about Github Classroom itself

Assignment 2

- WebStorm IDE: [https://www.jetbrains.com/webstorm/ (https://www.jetbrains.com/webstorm/)](https://www.jetbrains.com/webstorm/)

- Make your copy of assignment 2 repo: https://classroom.github.com/a/xS2FJ3iG (https://classroom.github.com/a/xS2FJ3iG)

Points to cover

- `main-scene.js`
- `transforms-sandbox.js`
- `assignment2.js`