Computer Graphics

Taesoo Kwon
(권태수)

Outline

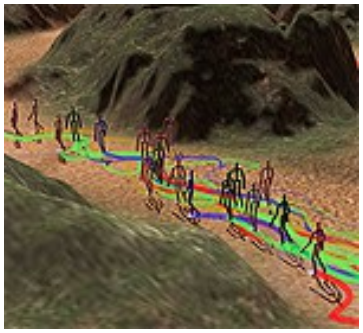
- About the instructor
- What is computer graphics
- Applications
- What you will learn in this class

About the Instructor: Taesoo Kwon (assistant professor)

- Joined Hanyang Univ. at 2012
- B.S., M.S. at Seoul National Univ.
- 2 years' experience in the game industry
- Ph. D. at KAIST
- Postdoc at SNU and Carnegie Mellon University
- Wrote many open source programs
  - 곰키보드 , paperCrop, resizerII, luna-gen,

Main Research Focus

- Character animation problems
- Papers and videos
  - http://calab.hanyang.ac.kr



Course Information

- Instructor: Taesoo Kwon
- E-mail: taesoo@hanyang.ac.kr
- Office: 401
- Office hours: right after class time
- English class (type B)
  - I will mainly use English during classes
  - You are free to ask questions in Korean

Introduction

- **Computer graphics:** The study of creating, manipulating, and using visual images in the computer.

Computer vision inverts the process
Image processing deals with images

Applications

- Entertainment industry
  - Movies and games
- ACM SIGGRAPH is one of the biggest conferences among computer science related ones

Complex light inter-reflection

Motion blur

Pixar—*Toy Story*

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Fur, water, rigid-body simulation

Pixar—*Ratatouille* (2007)

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Non-photorealistic rendering

Pixar—*Ratatouille* (2007)

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Pixar—*Ratatouille* (2007)

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Composition of real and virtual scenes

King Kong (Universal Pictures, 2005)—visual effects: WETA Digital

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King Kong (Universal Pictures, 2005)—visual effects: WETA Digital

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NG KONG
5 Universal Studios. Used With Permission.

These days, digital clones of a real subject look near perfect except ...

The Two Towers (New Line Cinema, 2002)—visual effects: WETA Digital

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Real-time interactive applications

id Software—*Quake 4* (screenshot: Planet Quake)

Both rendering and motion quality are not satisfactory

Electronic Arts—*NBA Live 07* (screenshot: gamespy.com)

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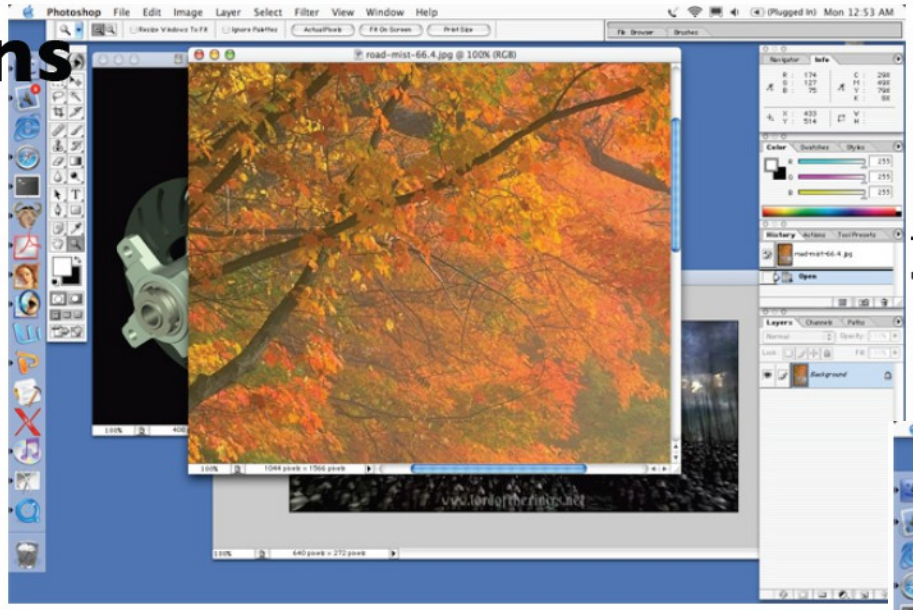
Game Industry : one of biggest IT sectors in Korea

