

# Computergrafik SS 2010

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# Organisation

- Vorlesung: Mo+Di, 10:15 Uhr, 31/449a
- Übung: Do, 14:15 + 16:00 Uhr, 31/449a
- Übungsblatt am Dienstag
- Übung am Donnerstag
- Testate am Montag, Dienstag, Mittwoch
- Klausur am 05.07.10

# stud.ip

The screenshot shows a Mozilla Firefox browser window displaying the Stud.IP login page for the University of Osnabrück. The browser's address bar shows the URL [https://studip.rz.uos.de/meine\\_seminare.php](https://studip.rz.uos.de/meine_seminare.php). The page header includes the text "Universität Osnabrück" and the "STUD.IP" logo. Below the header, there is a navigation bar with "Aktuelle Seite: Login" and links for "Datenschutz", "Impressum", "Hilfe", and "Login". The main content area is titled "Stud.IP - Login" and features a login form with the following fields:

- Benutzername: oliver
- Passwort: [masked]

Below the password field, there is a link for "Login für Nutzer anderer niedersächsischer Hochschulen" and an "anmelden" button with a green checkmark. The background of the page is a photograph of a large, yellow, classical building with a central tower. In the bottom right corner, there is a statistics box:

Aktive Veranstaltungen:	33813
Registrierte NutzerInnen:	33918
Davon online:	122
	mehr...

At the bottom of the browser window, the status bar shows "Fertig" and a lock icon.

<https://studip.rz.uos.de>

# Google

computer graphics - Google-Suche - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

http://www.google.de/search?hl=de&client=firefox-a&hs=rBq&rls=org.mozilla%3Ade% computer graphics

computer graphics - Google-Suche

Web Bilder Videos Maps News Shopping E-Mail Mehr oliver@uos.de | Webprotokoll | Einstellungen | Abmelden

Google computer graphics Suche Erweiterte Suche

Suche:  Das Web  Seiten auf Deutsch  Seiten aus Deutschland

Web [Optionen anzeigen...](#) Ergebnisse 1 - 10 von ungefähr **94.800.000** für computer graphics. (0,21 Sekunden)

Tipp: [Suchen nur nach Ergebnissen auf Deutsch](#). Sie können Ihre bevorzugten Spracheinstellungen in [Einstellungen](#) angeben.

**Computer graphics** - Wikipedia, the free encyclopedia ☆ - [ [Diese Seite übersetzen](#) ]  
Computer graphics are graphics created using computers and, more generally, the representation and manipulation of image data by a computer. ...  
[Overview](#) - [History](#) - [Image types](#) - [Concepts and Principles](#)  
[en.wikipedia.org/wiki/Computer\\_graphics](http://en.wikipedia.org/wiki/Computer_graphics) - [Im Cache](#) - [Ähnlich](#)

**Computer Graphics World - Home** ☆ - [ [Diese Seite übersetzen](#) ]  
Home - CGW explores how leading-edge graphics techniques, including the 3D modeling, animation and visualization are used in such applications as ...  
[www.cgw.com/](http://www.cgw.com/) - [Im Cache](#) - [Ähnlich](#)

**Computer Graphics: Computer Graphics** ☆ - [ [Diese Seite übersetzen](#) ]  
Computer Graphics is about digital models for threedimensional geometric objects as well as images. These shapes and images may represent approximations of ...  
[www.cg.tu-berlin.de/](http://www.cg.tu-berlin.de/) - [Im Cache](#) - [Ähnlich](#)

[Ergebnisse Bildersuche nach computer graphics](#) - [Bilder melden](#)

Anzeigen

[Blanx 3D Animation Studio](#)  
Computeranimation und Postproduktion  
[blanx.de](http://blanx.de)

[Computer Graphics](#)  
Über 7 Millionen englische Bücher. Jetzt portofrei bestellen!  
[Amazon.de/englishbooks](http://Amazon.de/englishbooks)

[Schalten Sie hier Ihre Anzeige >](#)

Fertig

<http://www.google.de/search?q=computer+graphics>

# Amazon

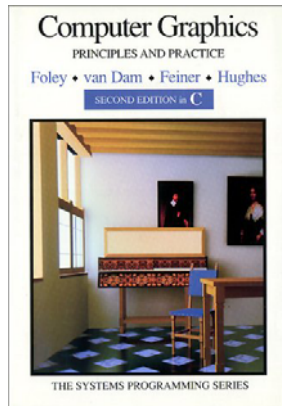
The screenshot shows the Amazon.de website interface. At the top, the browser title is "Amazon.de: computer graphics - Mozilla Firefox". The address bar shows the URL: [http://www.amazon.de/s/ref=nb\\_sb\\_noss?\\_\\_mk\\_de\\_DE=%C5M%C5Z%D5%D1&url=search-alias%3Dapst](http://www.amazon.de/s/ref=nb_sb_noss?__mk_de_DE=%C5M%C5Z%D5%D1&url=search-alias%3Dapst). The page header includes the Amazon.de logo, a greeting, and navigation links like "Mein Amazon.de", "Sonderangebote", "Wunschzettel", "Gutscheine", and "Geschenke". A search bar contains the text "computer graphics". Below the search bar, there are tabs for "Amazon.de", "Gutscheine", "Bestseller", "Sonderangebote", "Outlet", "Jetzt verkaufen", "Hollywood", "Disney", and "Sony Entertainment".

The main content area is titled "computer graphics" and shows search results. On the left, there is a sidebar with "Kategorie" and "Beliebige Kategorie" sections. The "Beliebige Kategorie" section is circled in red and lists various categories with their respective item counts: Englische Bücher (16.361), Bücher (917), Software (100), Elektronik & Foto (92), DVD (2), MP3-Downloads (1), and Musik (1). Below this, there is a "Versandoption" section with "Prime" and "Kostenlose Lieferung" options, and a "Web Graphics" section with "Format" options like "Gebundene Ausgabe", "Taschenbuch", and "Hörbuch".

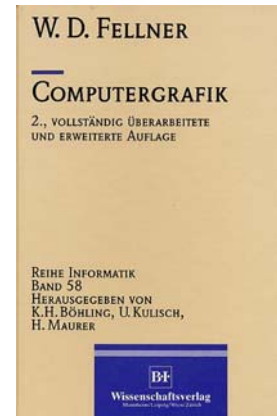
The search results are displayed in a list format. The first result is "Computer Graphics: Principles and Practice in C (Addison-Wesley Systems Programming Series)" by James D. Foley, Andries VanDam, and Steven K. Feiner. It is a "Gebundene Ausgabe" from October 1995, priced at EUR 58,98 (new) and EUR 47,54 (used). The second result is "Math for 3D Game Programming & Computer Graphics (Charles River Media Game Development)" by Eric Lengyel and Lengyel von Delmar, a "Gebundene Ausgabe" from December 2003, priced at EUR 33,95 (new) and EUR 39,10 (used). The third result is "Computer Graphics: Principles and Practice in C" by James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes, a "Taschenbuch" from 1995, priced at EUR 36,99 (used). The sidebar also shows "Lieblingslisten" and a status message at the bottom: "Übertragen der Daten von s0.2mdn.net..."

