Photorealistic Rendering vs. Interactive 3D Graphics

(An Introduction to Digital Image Synthesis)

Short Film Festival

- I will show a short film at the beginning of each class, so don't be late!

Course Positioning

- This course focuses on the picture quality, not on the rendering speed.

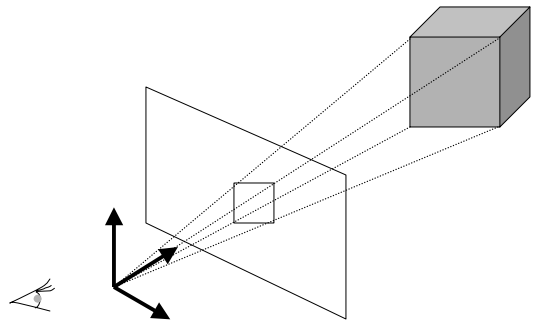
CS5502	vs.	CS6500/CS5500
Photorealism;		Rendering speed;
Complex lighting simulation		Simplified lighting models
e.g., ray tracing, radiosity, photon map.		e.g., transformation and lighting, rasterization, graphics hardware.

How Do You Draw a Picture (Without a Computer)?

- What is your subject?
- Viewing Parameters:
  - Camera, Picture Frames, Resolutions
- Many ways to specify it:

(1) eye, focus length, image plane

(2) eye, direction, FOV, up vector

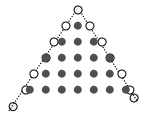


3D to 2D Projection

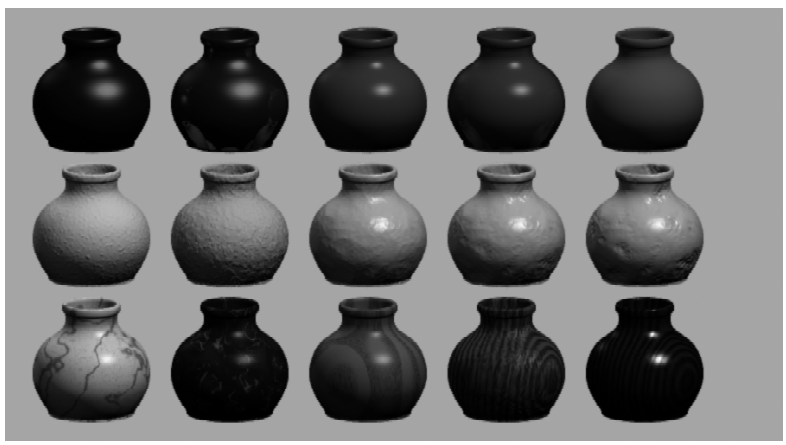
- OK, so we can map a 3D point (or vertex) to 2D image.
- But what about a 3D surface?
- Polygons are made from points.
- Actually, we only need triangles!

Scan Conversion

- Also called rasterization.
- The 3D to 2D Projection gives us 2D vertices (points).
- We need to fill in the interior.



Shading

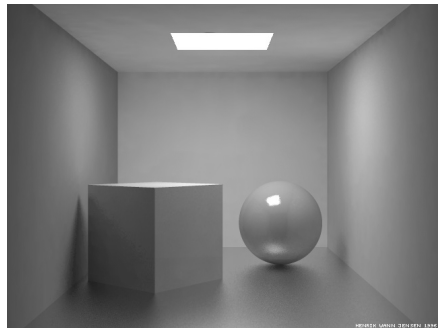


An Overview of 3D Pipeline

- The above can be implemented in hardware.
- Z Buffer to detect hidden surfaces.
- Other transformations not mentioned here: Modeling and Viewing.
- Browse Chapters 5 & 6 of Watt's book if you're not familiar with it.

"…But They Don't Look Real."

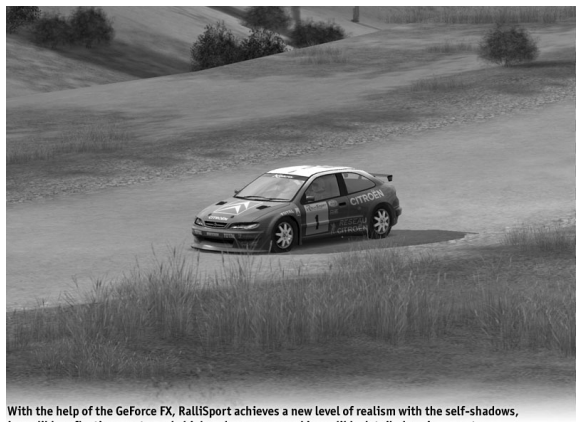
- Most things are not flat or simple geometry like spheres and cones.
- We need correct surface colors and shapes (and more)



- We also need correct lighting.
- Textures help, but not enough.
- Even simple things like CD can be challenging.

Real-time Graphics

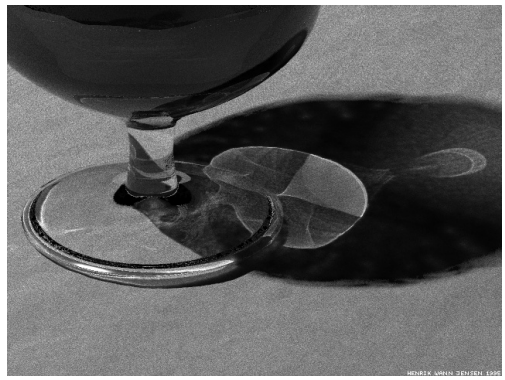
- They're becoming darn good!

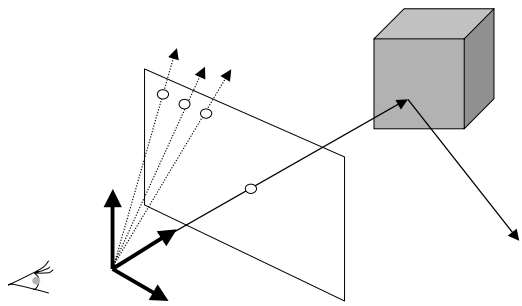


With the help of the GeForce FX, RalliSport achieves a new level of realism with the self-shadows, incredible reflections, extremely high-polygon cars, and incredibly detailed environments.

But…

- Some effects are hard to do in hardware, such as the caustics:



A Different View: Ray Tracing

- Actually inverse ray tracing.