Introduction

- Administratrivia.
- What is computer graphics?
- What I do…
- Topics
GOALS OF COMPUTER GRAPHICS

- Faking reality – convincingly.
- Creating alternative reality.
Faking Reality
FAKING REALITY
FAKING REALITY
MAKING OF THE GATORADE COMMERCIAL
WHAT IS COMPUTER GRAPHICS?

- 3D Modeling / Geometry
- Simulation / Animation / Character Animation
- Lighting / Light Transfer
- Textures and Color
- Post-Processing: Image Processing
- Camera tricks / Optics
WHAT ELSE IS COMPUTER GRAPHICS

Scientific Visualization

Illustration

NPR / Art

Computational Photography

Virtual Life

and much more....
Introduction

- Administratrivia.
- What is computer graphics?
- What I do…
- Topics
WHAT I DO

Merlot Wine

Chardonnay Wine
WHAT I DO
What I Do

Haze

De-hazed
WHAT I DO

Tokyo Sky Scraper

Berkeley Scene
Tokyo Sky Scraper in Berkeley
WHAT I DO
WHAT I DO

“Honey! Look! The TV ran out of water again!!” – Youtube
WHAT I DO

Motion-aware camera
WHAT I DO
**Introduction**

- Administrat trivia.
- What is computer graphics?
- What I do...
- Topics
ADMINISTRATRIVIA

- Web Page
  - http://www.cs.cmu.edu/~15462/
  - linked from my web page
TA OFFICE HOURS

- TAs:
  - Cathy Li (chli@andrew.cmu.edu) Mon 8-10pm
  - Nico Feltman (nfeltman@andrew.cmu.edu) Tue 8:30-10:30pm
  - Jitu Das (cdas@andrew.cmu.edu) Wed 8-10pm
- No office hours this week.
TEXTBOOK

- Shirley, 2nd or 3rd Edition
- OpenGL Red Book
  - http://www.glprogramming.com/red/
- For Thursday:
  - Red Book Chapters 1 and 2
PRE-REQUISITES

- Talk to us if you’re missing these!
  - 15-213: Introduction to Computer Systems
  - 21-241: Matrix Algebra (matrix & vector algebra)
  - 21-259: Calculus in Three Dimensions (i.e. planes, quadratic surfaces,
- Basic 3-D geometry / C++
Grading

- Project 1 (10%)
- Project 2 (10%)
- Project 3 (10%)
- Project 4 (15%)
- Project 5 (15%)
- Homework 1 (7.5%)
- Homework 2 (7.5%)
- Midterm (10%)
- Final Exam (15%)
LATE POLICY

- 3 late days for projects.
- No further extensions without explicit permission 2 days before deadline.
CHEATING – ZERO TOLERANCE

- Please don’t cheat! Using code from the web is ok as long as it is a SMALL percentage of the code for written the assignment.

- Do projects and home works individually.
INTRODUCTION

- Administratrivia.
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## Syllabus and Schedule

### Intro
- **01 Tues 08/28** - Introduction
- **02 Thur 09/30** - OpenGL
  [PROJ 1 ASSIGNED]

### Geometry
- **03 Tues 09/04** - Math for Computer Graphics
- **04 Thur 09/06** - Transformations
- **05 Tues 09/11** – Viewing/Camera
  - **07 Thur 09/13** - Curves and Splines
    [PROJ 1 DUE, HW1 ASSIGNED]
  - **08 Tues 09/18** - Meshes and Surfaces
    [PROJ 2 ASSIGNED]

### Light
- **09 Thur 09/20** – Shading/Light
- **10 Tues 09/25** – Materials
- **11 Thur 09/27** – Texture mapping + GLSL
  [HW1 DUE]

### NPR
- **12 Tues 10/02** – Non-photorealistic rendering
  [PROJ 2 DUE, PROJ 3 ASSIGNED]
- **13 Thur 10/04** – Illusions

### Ray Tracing
- **14 Tues 10/09** – Raycasting/Raytracing
- **15 Thur 10/11** – Spatial Data Structures
  [P3 Check Point]
- **16 Tues 10/16** – Midterm review
- **17 Thur 10/18** - [MIDTERM EXAM]

