

# Introduction to Computer Graphics

**CS380**

Spring 2019

# CS380 Intro to Computer Graphics

- This course aims at providing a broad introduction to the field of Computer Graphics.
  - Topics include geometric objects and transformation, viewing, shading, lighting, rendering, texture mapping, modeling, animation and 3D interactive applications.
  - Through a series of OpenGL programming assignments, students will become familiar with interactive 2D and 3D graphical display concepts.
- 
- 3:3:4
    - ▶ Window-based PC is required for this course! (Sorry, No Mac!)

# Class Time

– Lecture / Lab

- Tuesday: 14:30~16:00 @ N1 201
- Thursday: 14:30~16:00 @ N1 201

TA help hour

- Wednesday: 19:00~20:30 @ N1 317 (Computer Lab)
- Thursday: 19:00~20:30 @ N1 201

Extra Lab session (optional) / TA help hour

# Lab Sessions: 4 times

- We will divide the students into 2 groups.
  - **Group 1:** Student ID **before** 2016100  
class of 2014, class of 2015, and  
20160009~20160069
    - **Tuesday Lab**
  - **Group 2:** Student ID **after** 2016100  
20160102~ 20160776,  
class of 2017 and class of 2019
    - **Thursday Lab**
- If you need to change your group,  
please let me know in advance!

week	
1	
2	LAB 1
3	
4	
5	LAB 2
6	
7	
8	Midterm Exam
9	
10	LAB 3
11	
12	
13	LAB 4
14	
15	
16	Final Exam

# Schedule

## LECTURE

- Tuesday & Thursday
- 14:30~16:00 @ N1 201

## LAB (4 times)

- Week: 2, 5, 10, 13
- Tue or Thur 14:30 @ N1 201
- Extra Lab Thur 7PM @ N1 201  
(3/7, 3/28, 5/2, 5/23)

## TA Help hours

- Wed: 19:00~20:30 @N1 317
- Thur: 19:00~20:30 @N1 201

week		reading	hw due
1	Introduction	1.2, 1.7, 2.2	hw #0
2	LAB 1 (OpenGL Intro)		
3	Graphics System	Ch. 1	
4	Graphics Programming	Ch. 2	hw #1
5	LAB 2 (3D Graphics)		
6	Transformation	Ch. 3	
7	Viewing	Ch. 4	hw #2
8	Midterm Exam		
9	Lighting and Shading	Ch. 5	
10	LAB 3 (Shaders)		
11	From Vertices to Fragments	Ch. 6	
12	Texture Mapping	Ch. 7	hw #3
13	LAB 4 (Texturing)		
14	Modeling Methods	Ch. 8~10	
15	Rendering (Raytracing)	Ch. 11	hw #4
16	Final Exam		

# Homework #0

- Already uploaded to KLMS
- OpenGL graphics programming environment set up.
- Follow the instruction and complete the set up by this Thursday.
- Install on to [the computer \(window-based\) that you will be using](#) for your lab/homework.
- Submit the snapshot to show your successful completion by this **Thursday (2/28) midnight** via KLMS
- Should you need any help for setting it up, please come to the TA's office hour on Wed/Thurs (7~8:30 PM).

# Prerequisites

- Linear Algebra
- Basic programming skill
  - C / C++ / Java
  - Python (okay, but will need to study C++ for yourself)
- Some understanding of algorithm and data structures (Level you've learned in Discrete Mathematics course)
- Some understanding of computer architecture and system.
- Pre-Test to assess yourself.

# Instructor

- **Jinah Park**
- Computer Graphics & Visualization (CGV) Lab
- <http://cgv.kaist.ac.kr>
- Office: E3-1 #2404
- Email: [jinahpark@kaist.ac.kr](mailto:jinahpark@kaist.ac.kr)
- Office Hours: Please send me email to set up a meeting time!



