

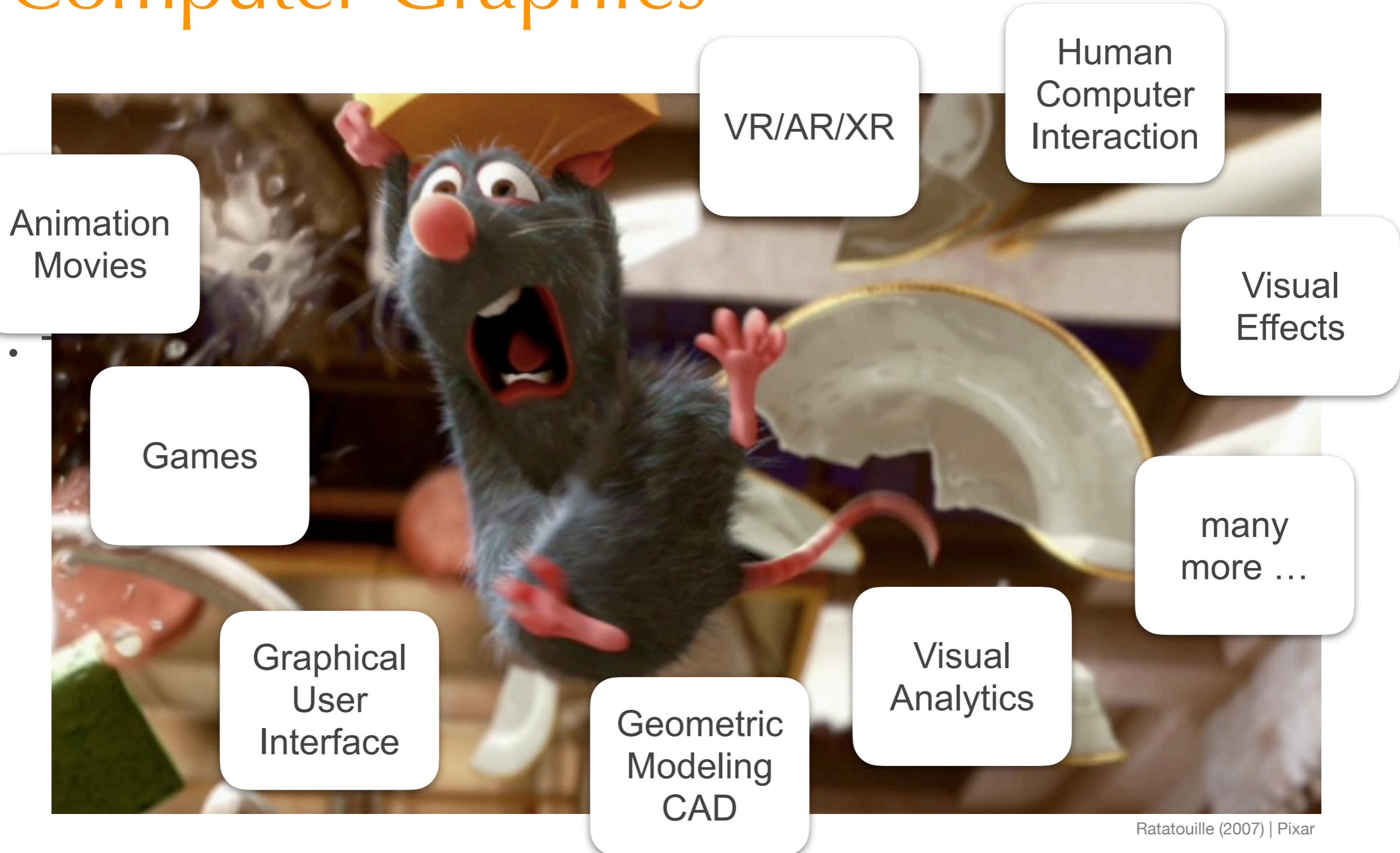
Historical Overview

Computer Graphics

Prof. Dr.-Ing. Angela Brennecke
Creative Technologies

Filmuniversität Babelsberg
KONRAD WOLF

Computer Graphics



Historical Overview

Whirlwind | 1950s

- 1949 First computer graphics rendered on Whirlwind computer at MIT
- 1952 Use of computer graphics for radar displays
- 1955 interactive input device LightPen