<http://www.amazon.de>

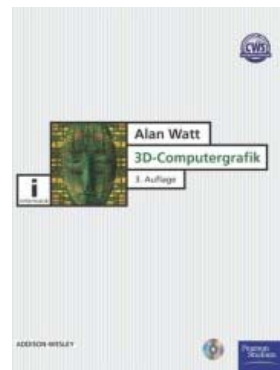
# Literatur



James Foley et al:  
**Computer Graphics  
Principles and  
Practice**  
2nd Edition  
Addison Wesley 1995



Dieter Fellner:  
**Computergrafik**  
*BI 1994*



Alan Watt:  
**3D-Computergrafik**  
3. Auflage  
Addison Wesley 2002



Klaus Zeppenfeld:  
**Lehrbuch der Grafik-  
programmierung**  
Spektrum 2004

# Begleitmaterial

- Skript, gedruckt, 7.50 €
- Skript in HTML
- Skript in PDF
- Folien in PDF
- Videomitschnitt im virtPresenter-Format
- Videopodcast im mp4-Format
- Audiomitschnitt im mp3-Format

<http://www-lehre.inf.uos.de/~cg/2010>

# Classroomquiz





# Motivation

- Bild sagt mehr als 1000 Worte
- Auge erfasst 40.000.000 Bit/sec
- Lesegeschwindigkeit
  - = 10 Worte à 5 Zeichen/sec
  - =  $10 \cdot 5 \cdot 8 = 400$  Bit/sec
- $\Rightarrow$  Faktor 100.000

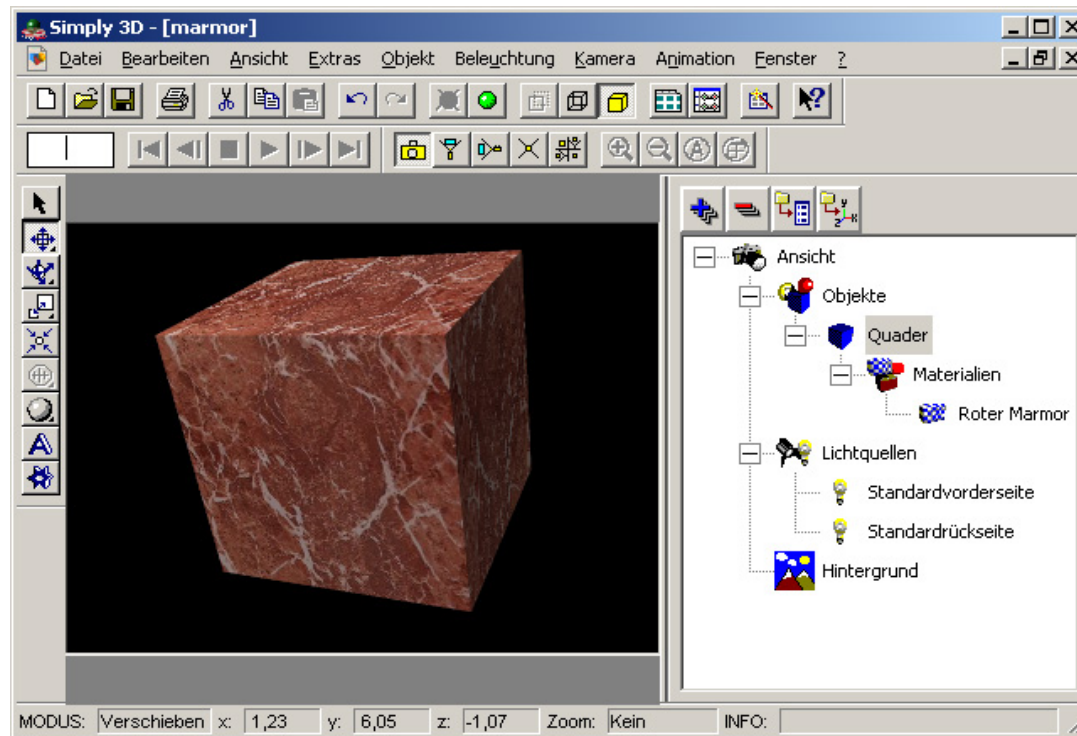
# Grafische Datenverarbeitung

- Bildverarbeitung
  - Licht, Radar, Röntgen, Ultraschall, ...
  - Vereinfachung, Verbesserung
- Mustererkennung
  - Analyse von Rasterdaten
  - Optical Character Recognition (OCR)
- Generative Computergrafik
  - Eingabe der Repräsentation
  - Ausgabe der Darstellung

# Anwendungen

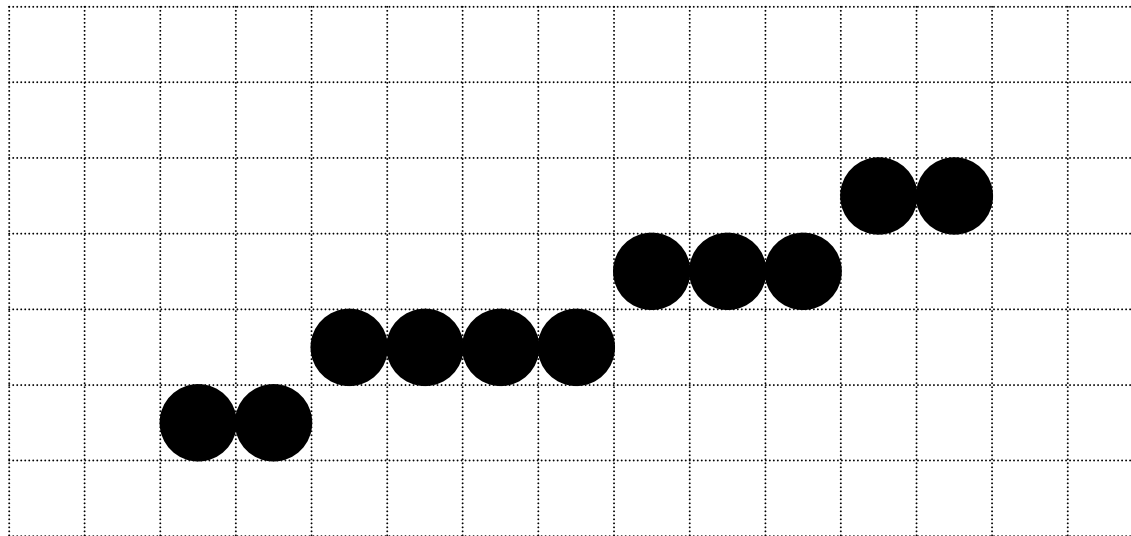
- Business-Grafik
- Grafische Benutzeroberflächen
- Kartografie
- CAD (Haus, Auto,...)
- Visualisierung (Molekül, Strömung, Scan)
- Simulation (Fahrzeug, Flugzeug,...)
- Virtual Reality (Computerspiele,...)