창원에 엔씨소프트 프로야구단 생긴다(종합)

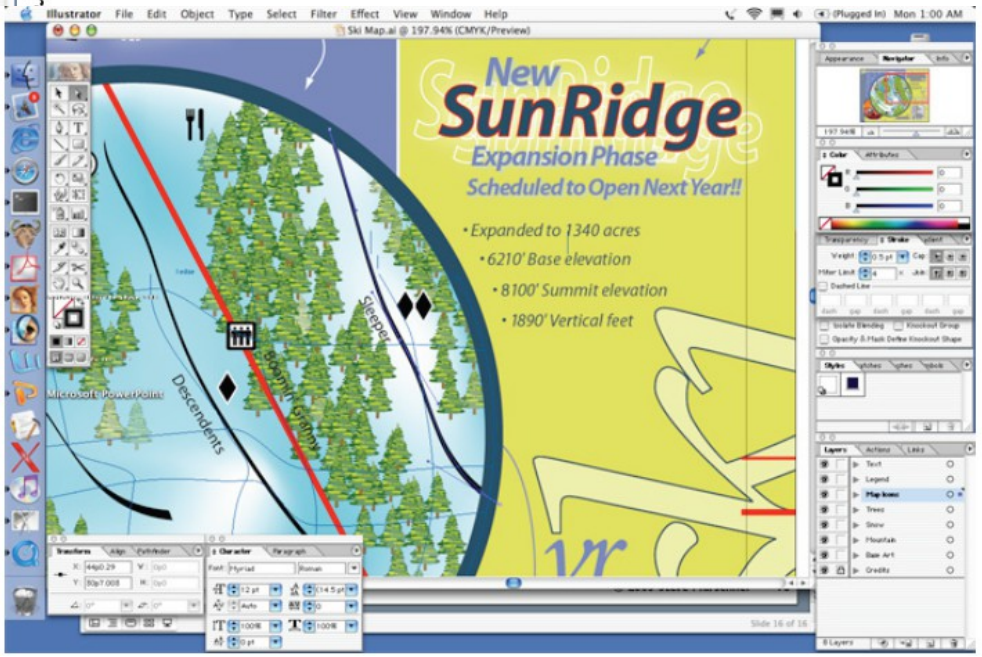
KBO 이사회 개최

(서울=연합뉴스) 이상학 기자 =11일 오전 서울 강남구 도곡동 야구회관에서 열린 KBO 이사회에서 유영구 총재가 회의를 주재하고 있다. 8개 구단 사장단이 참석한 가운데 열린 이날 이사회에서는 9구단 승인 여부 등을 논의한다.2011.1.11 leesh@yna.co.kr