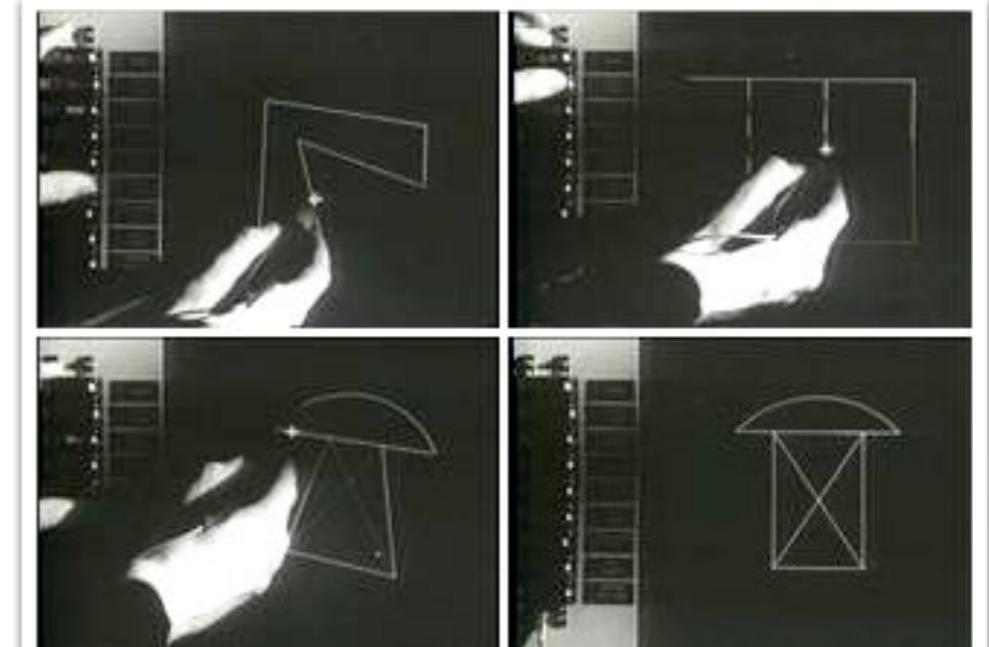
Sketchpad

- 1963 Ivan Sutherland develops first interactive computer graphics system called Sketchpad



<https://caddia.blogspot.com/2016/09/what-is-cad-and-its-history.html>

- Capable to draw geometrical objects
- Supports human-computer interaction via LightPen, keyboard & menus
- Introduces data structures to manage data
- Initiates object oriented programming



<https://upload.wikimedia.org/wikipedia/en/7/7b/Sketchpad-Apple.jpg>



3D Computer Graphics | 1960s

- Throughout 1960s many different CGI research projects start to blossom
- Leads to first SIGGRAPH conference in 1969

1960s - the visibility problem

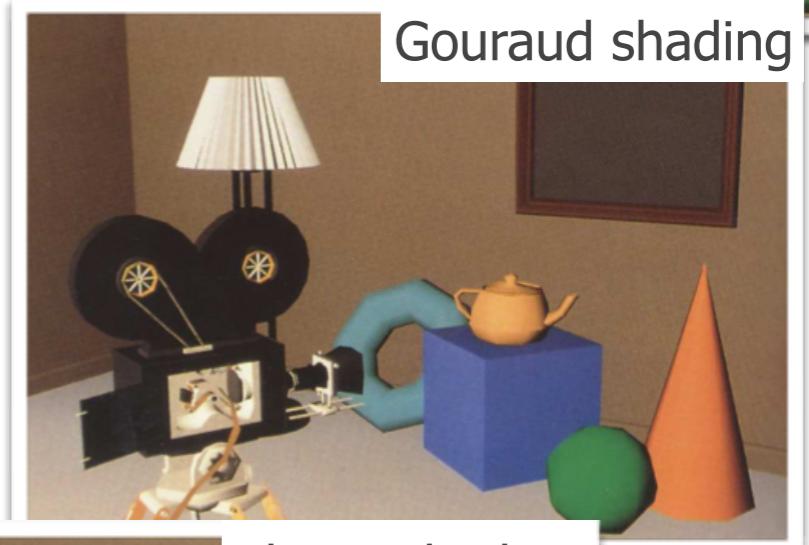
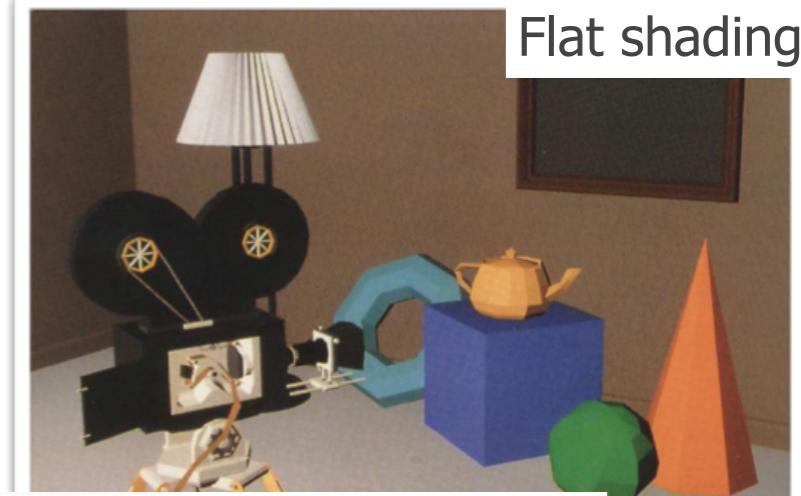
- Roberts (1963), Appel (1967) - hidden-line algorithms
- Warnock (1969), Watkins (1970) - hidden-surface algorithms
- Sutherland (1974) - visibility = sorting