# Modellieren, Projizieren, Rendern

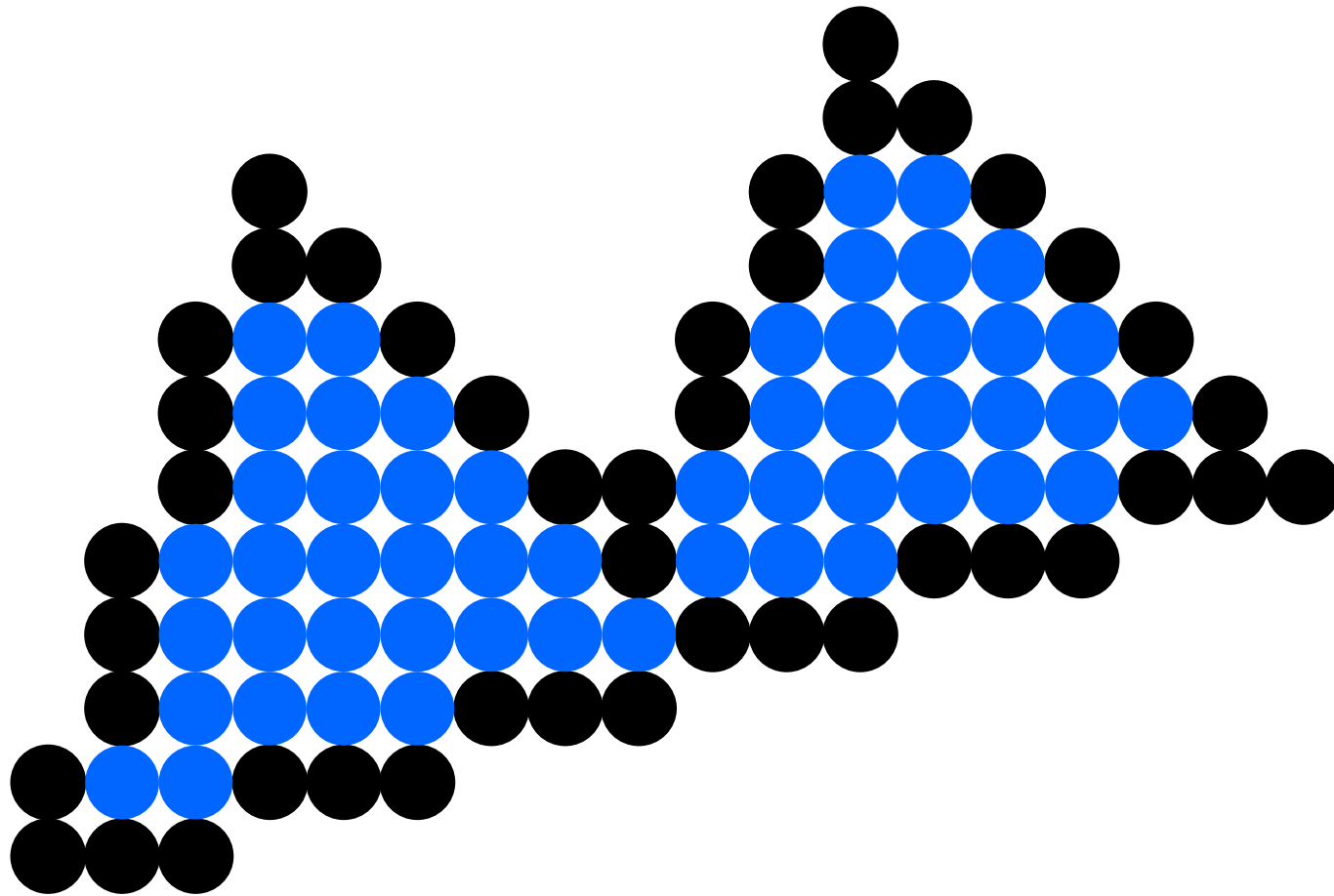


Micrografx Simply 3D

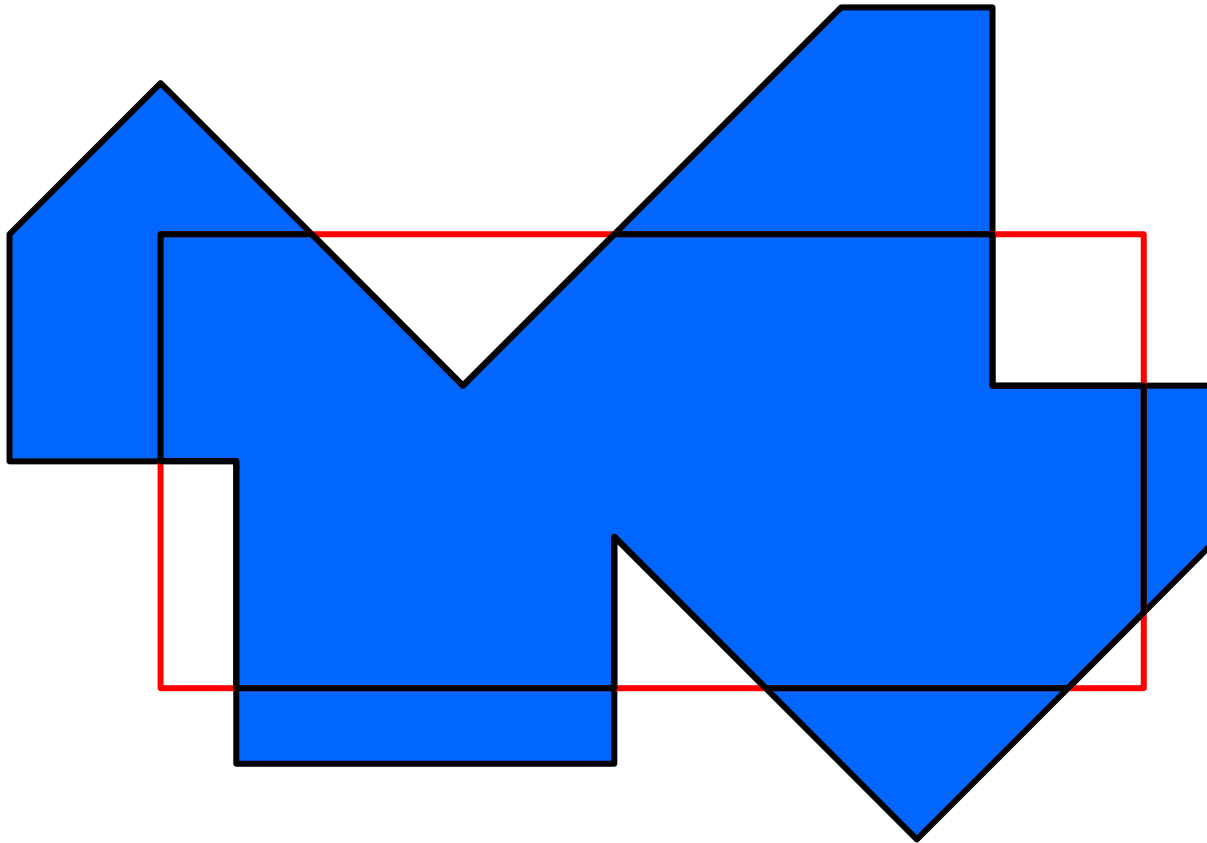
# 2D-Grundlagen



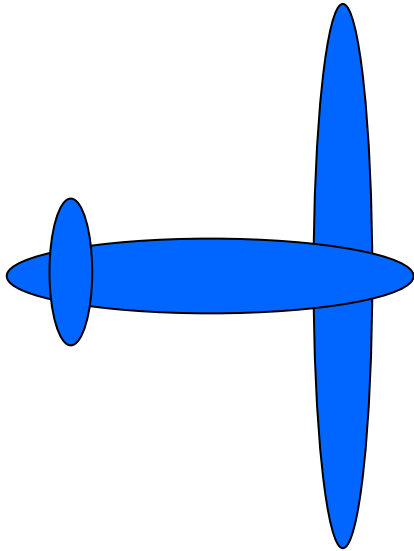
# 2D-Füllen



# 2D-Clipping

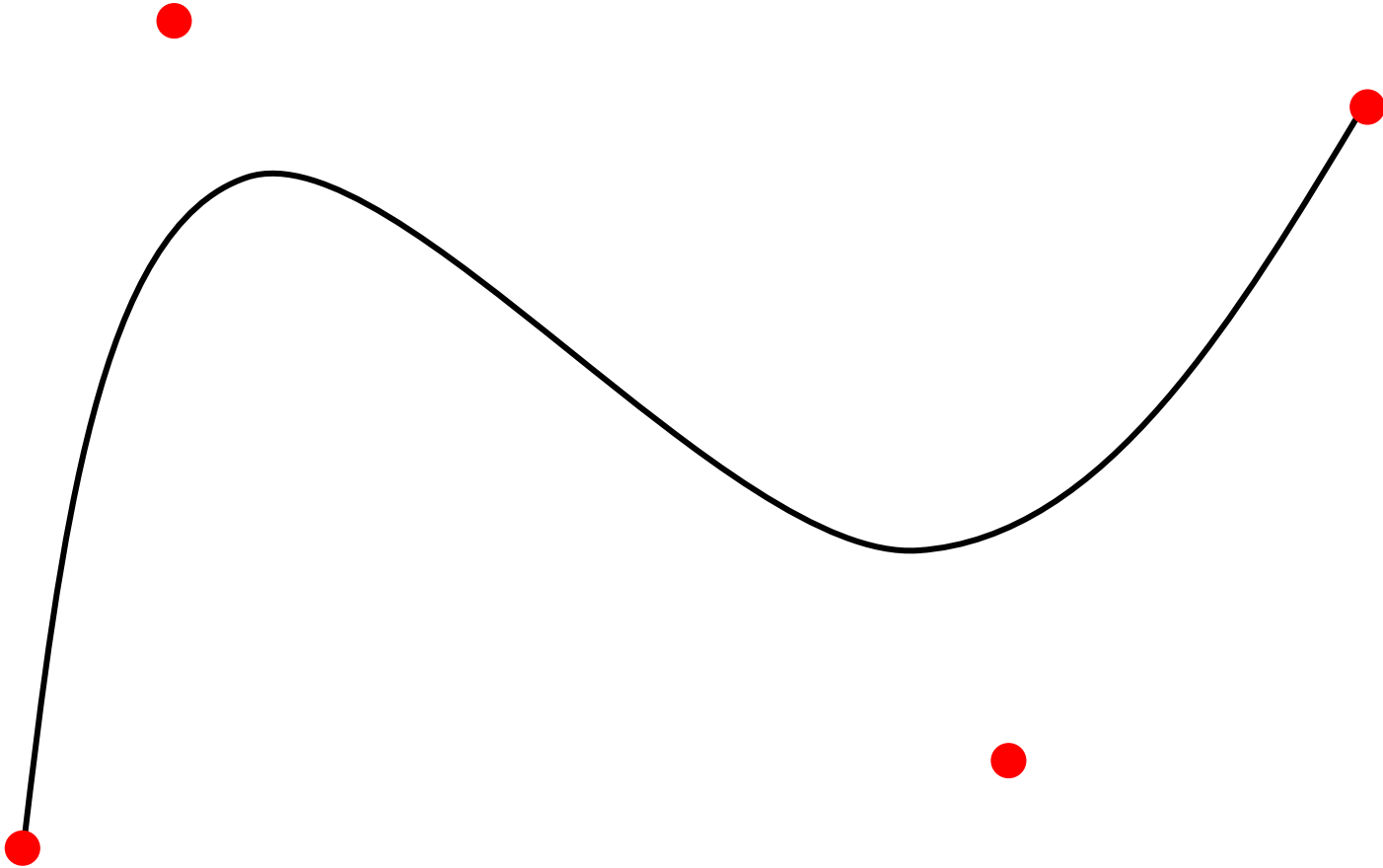


