Introduction to Computer Graphics

0. Overview

National Chiao Tung Univ, Taiwan
By: I-Chen Lin, Assistant Professor
About the course

○ Course title: Introduction to Computer Graphics

○ Lectures:
  ● EC022, 10:10~12:00(Mon.) & 9:00~9:50 (Wed.)

○ Pre-requisites:
  ● Computer programming skills in C/C++.
  ● Basic concepts of data structures.

○ Teacher:
  ● I-Chen Lin (林奕成), Assistant Professor
  ● Email: ichenlin@cs.nctu.edu.tw
  ● Office: EC 704 (工程三館)
  ● Tel ext: 56684
About the course (cont.)

- TAs:
  - 陸品樺、劉峻豪、蔡明翰
  - Office: EC237, EC229b
  - Phone ext: 56675, 56676

- Course web page:

- Text book:
About the course (cont.)

- Reference:
What’s CG?

- **Computer Graphics.**
  - Mainly focuses on 3D graphics.
  - Displays a realistic virtual environment by computers.
  - Or synthesizes virtual objects in the real world.

FF XIII, Square-Enix corp. Image from ign.com
Avatar, 20th Century Fox.
Transformers, Dreamworks
What’s CG? (cont.)

- Or displays a virtual world with specific styles. (e.g. non-photorealistic rendering)

- CG tech. is the foundation of modern 3D animation, special effects and games.

DragonBall Z3 (PS2), BANDAI
NPR demo, ATI
Graphics and related fields

- 3 related fields.

- Find features.
- Eyes? a nose?
- A face?
- Structure?
- Lin?

Image Processing

Computer Vision & Recog.

Computer Graphics
Nevertheless, the boundaries between these fields, especially CG and CV, are getting indistinct.
Applications

- Movies
- Games
- Virtual characters
Applications (cont.)

- Virtual reality (VR)

Office of the future, UNC
Applications (cont.)

- Augmented reality (AR)

- Advanced human computer interfaces

AR, U. Columbia
Applications (cont.)

- Medical diagnosis.
- Virtual Surgery.
Applications (cont.)

- Computer aided design (CAD)
  - Collaborating on cyberspace.
  - Ex. Cabin design (Boem Inc.)

- Visualization tools
  - Meteorology
  - Flow display etc.

Syllabus

1. Introduction.
2. Graphics primitives
3. Illumination and surface rendering

\[
\text{Ambient} + \text{Diffuse} + \text{Specular} = \text{Phong reflection}
\]
Syllabus (cont.)

4. Geometric transformations
5. Viewing in 3D
6. Visible-surface detection

World Coordinates

Camera Coordinates

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Syllabus (cont.)

7. Texture mapping
8. Global illumination
9. Curves and surfaces
10. Advanced topics and research in CG

- Advanced courses in NCTU:
  - Advanced computer graphics
  - Computer animation
  - Image-based modeling and rendering
  - Texture synthesis
  - Real-time rendering
  - 3D game programming
  - Human computer interaction
  - ......
About the course (cont.)

- Grades:
  - Homework (2 programs)
    - OpenGL object viewer (15%)
    - TBA (15%)
  - Term Project (25%)
  - Exam
    - Midterm (25%)
    - Final (20%)
  - Class participation: bonus
What can I obtain in this course?

- Fundamentals of computer graphics techniques.
- Programming ability of 3D graphics pipeline.
- Preliminary concepts on advanced graphics-related topics, e.g. 3D games, movies.
What can I obtain in this course?

- 2D image special effects.
- Digital art styles.
- Usage of editing tools.
  - Photoshop, 3DMax, Maya, etc.
Conclusion

- The role of graphics people in CS
  - Improving faithfulness or visual effects
  - Speed-up of CG generation
  - (by computer techniques)

*We give “wizards” the “wands” and “spells”!*