### Indirect Lighting
- **18 Tues 10/23** – Radiosity
  [PROJ 3 DUE, PROJ 4 ASSIGNED]
- **19 Thur 10/25** - Photon Mapping
- **20 Tues 10/30** – Direct-Indirect Separation

### Animation
- **21 Thur 11/01** - Animation and Motion-capture
- **22 Tues 11/06** - Differential Eqn & Particle Systems
- **23 Thur 11/08** – Fluids
  [HW2 ASSIGNED]

### Images
- **24 Tues 11/13** - Image Processing
  [PROJ 4 DUE, PROJ 5 ASSIGNED]
- **25 Thur 11/15** – High Dynamic Range Imaging & Tone Mapping
- **26 Tues 11/20** – Photo and Webcam Clipart

### Advanced
- **27 Thur 11/22** – THANKSGIVING
- **29 Tues 11/27** – Displays
  [PROJ 5 DUE]
- **28 Thur 11/29** – Cool new research in Graphics
  [HW 2 DUE]

### Final
- **30 Tues 12/04** – Final Review and Project Showcase
- **31 Thur 12/06** – [FINAL EXAM]
# Syllabus and Schedule

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[HW 2 DUE]

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Light
- 08 Tues 09/18 - Meshes and Surfaces
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NPR
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Radiosity
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- 27 Thur 11/22 – THANKSGIVING

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- **Geometry**: Math for Computer Graphics, Transformations, Viewing/Camera, Curves and Splines, Meshes and Surfaces
- **Light**: Shading/Light, Materials, Texture mapping + GLSL
- **NPR**: Non-photorealistic rendering, Direct-Indirect Separation, Radiosity, Photon Mapping, High Dynamic Range Imaging & Tone
- **Ray Tracing**: Direct-Indirect Separation, Midterm Review, Image Processing, Photo and Webcam Clipart, Thanksgiving, Displays
- **Final**: Final Review and Project Showcase, Final Exam
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>01 Tues 08/28</td>
<td>Introduction</td>
</tr>
<tr>
<td>02 Thur 09/30</td>
<td>OpenGL (PROJ 1 ASSIGNED)</td>
</tr>
<tr>
<td>03 Tues 09/04</td>
<td>Math for Computer Graphics</td>
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<tr>
<td>04 Thur 09/06</td>
<td>Transformations</td>
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<tr>
<td>05 Tues 09/11</td>
<td>Viewing/Camera</td>
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<td>07 Thur 09/13</td>
<td>Curves and Splines (PROJ 1 DUE, HW1 ASSIGNED)</td>
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<td>08 Tues 09/18</td>
<td>Meshes and Surfaces (PROJ 2 ASSIGNED)</td>
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<tr>
<td>09 Thur 09/20</td>
<td>Shading/Light</td>
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<td>10 Tues 09/25</td>
<td>Materials</td>
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<td>11 Thur 09/27</td>
<td>Texture mapping + GLSL (HW1 DUE)</td>
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<td>12 Tues 10/02</td>
<td>Non-photorealistic rendering (PROJ 2 DUE, PROJ 3 ASSIGNED)</td>
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<td>13 Thur 10/04</td>
<td>Illusions</td>
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<tr>
<td>14 Tues 10/09</td>
<td>Raycasting/Raytracing</td>
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<tr>
<td>15 Thur 10/11</td>
<td>Spatial Data Structures (P3 Check Point)</td>
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<td>16 Tues 10/16</td>
<td>Midterm review</td>
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<td>17 Thur 10/18</td>
<td>[MIDTERM EXAM]</td>
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<td>18 Tues 10/23</td>
<td>Radiosity (PROJ 3 DUE, PROJ 4 ASSIGNED)</td>
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<td>19 Thur 10/25</td>
<td>Photon Mapping (PROJ 5 ASSIGNED)</td>
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<td>20 Tues 10/30</td>
<td>Direct-Indirect Separation</td>
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<tr>
<td>21 Thur 10/31</td>
<td>Illusions</td>
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<tr>
<td>22 Tues 11/06</td>
<td>Differential Eqn &amp; Particle Systems</td>
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<tr>
<td>23 Thur 11/08</td>
<td>Fluids (HW2 ASSIGNED)</td>
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<td>24 Tues 11/13</td>
<td>Image Processing (PROJ 4 DUE, PROJ 5 ASSIGNED)</td>
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<tr>
<td>25 Thur 11/15</td>
<td>High Dynamic Range Imaging &amp; Tone</td>
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<tr>
<td>26 Tues 11/20</td>
<td>Photo and Webcam Clipart</td>
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<tr>
<td>27 Thur 11/22</td>
<td>THANKSGIVING</td>
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<tr>
<td>28 Thur 11/29</td>
<td>Cool new research in Graphics</td>
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<tr>
<td>29 Tues 11/27</td>
<td>Displays</td>
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<tr>
<td>30 Tues 12/04</td>
<td>Final Review and Project Showcase</td>
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<tr>
<td>31 Thur 12/06</td>
<td>[FINAL EXAM]</td>
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</table>
### Syllabus and Schedule