<https://graphics.stanford.edu/courses/cs248-02/History-of-graphics/History-of-graphics.pdf>

Local Illumination | 1970s

- At the University of Utah, several new algorithms are being developed, e.g.
- 1970 Bezier: Bezier curves
- 1971 Gouraud: Shading & diffuse lighting
- 1974 Catmull: z-Buffer algorithm
- 1974 Blinn: Curved surfaces & texture
- 1975 Phong: Shading & specular lighting
- 1977 Crow: Anti-aliasing



<http://www.cs.umd.edu/~djacobs/CMSC427/Shading.pdf>

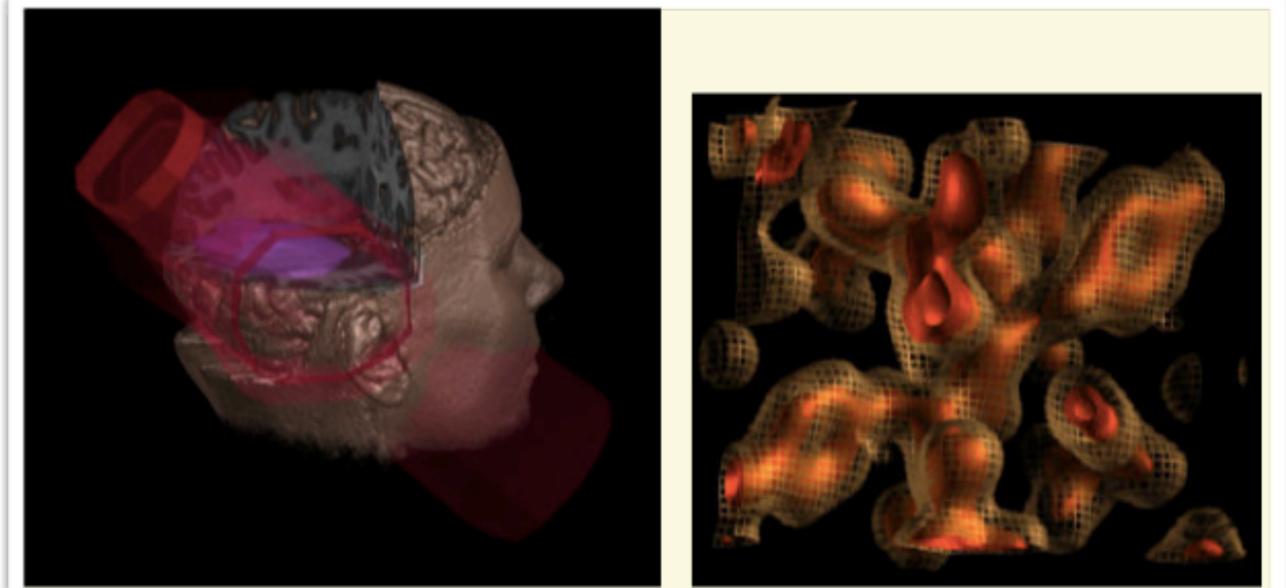
Towards Photorealism | 1980s

- 1979 Computer Graphics department introduced at Lucas Film
- 1980 L. Carpenter's „VolLibre“
- Flight through fractal landscape
- TRON first movie that extensively uses computer graphics (ca. 30 minutes)