Graphic Arts



Adobe Photoshop [Photo: P. Gr



Adobe Illustrator

Science and Engineering

Simulated deformation of citrate synthase during substrate binding

Kalju Kahn, UCSB

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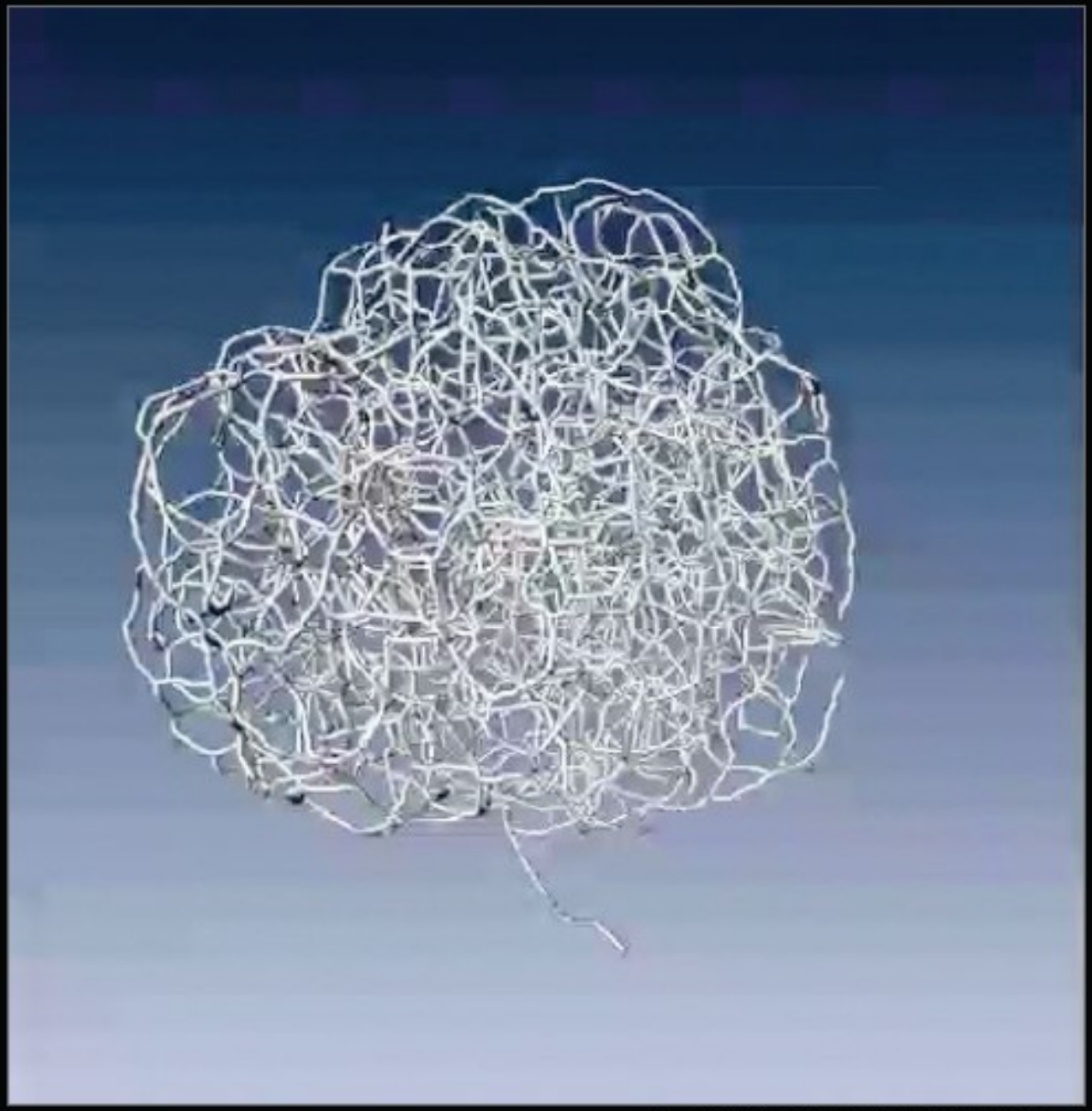

