

Computer Graphics & OpenGL

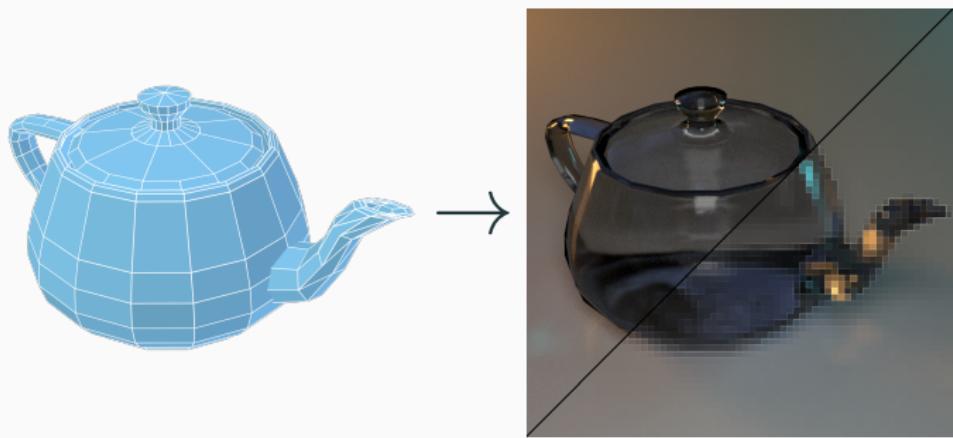
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Mines Linux Users Group

Introduction

Definition



Computer graphics is the science of turning *shapes* into *pixels*.

Uses

Computer graphics is everywhere!

- Your terminal
- Web browsers
- Video games
- CAD software
- Movies, TV Shows
- Virtual reality
- Your bootloader
- QT, GTK+, wxWidgets
- Vim, Emacs, Notepad
- Embedded devices



Online and Offline

History

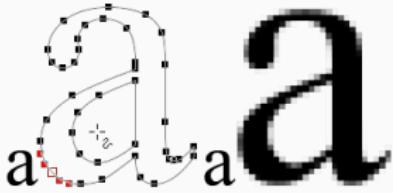
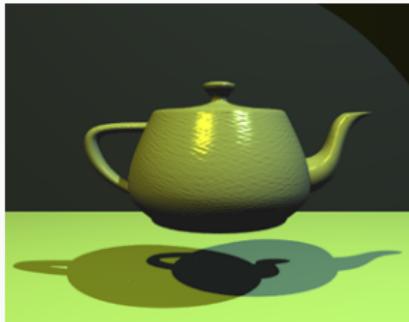
1950s & 1960s

- Military used computer controlled oscilloscopes to display strategic information
- Very simple graphical CAD programs and visualizers created
- Very first computer games
- Research into elementary 3D wireframe graphics
- Very early raster displays



1970s & 1980s

- Basic lighting models such as Phong developed
- Low-res, 2D games become commercially available
- CGI starts to be used in Movies such as 1982's *Wrath of Khan* and 1985's *Young Sherlock Holmes*
- Modern GUIs are developed
- High-quality digital typesetting becomes commonplace



PostScript type

Bitmap type

1990s & 2000s

- Fidelity and performance are immensely increased
- Personal computers, 3D video games, and GUIs become ubiquitous
- OpenGL and Direct3D standardize hardware graphics support
- CGI becomes commonplace in Movies, advertisements, and TV
- Global illumination and physically based rendering (PBR) techniques developed



Today

- Given enough time, budget and expertise, offline graphics are photorealistic
- Particle and fluid simulations are extremely fast and accurate
- Realtime graphics make extensive use of shaders and PBR techniques
- UIs and offline graphics are increasingly GPU accelerated
- Linux and Mac have improved support for games and graphical software



Behind the Scenes

OpenGL & Direct3D

Text

Vector vs Raster

Crappy Text

Subpixels & Fancy Stuff

Atlases

Offline Rendering

Physics

Local Illumination & Rays

Monte-Carlo & Pathtracing

Industry

Examples