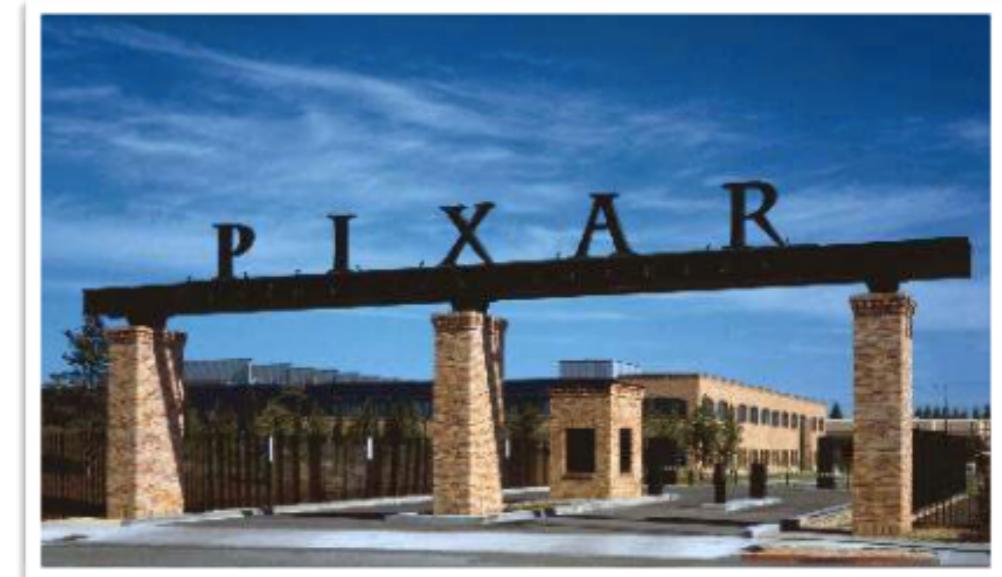


Novel Techniques | 1980s

- 1981 Volume rendering starts to form
- 1982 Morphing introduced (T. Brigham)
- 1982 Silicon Graphics (sgi) is founded
- 1986 Pixar is founded by Ed Catmull & A.R. Smith
- Pixar's rendering engine RenderMan soon to become industry standard for computer generated animation