# Transformation

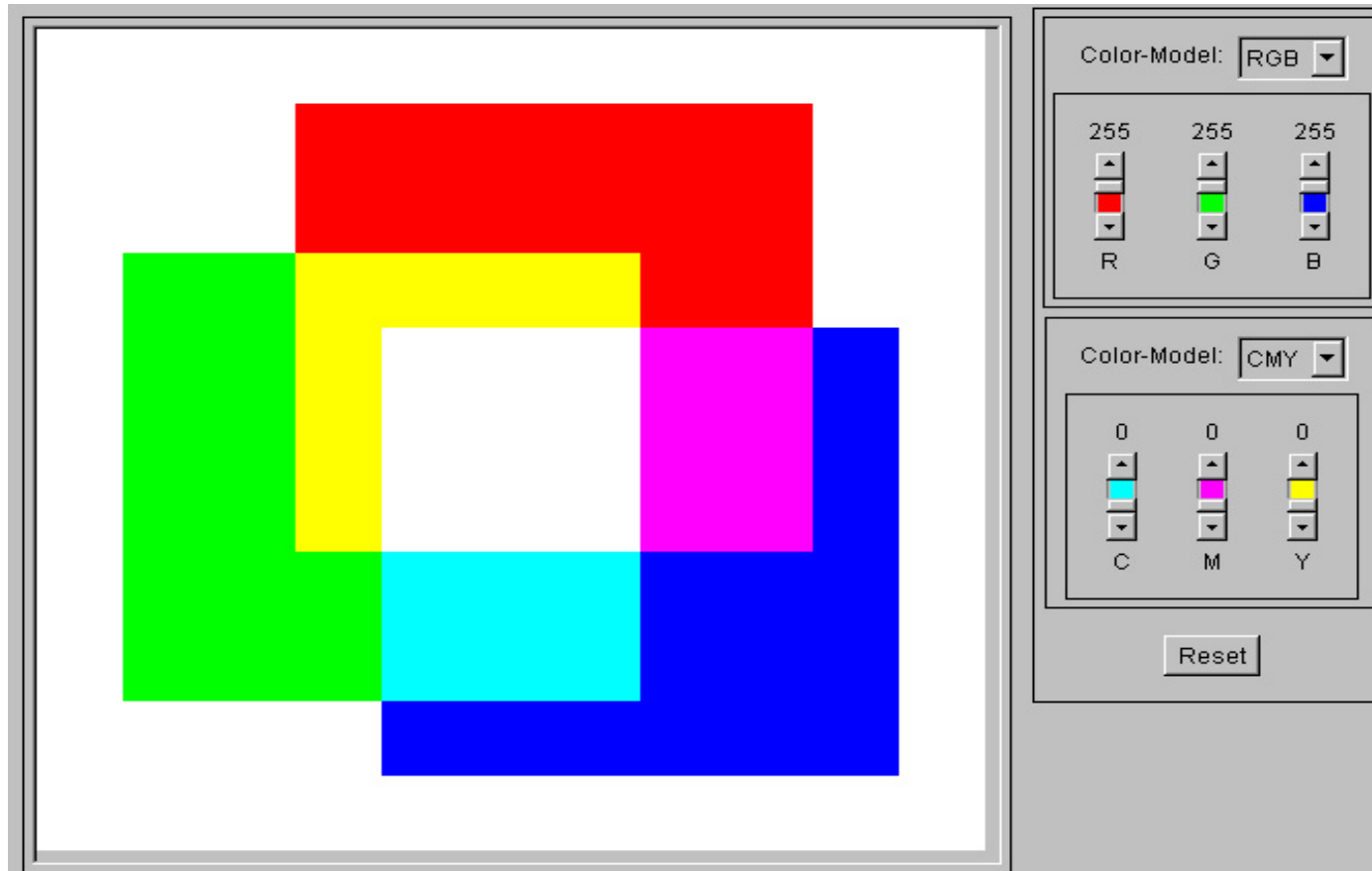




# Kurven



# Farbe



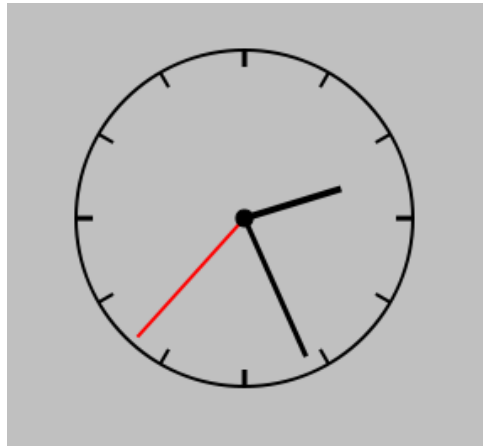
# Pixeldateiformate



# Macromedia Flash



# SVG

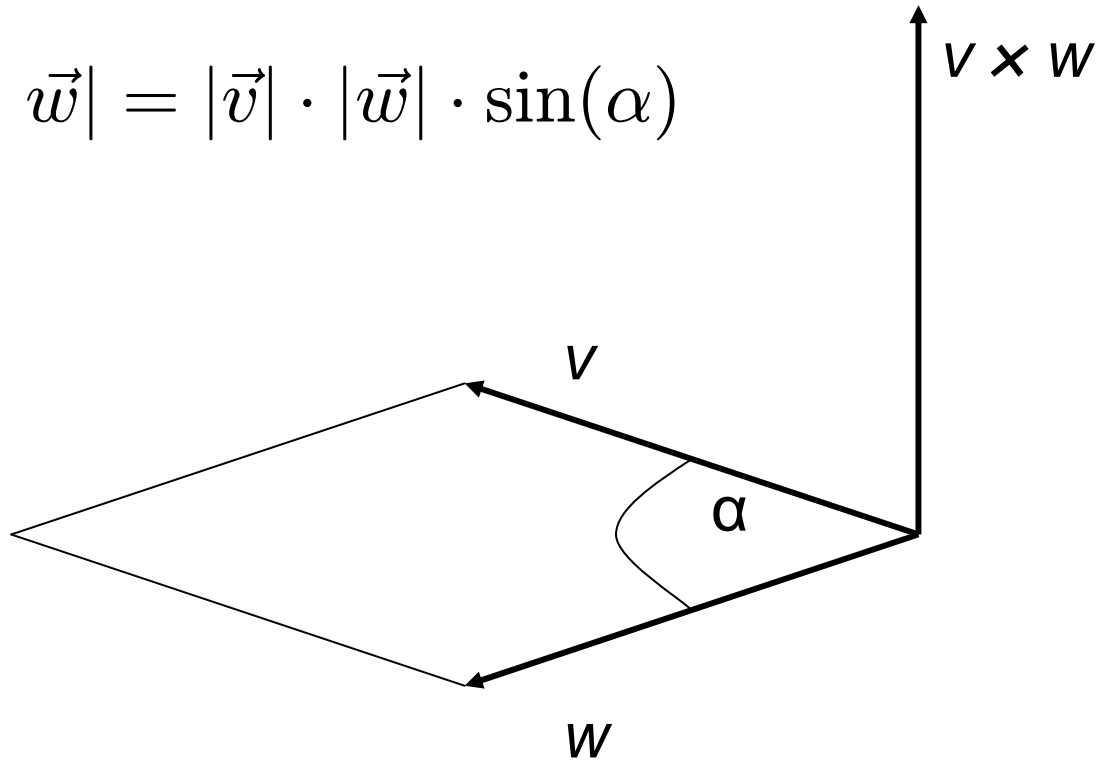