3D microscopy
of capillaries
in glomulerus of a
human kidney

Roger C. Wagner, Univ. Delaware

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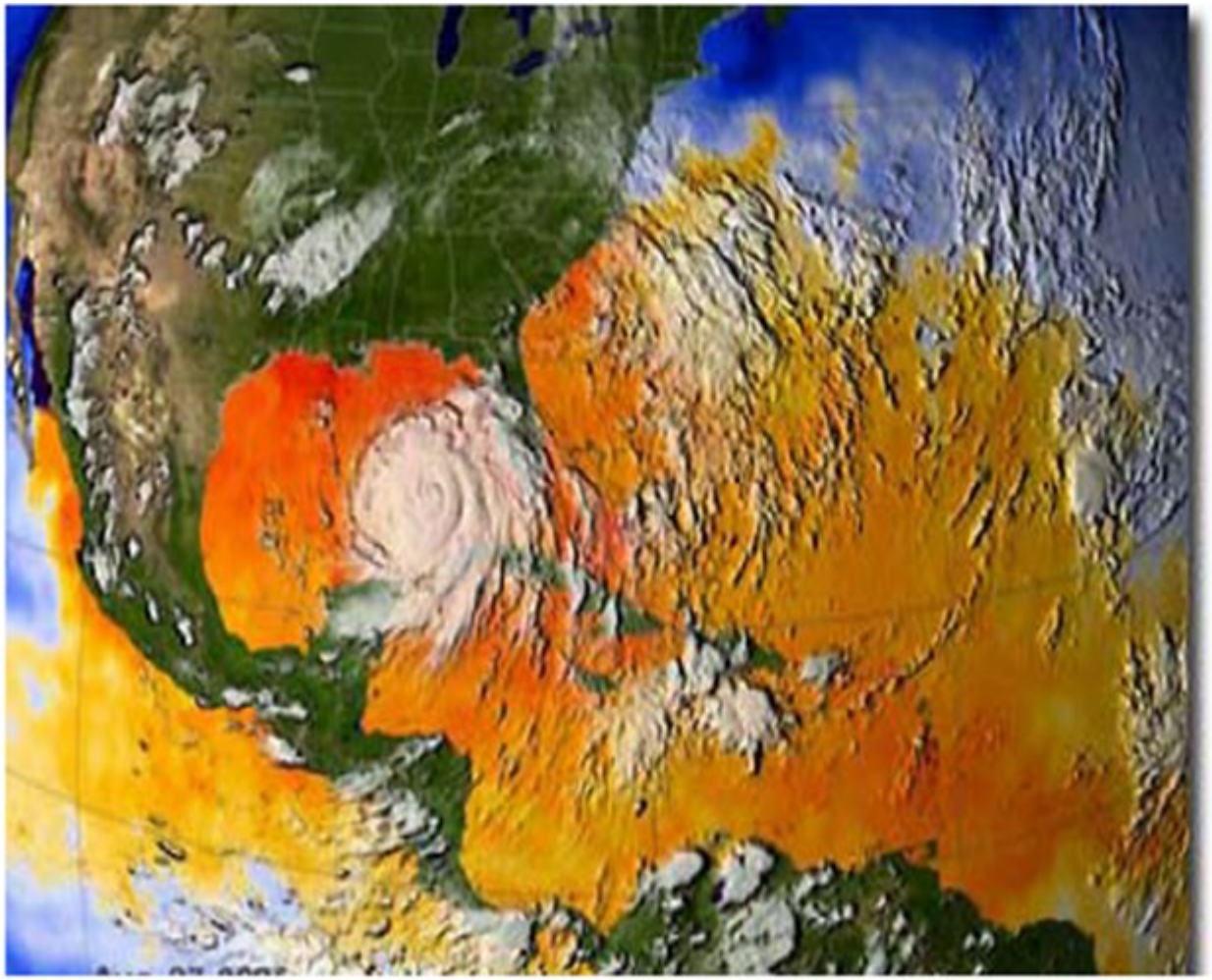
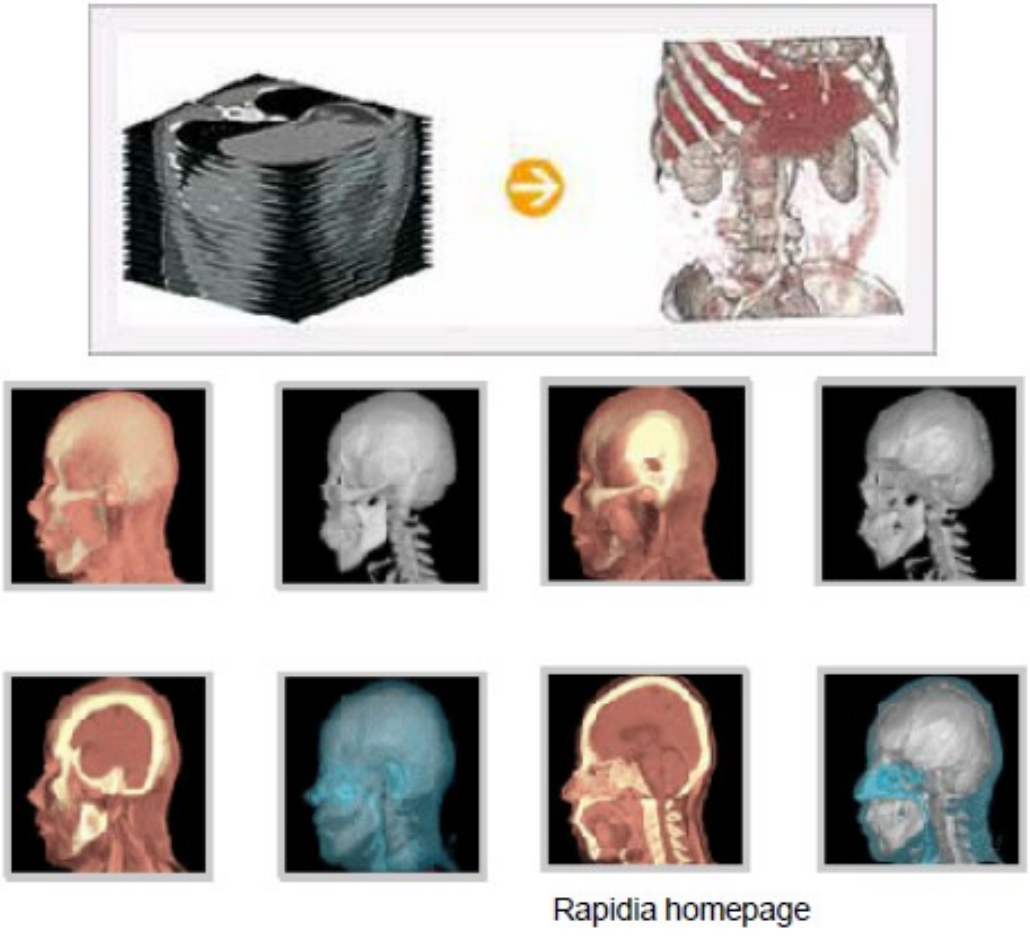
Weather visualization