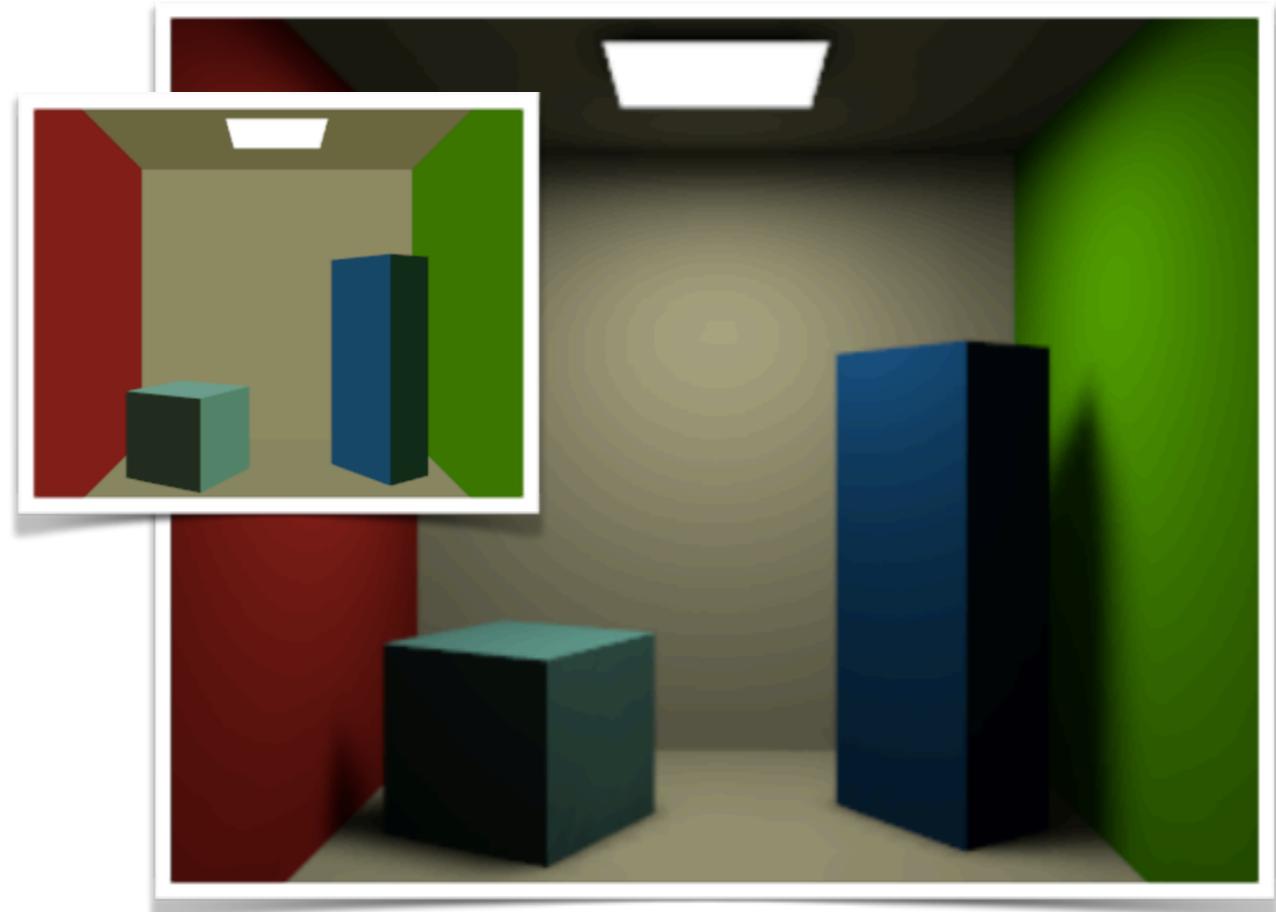
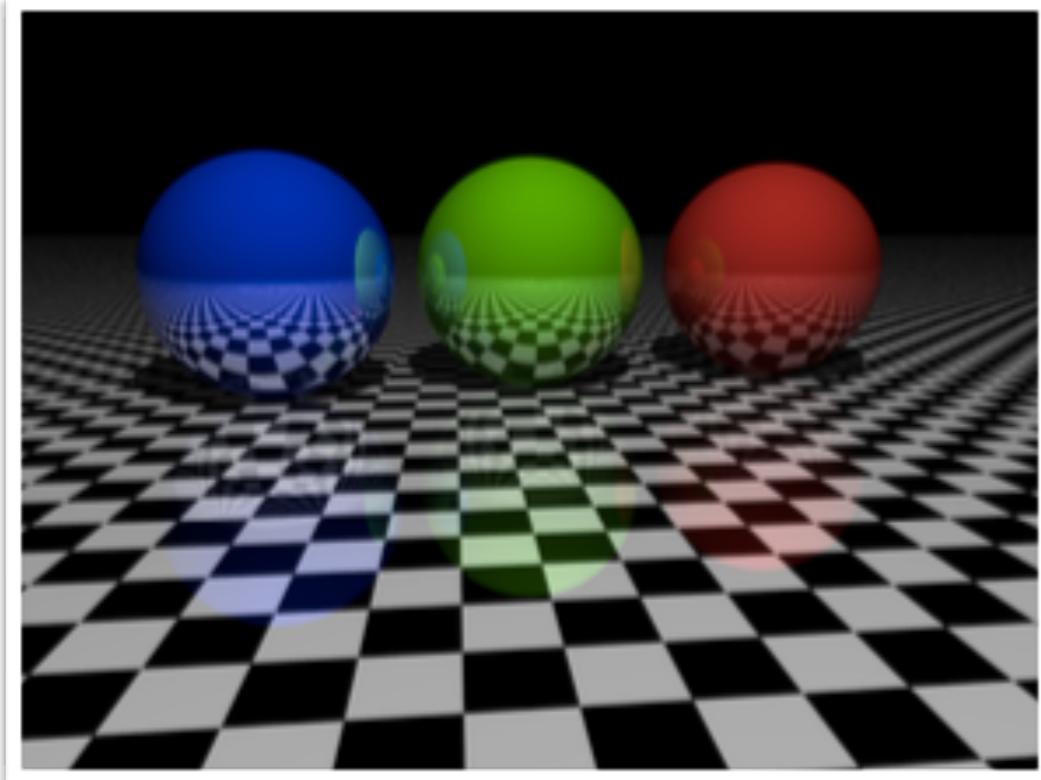
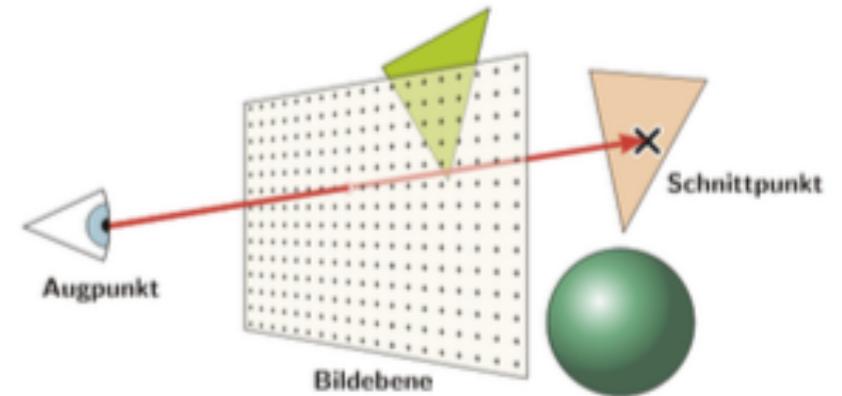
<https://graphics.stanford.edu/courses/cs248-02/History-of-graphics/History-of-graphics.pdf>