# TAs

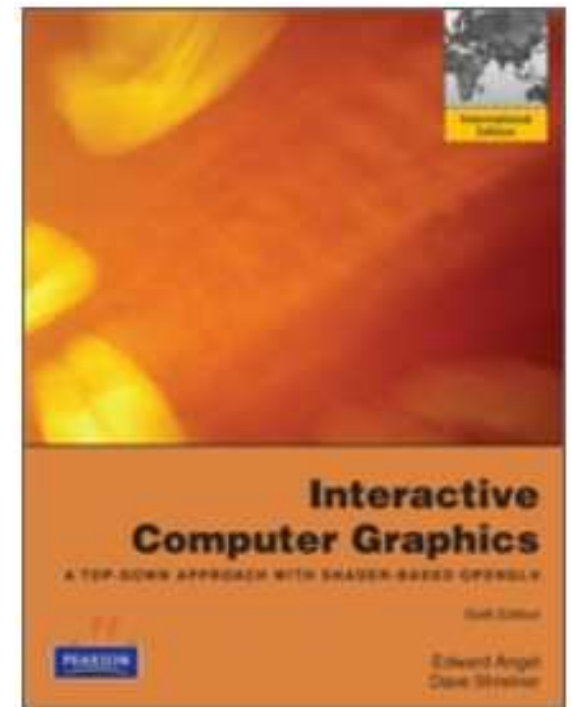
- **Jaehyun Jang** (장재현) jaehyunjang@kaist.ac.kr
- **Jihoon Cho** (조지훈) zinic@kaist.ac.kr
- **Hyunyul Cho** (조현율) hyunyul@kaist.ac.kr
  
- **Hyunsoo Kim** (김현수) ppnchb@kaist.ac.kr
- **Joowon Lim** (임주원) marbleone@kaist.ac.kr
  
- Office: E3-1 #2413 [CGV Lab]  
042-350-7755

# Course Homepage

- [klms.kaist.ac.kr](http://klms.kaist.ac.kr)
- CS380
  - Lecture materials
  - Announcements
  - Question & Answer
  - Programming homeworks
  - Grading record
  - ...

# Textbook

- Interactive Computer Graphics: A Top-Down Approach with **Shader-Based** OpenGL **(6<sup>th</sup> Edition)**
- Edward Angel & Dave Shreiner
- 2011
- International Edition
- It is available in the KAIST Bookstore!



# Topics

- Chapters 1~5
  - Fundamentals
  - Graphics programming, architecture, model
  - Mathematical background
  - Transformation
  - Rendering
- Chapters 6~11
  - Discrete mappings / Texture mapping
  - Modeling
  - Advanced Modeling
  - Advanced Rendering

# Schedule

week		reading	hw due
1	Introduction	1.2, 1.7, 2.2	hw #0
2	LAB 1 (OpenGL Intro)		
3	Graphics System	Ch. 1	
4	Graphics Programming	Ch. 2	hw #1
5	LAB 2 (3D Graphics)		
6	Transformation	Ch. 3	
7	Viewing	Ch. 4	hw #2
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14	Modeling Methods	Ch. 8~10	
15	Rendering (Raytracing)	Ch. 11	hw #4
16	Final Exam		

# Homework

- Programming Assignments
  - #0 – get ready (no grading points)
  - #1 ~ #4 : will be given just after each lab session by the TA
    - roughly 2 weeks to complete.
    - due **Friday noon** (before lunch).  
Late submission allowed only for 1 week. (penalty applied).
    - upload all source/executable/resources + short report document
- Written homework for each chapter (every week)
  - List of terminologies will be posted. \* from the textbook \*
  - You should write its definition (wrt computer graphics)
  - Upload your answers to KLMS by **Tuesday 1PM**. No late submission!
  - Randomly and selectively graded.  
(If you submitted in time, your default grade is a full credit.)

# What you should expect from the lecture

- Learn basic concepts and topics selected from the textbook (mostly)
- Get motivated to read the textbook & extra reference materials
- **Pop-quiz** to check how the class is following the lecture materials

## and what I expect from you

- Skim through the chapter *before* coming to class (do your written homework)
- **Read the chapter** carefully after the lecture
- Participate!

# Grading

- Attendance and Participation : 10 %
  - Pop quiz
- Homework : 40 %
  - 4 Programming homework [90%]
  - Written homework [10%]
- Midterm exam : 25 %
  - On Chapters 1~4
- Final exam : 25 %
  - Chapters 5~7 + On all materials learned in this course