#### Intro
- **01** Tues 08/28 - Introduction
- **02** Thur 09/30 - OpenGL
  - [PROJ 1 ASSIGNED]

#### Geometry
- **03** Tues 09/04 - Math for Computer Graphics
- **04** Thur 09/06 - Transformations
  - [PROJ 1 DUE]
- **05** Tues 09/11 - Viewing/Camera
- **07** Thur 09/13 - Curves and Splines
  - [PROJ 1 DUE]
- **08** Tues 09/18 - Meshes and Surfaces
  - [PROJ 2 ASSIGNED]

#### Light
- **09** Thur 09/20 - Shading/Light
- **10** Tues 09/25 - Materials
- **11** Thur 09/27 - Texture mapping
  - [HW1 DUE]

#### NPR
- **12** Tues 10/02 - Non-photorealistic rendering
  - [PROJ 2 DUE]
- **13** Thur 10/04 - Illusions

#### Ray Tracing
- **14** Tues 10/09 - Raycasting/Raytracing
- **15** Thur 10/11 - Spatial Data Structures  [P3 Check Point]
- **16** Tues 10/16 - Midterm review
- **17** Thur 10/18 - [MIDTERM EXAM]

#### Final
- **18** Tues 10/23 - Radiosity
- **19** Thur 10/25 - Photon Mapping
- **20** Tues 10/30 – Midterm review
- **21** Thur 11/01 - Animation and Motion-capture
- **22** Tues 11/06 - Differential Eqn & Particle Systems
  - Fluids
  - [HW2 ASSIGNED]

#### Image Processing
- **23** Thur 11/08 – Fluids
  - Image Processing
  - [PROJ 4 DUE, PROJ 5 ASSIGNED]
  - High Dynamic Range Imaging & Tone Mapping
  - Photo and Webcam Clipart
  - [PROJ 5 DUE]
  - Cool new research in Graphics
  - [HW 2 DUE]

- **24** Tues 11/13 - Image Processing
  - [PROJ 4 DUE, PROJ 5 ASSIGNED]

- **25** Thur 11/15 – High Dynamic Range Imaging & Tone Mapping
  - Photo and Webcam Clipart
  - [HW 2 DUE]

- **26** Tues 11/20 – Photo and Webcam Clipart
- **27** Thur 11/22 – THANKSGIVING

- **28** Tues 11/27 – Displays
  - [PROJ 5 DUE]
  - Final Review and Project Showcase

- **29** Thur 12/06 – [FINAL EXAM]

- **30** Tues 12/04 – Final Review and Project Showcase

- **31** Thur 12/06 – [FINAL EXAM]
We will have full class votes and prizes too!

Five Projects:

- Starter project - OpenGL
- Geometry and Meshes
- GLSL Shaders – Special effects/Materials
- Ray Tracing
- Animation and Physical Simulation
PROJECT 1: BASICS OF OPENGL
PROJECT 2: GEOMETRY AND MESHES
PROJECT 3: OPENGL SHADERS
PROJECT 4: RAY TRACING
PROJECT 5: PHYSICAL SIMULATION

VISIT WWW.IDLEWORM.COM/HOW/INDEX.SHTML FOR ANIMATION TUTORIALS
NEXT LECTURE

- Basics of OpenGL
- How to access CMU machines and start programming
- Project 1 assigned