LLNL

Medical Applications

- Visualizing data of CT, MRI, etc



Rapidia homepage

Training & Simulation

NASA/Ames—ACFS

Army Research Lab—IES

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Computer-aided design

Fine Arts

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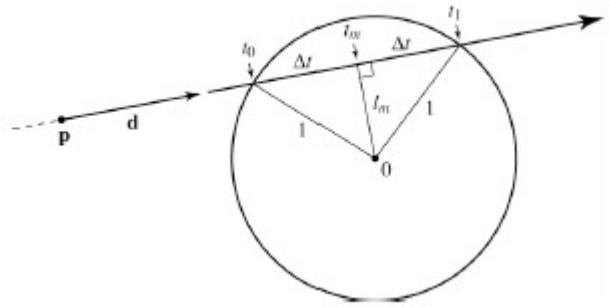
Course Overview

- Computer Graphics: Mathematics made visible
- In this course, you will
  - Explore fundamental ideas
  - Learn math essential to graphics
  - Implement key algorithms
  - Write cool programs
- You will not
  - Learn a lot about OpenGL or DirectX
  - Write big programs

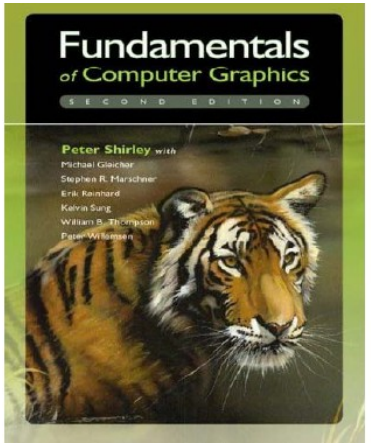
Prerequisites



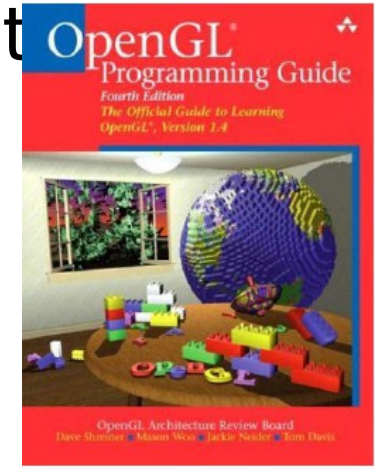
- Basic knowledge of mathematics
  - E.g., vector geometry, linear algebra
- Good knowledge of programming skill
  - Preferably with C-like language (e.g., C and C++)
- You don’t need artistic sense!
- If you are unsure, consult the instructor at the end of this class