<http://www.computerhistory.org/timeline/graphics-games/>

Towards Photorealism | 1980s

- 1980 Raytracing introduces transparency & reflection
- 1984 Radiosity introduces global illumination
- 1986 Rendering equation



Images credit: <http://www.mttcs.org/Skripte/Pra/Material/vorlesung1.pdf>

CGI in the Movies | 1990s

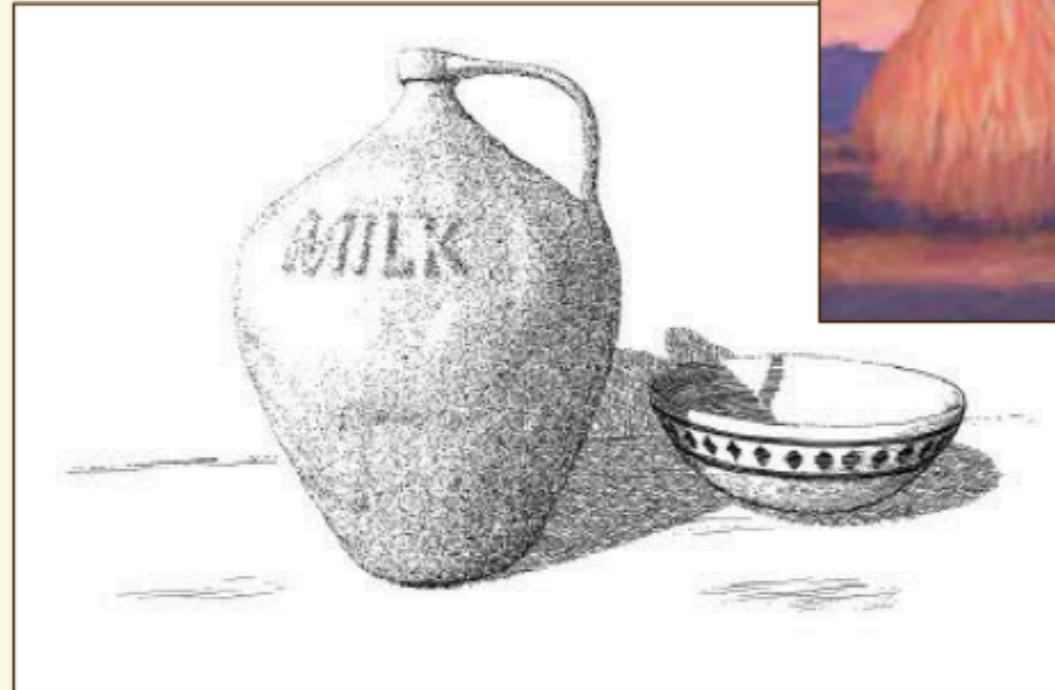
- 1993 Steven Spielberg's Jurassic Park
- First big budget CGI visual effects movie
- 1995 Pixar/Disney's Toy Story
completely computer generated
- 800.000 hours rendering for 77 min film



Non-Photorealistic Rendering | 1990s

early 1990s - non-photorealistic rendering

- Haeberli (1990) - impressionistic paint programs
- Salesin et al. (1994-) - automatic pen-and-ink illustration
- Meier (1996) - painterly rendering