# Fraktale



# 3D-Grundlagen

$$|\vec{v} \times \vec{w}| = |\vec{v}| \cdot |\vec{w}| \cdot \sin(\alpha)$$

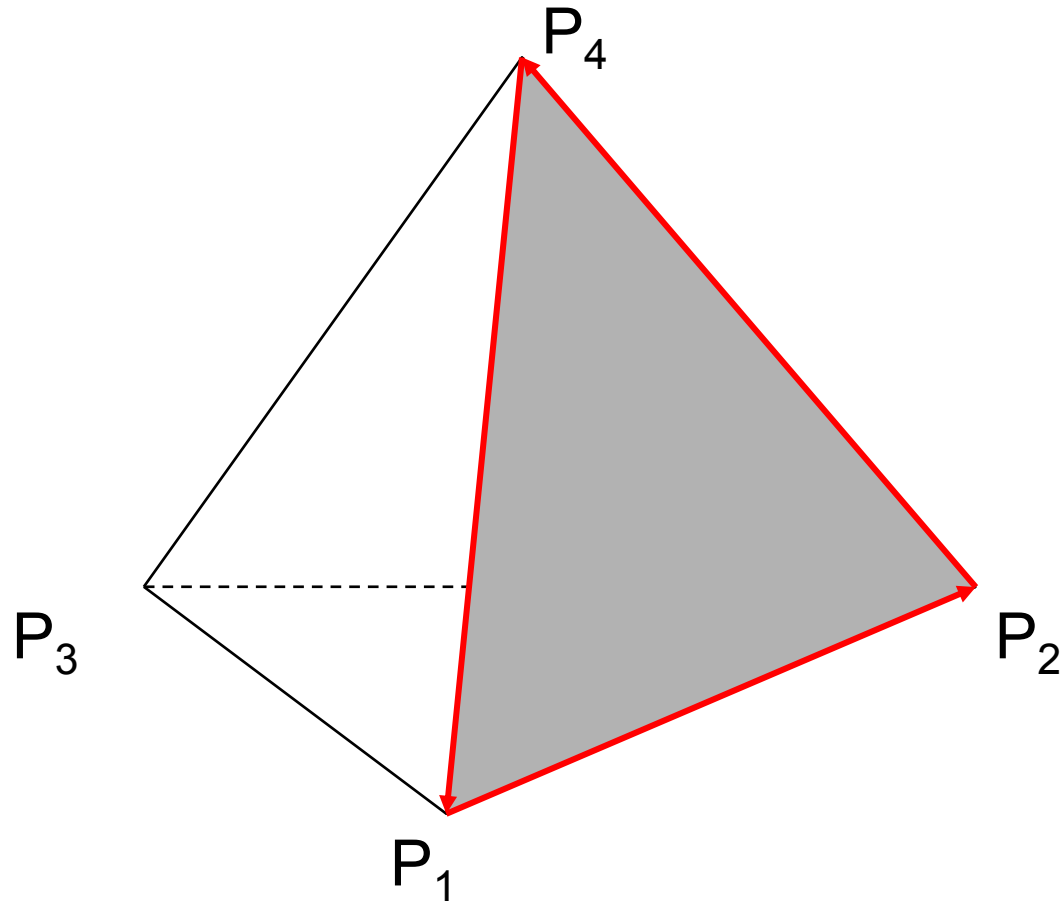


# 3D-Transformationen

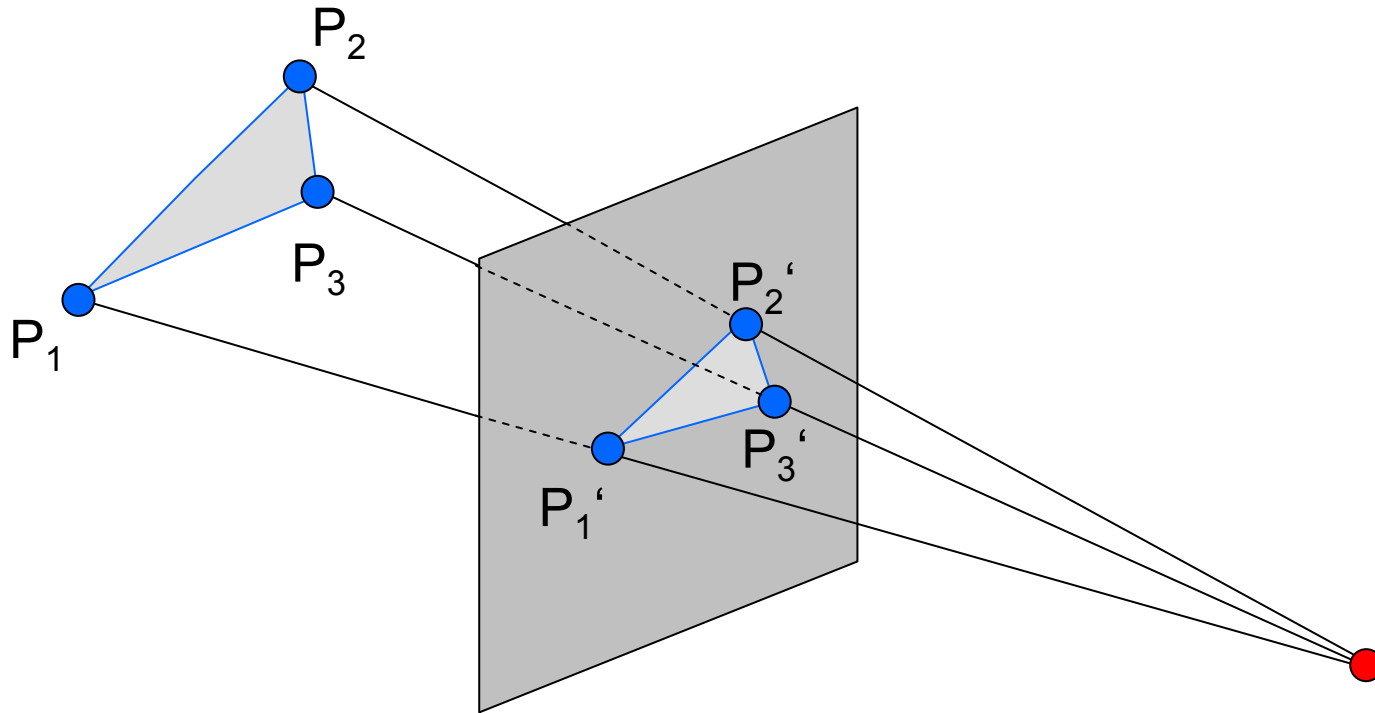
$$R_y(\delta) = \begin{pmatrix} \cos(\delta) & 0 & \sin(\delta) & 0 \\ 0 & 1 & 