Textbook

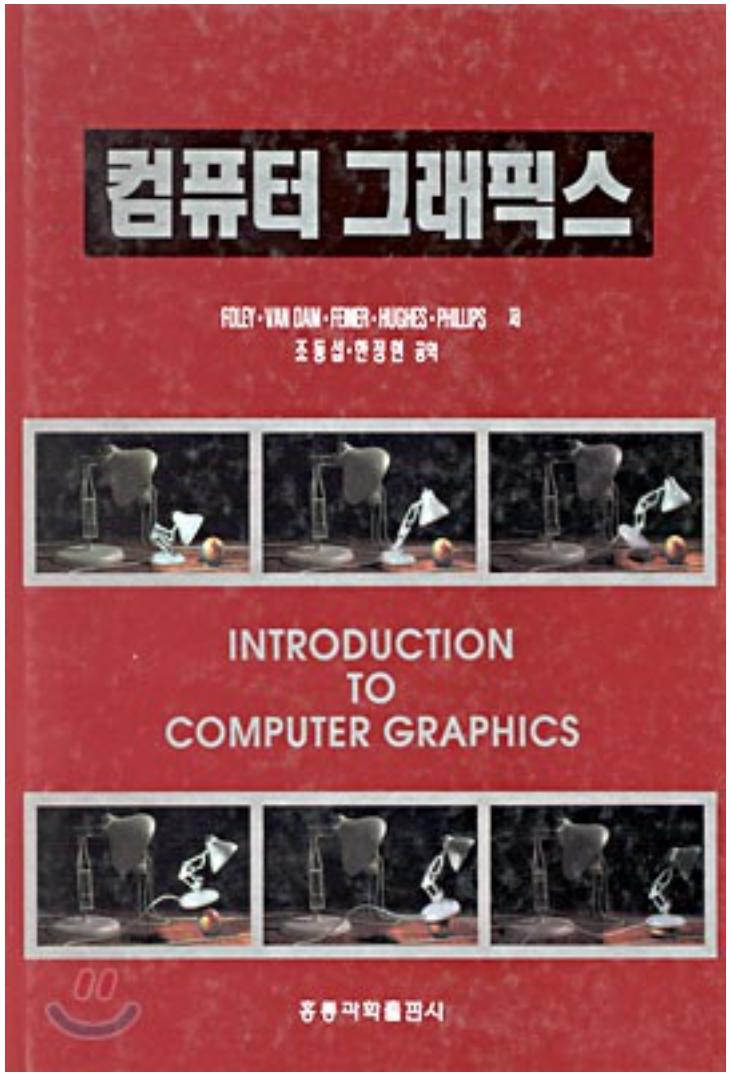
- Fundamentals of Computer Graphics
  - 1,2 or 3rd edition
  - Peter Shirley et al.
  - AK Peters



- OpenGL Programming Guide
  - Version 1.1 is available at internet
  - http://www.glprogramming.com/red/
  - Reference book is also available
  - http://www.glprogramming.com/blue



Textbook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FOLEY · VAN DAM · FEINER · HUGHES · PHILLIPS 저
조동섭 · 연정현 공역
INTRODUCTION
TO
COMPUTER GRAPHICS
홍릉과학출판사

Topics

- Images
- 3D models
- Ray tracing
- Global illumination
- Hidden surface removal
- Curves and surfaces
- Simplification and Rasterization
- levels of detail
- Collision detection
- Lighting and shading
- Shadows
- Graphics hardware, etc
- Texture mapping