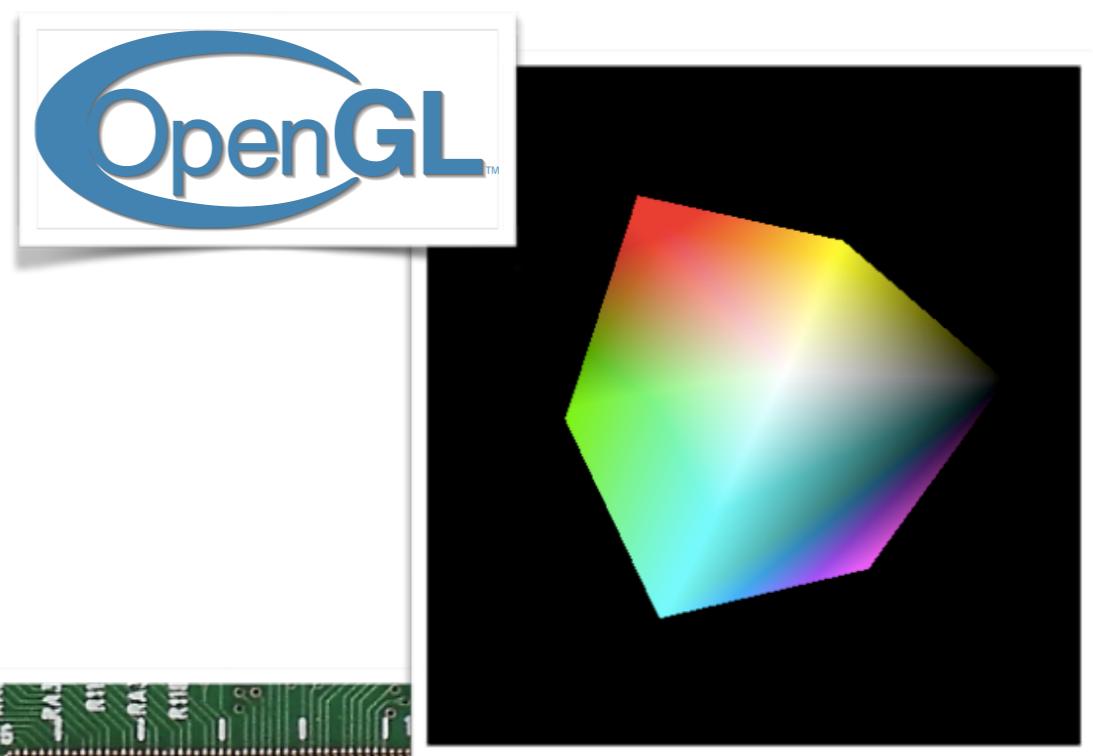
<https://graphics.stanford.edu/courses/cs248-02/History-of-graphics/History-of-graphics.pdf>

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Graphics Development | 1990s

- 1992 OpenGL v1.0 released
 - Open source graphics API
 - Alternative to the proprietary Iris GL used on Silicon Graphics workstations
 - 1996 3dfx releases Voodoo graphics cards & opens up real time graphics development to consumer market
 - 1999 Nvidia GeForce 256 first GPU