0 & 0 \\ -\sin(\delta) & 0 & \cos(\delta) & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$



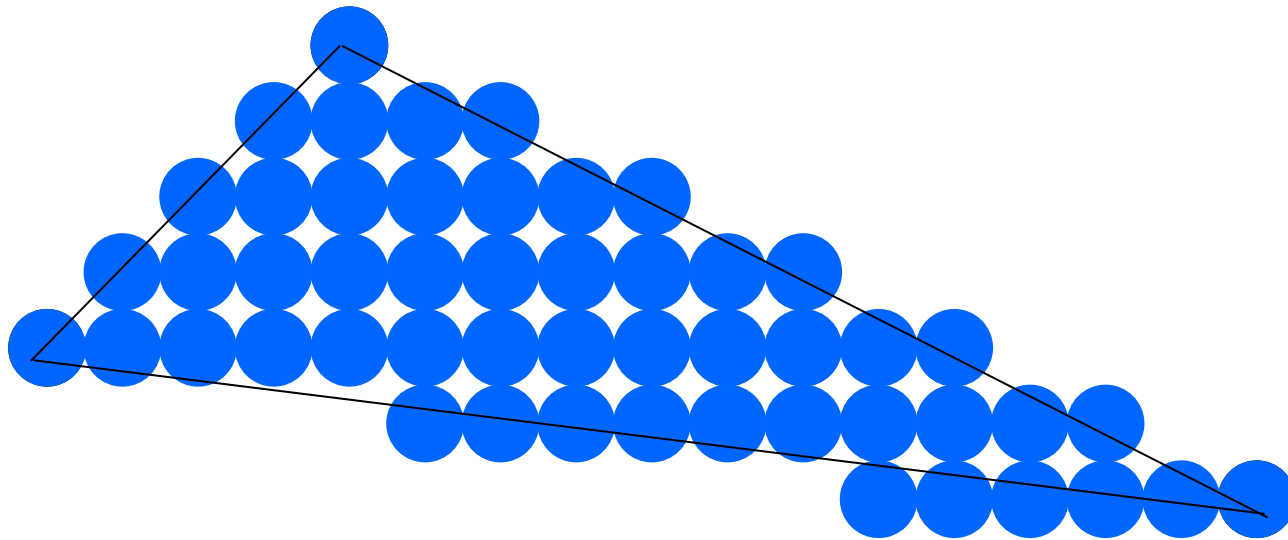
# 3D-Repräsentation



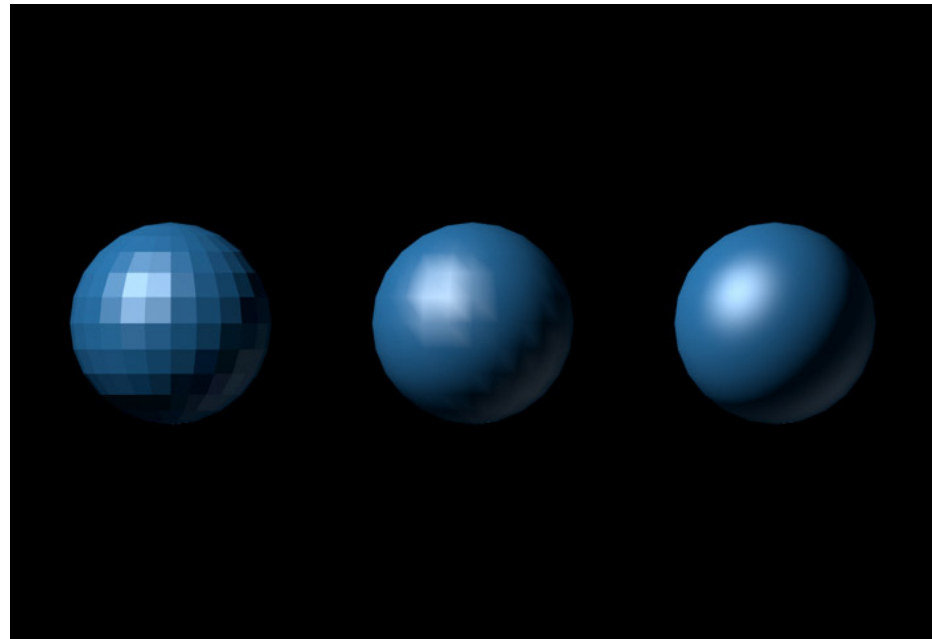
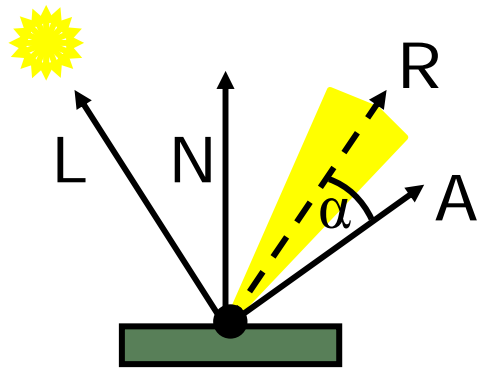
# Projektion