# How we run the course..

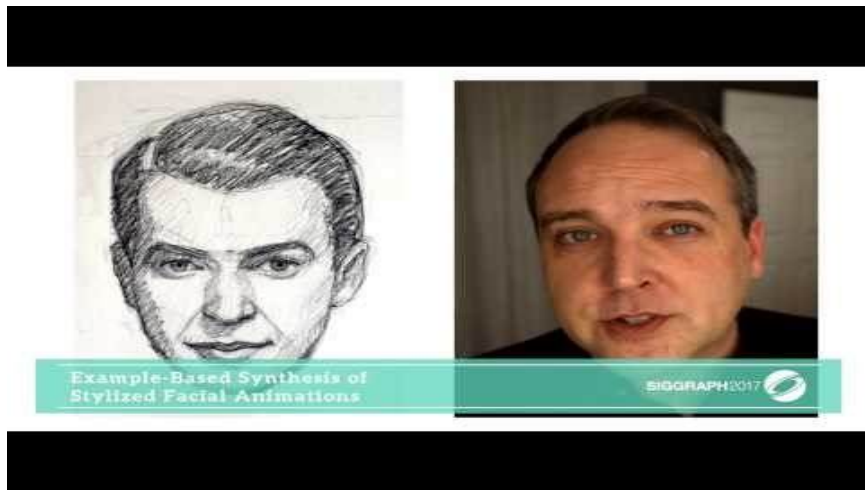
- Top-down Programming Approach!
- John Kemeny (a pioneer in computer education)'s automobile analogy

"You don't have to know what's under the hood to be literate, but unless you know how to program, you'll be sitting in the back seat instead of driving"

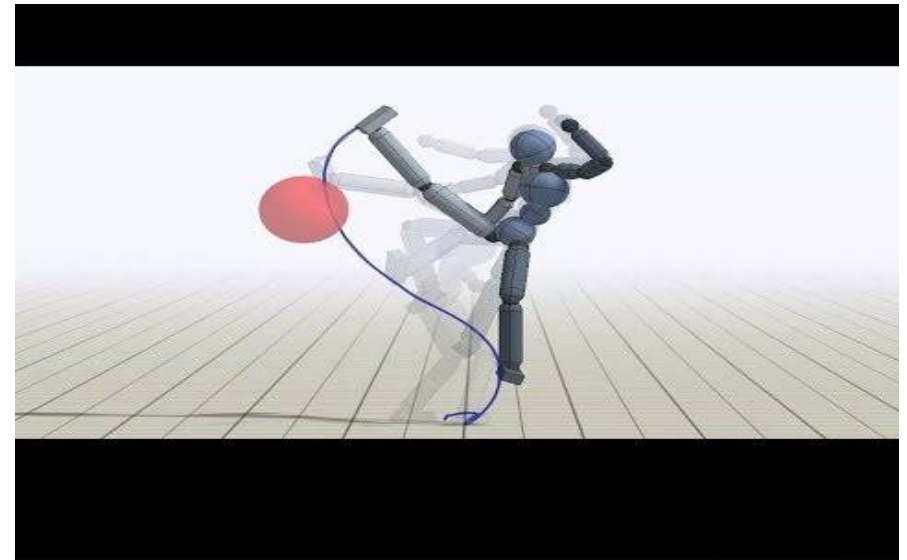
  - Algorithmic approach
    - To teach everything about what makes a car function, the engine, the transmission the combustion process
  - Survey approach
    - To hire a chauffeur, sit back, and see the world as a spectator
  - Programming approach
    - To teach you how to drive and how to take yourself wherever you want to go
    - → Put you in the driver's seat!

# Computer Graphics

- Recent developments...



SIGGRAPH 2017 : Technical Papers Preview Trailer  
SIGGRAPH 2018 : Technical Papers Preview Trailer  
Emerging Technologies Preview



# Computer Graphics

- 3D Computer Graphics
- Geometric objects
- Real objects to **virtual world**
- Simulating the behavior of the objects
- Rendering – show the virtual world
- Realistic, stylized .
- Motion synthesis
- **Interaction !**
- ....

# CS380 Intro to Computer Graphics

- This course aims at providing a broad introduction to the field of Computer Graphics.
- You will learn the most basic concepts of 3D Computer Graphics.
- Topics include geometric objects and transformation, viewing, shading, lighting, rendering, texture mapping, modeling, animation and 3D interactive applications.
- Through a series of OpenGL programming assignments, students will become familiar with interactive 2D and 3D graphical display concepts.

# PRE-TEST

- Know what you should brush up yourself
- Self assessment
- The solution will be posted on KLMS. Please check for yourself!

Please get started with your homework #0  
TA help hours: Wednesday 7~8:30 PM (#317)  
Thursday 7~8:30 PM #201)