Historical Overview

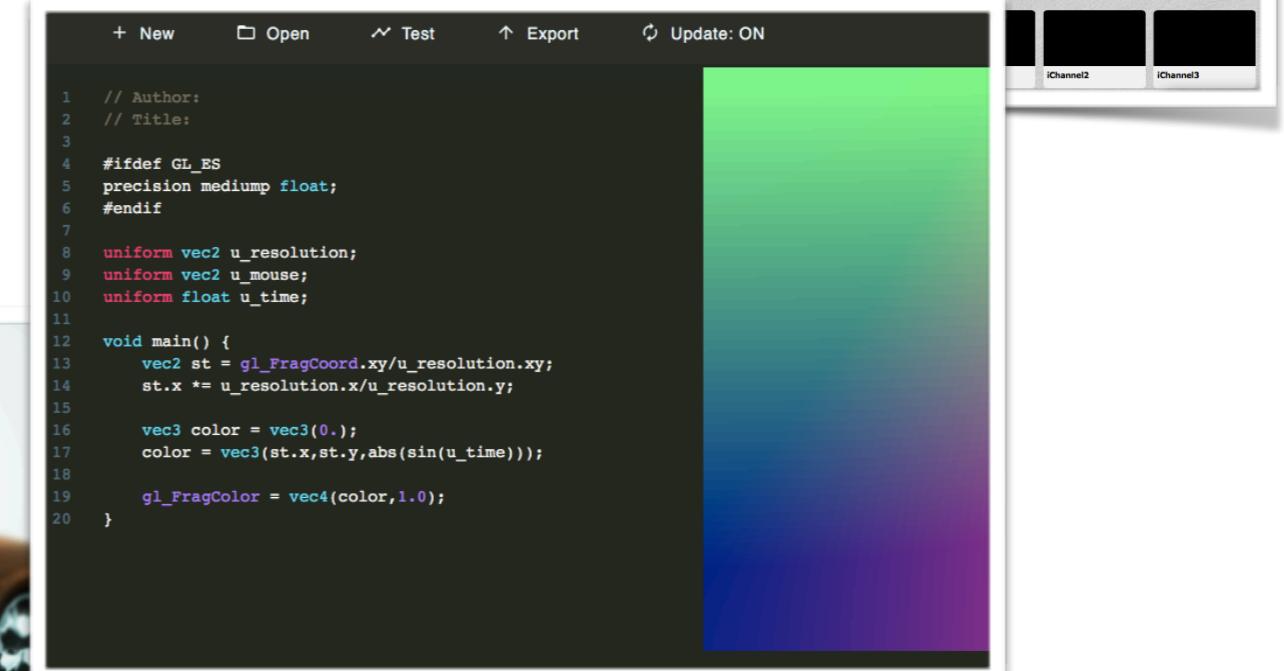
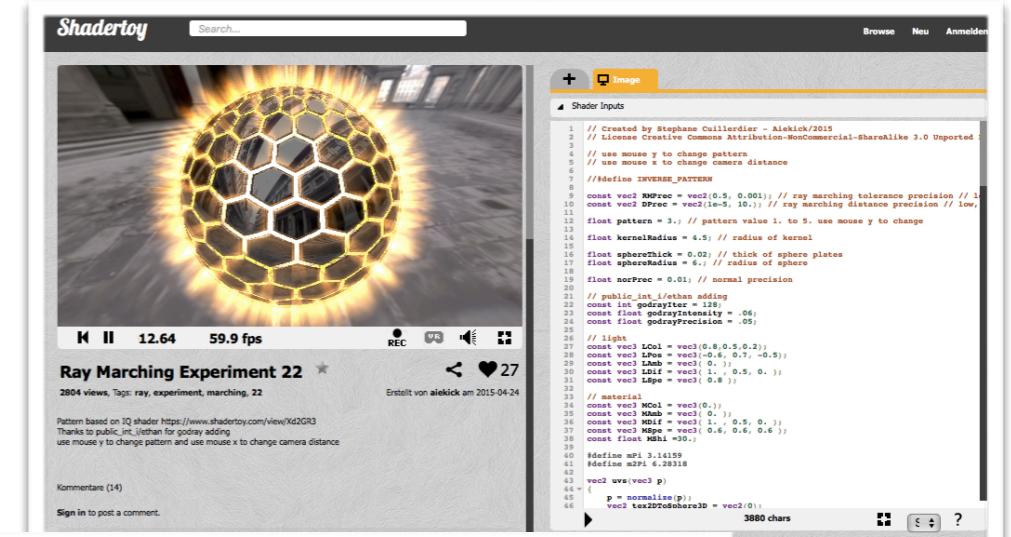
2000 & onwards

- Shaders GLSL & HLSL become supported on most consumer hardware chips
- WebGL in combination with JavaScript and HTML5 allows for rendering as well as developing highly complex computer graphics using web browsers



Theoretical Backgrounds
of Audio & Graphics

<https://www.shadertoy.com/view/lIB3zG>



<http://editor.thebookofshaders.com>

[https://threejs.org/examples/
#webgl_materials_cubemap_dynamic](https://threejs.org/examples/#webgl_materials_cubemap_dynamic)



FILMUNIVERSITÄT
BABELSBERG
KONRAD WOLF

Angela Brennecke | Prof. Dr.-Ing.
Audio & Interactive Media Technologies

Graphics Libraries

- **OpenGL** (Open Graphics Library) is a cross language, cross platform API for 2d & 3D graphics, basically a collection of commands that is hardware accelerated — it uses the GPU
- OpenGL is a standard to work with rendering images to the computer screen and used in many 3D environments
- **WebGL** is a standard to write OpenGL code in the browser



References

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