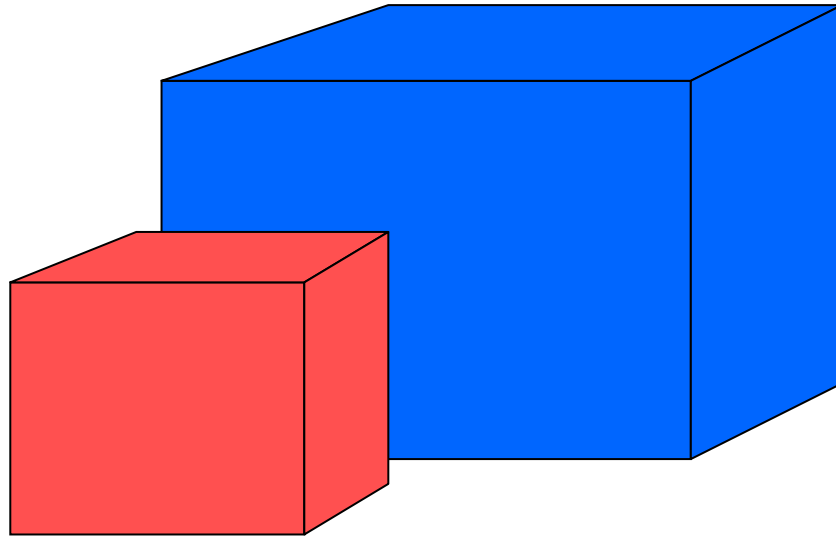
# Rendern



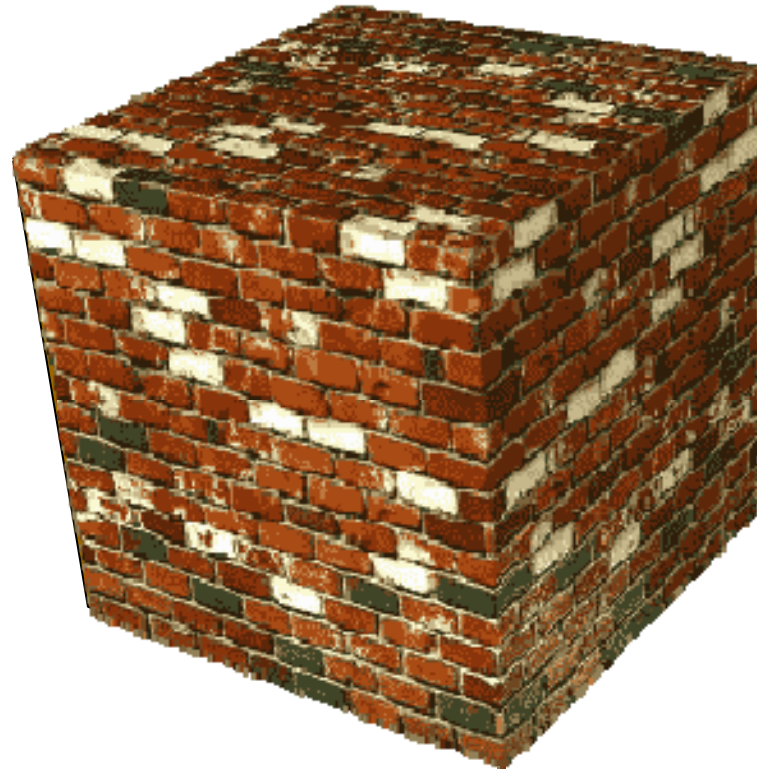
# Beleuchtung



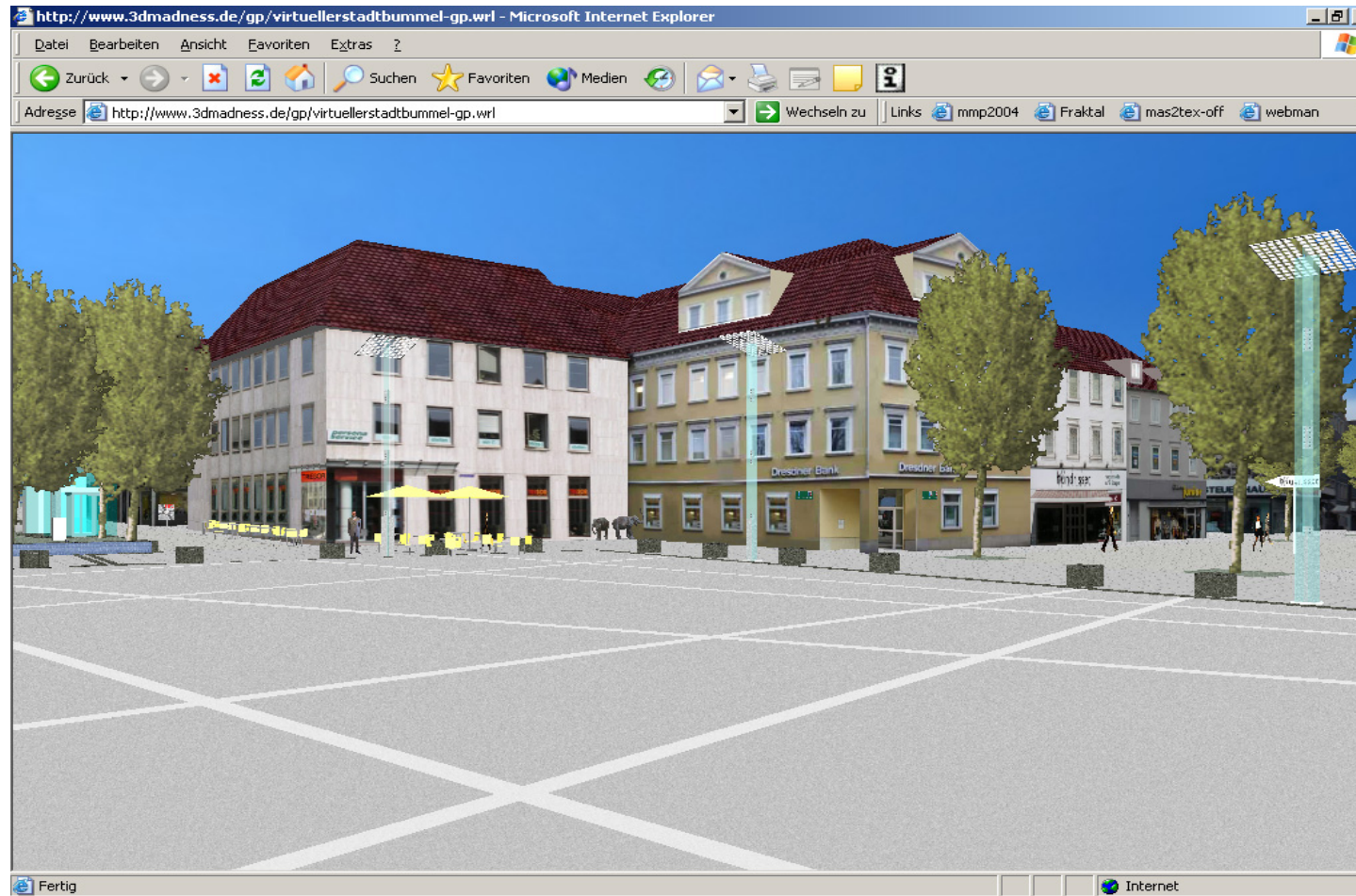
