



CPSC 414 Computer Graphics

Instructor:
Michiel van de Panne

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What This Course Is About

Topics covered

- basics of interactive rendering
 - modeling, geometric transformations
 - projections, hidden surface removal
 - lighting, texture mapping, animation
 - colour perception
- as time allows
 - shadows, current hardware, curves and surfaces
 - ray-tracing, global illumination
 - input and output hardware,

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What This Course is NOT About



Topics NOT covered:

- Artistic and design issues
- Usage of commercial software packages
- Other graphics courses
 - CPSC 424: Geometric Modeling
 - CPSC 514: Image-based Modeling and Rendering
 - CPSC 533A: Digital Geometry
 - CPSC 533B: Animation Physics
 - CPSC 533C: Information Visualization

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Course Organization

Programming assignments:

- C++, Windows or Linux
- OpenGL graphics library / GLUT for user interface

Collaboration:

- Individual solutions unless stated otherwise

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Course Organization



Up-to-date information:

- <http://www.ugrad.cs.ubc.ca/~cs414>
- WebCT (follow link from course home page)
 - Bulletin board
 - REQUIRES INTERCHANGE ACCOUNT!

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3D Graphics: Applications

- games
- CAD : Computer Aided Design
 - Architecture
 - product design
- Scientific vis,
- simulation
- film

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3D Graphics: History



- 2000 BC: Orthographic projection
- 1600s:
 - coordinate systems (Descartes)
 - optics (Huygens)
 - calculus, physics, optics (Newton)
- 1897: oscilloscope (Braun)
- 1950-70: vector display computers
- 1966: first raster display
- 1993: 500k tri/s, texmap @ 60Hz for \$150,000
- 1995: feature length CG films
- 2002: 100M tri/s for \$400

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Fake or Photo ?



<http://www.alias.com/eng/etc/fakeorfoto/quiz.html>

1



class guess:
?
ans: photo

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Fake or Photo ?



2



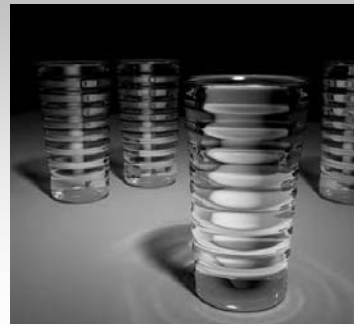
class guess:
Real
X

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Fake or Photo ?



3



class guess:
CG
✓

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Fake or Photo ?



4



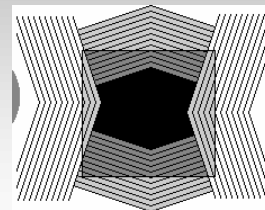
class guess:
Real
✓

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Perception ...



<http://www.skytopia.com/project/illusion/illusion.html>



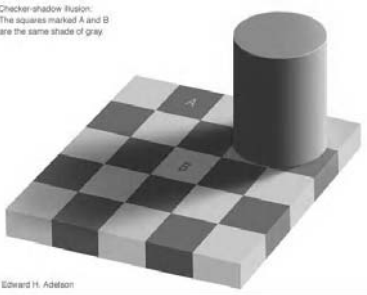
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<http://www.skytopia.com/project/illusion/illusion.html>

Checker shadow illusion:
The squares marked A and B
are the same shade of gray.



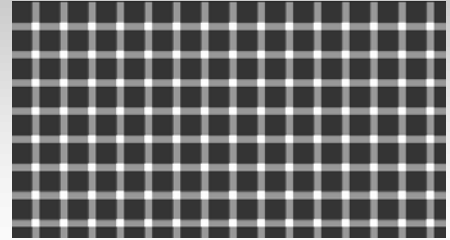
Edward H. Adelson

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<http://www.skytopia.com/project/illusion/illusion.html>

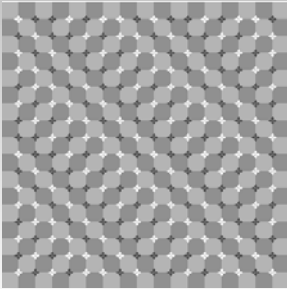


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<http://www.skytopia.com/project/illusion/illusion.html>



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Images...



77 K polygons
24 area lights
solution render time : around 7200 sec

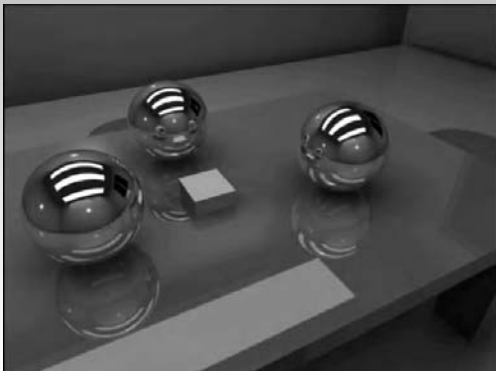


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Images...



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Images...



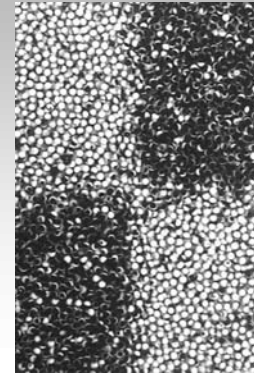
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Images...



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Images...



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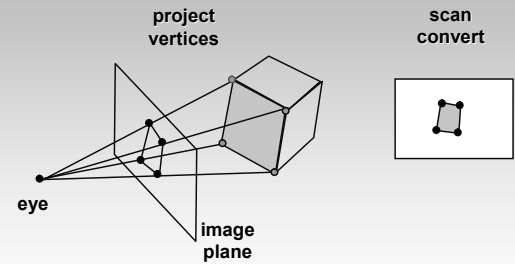
Graphics: State of the Art



- Displays:
 - IBM: 3840x2400 pixels, 3km wiring, 200ppi
 - electronic paper
 - 3D printers
- Input:
 - Z-cam, Triclops
 - motion capture
- Animations: fracture, water, cloth

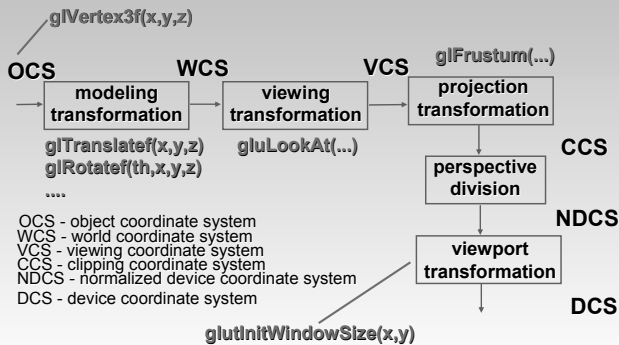
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Projective Rendering Pipeline



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Projective Rendering Pipeline



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Coming Up...



Thursday, January 8:

- math review:
 - points, vectors, coordinate frames
 - basis vectors, basis functions
 - dot product, cross product
- introduction to geometric transformations

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