# Culling



# Texturing

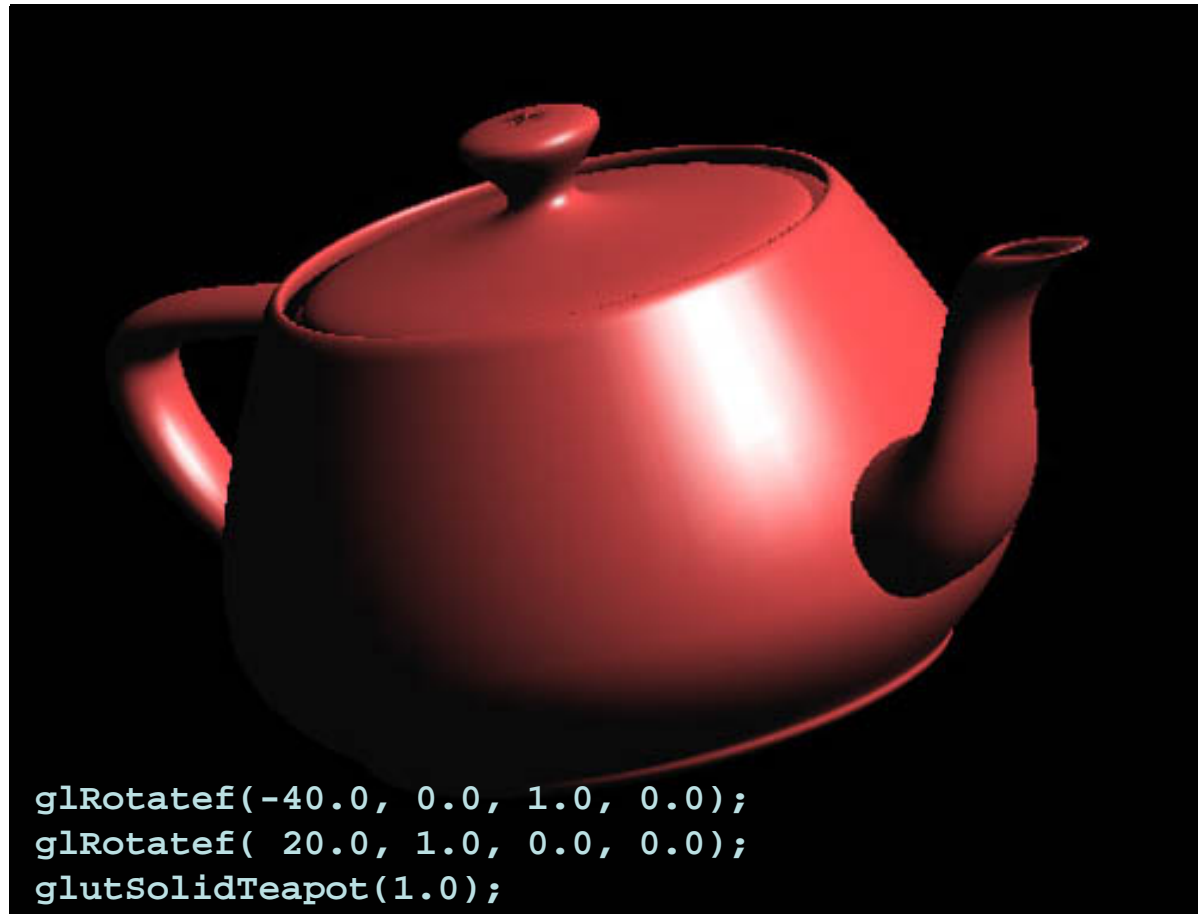


# VRML



<http://www-lehre.inf.uos.de/gp/>

# OpenGL

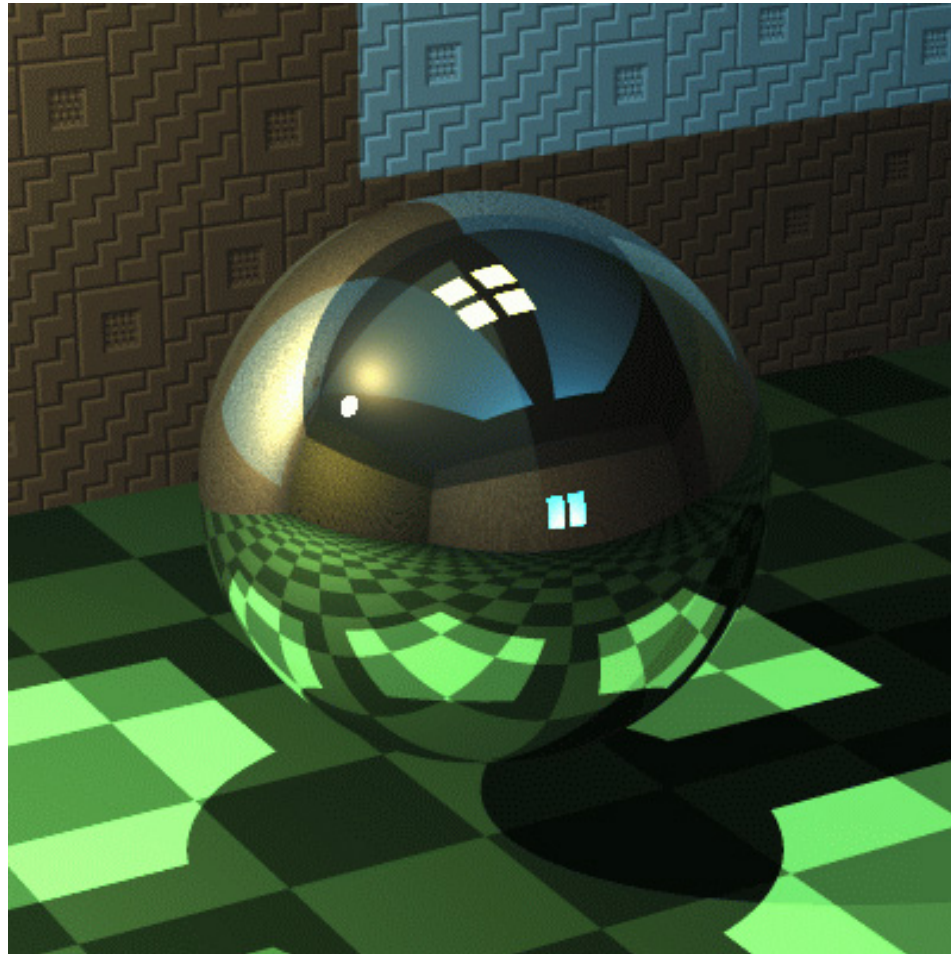




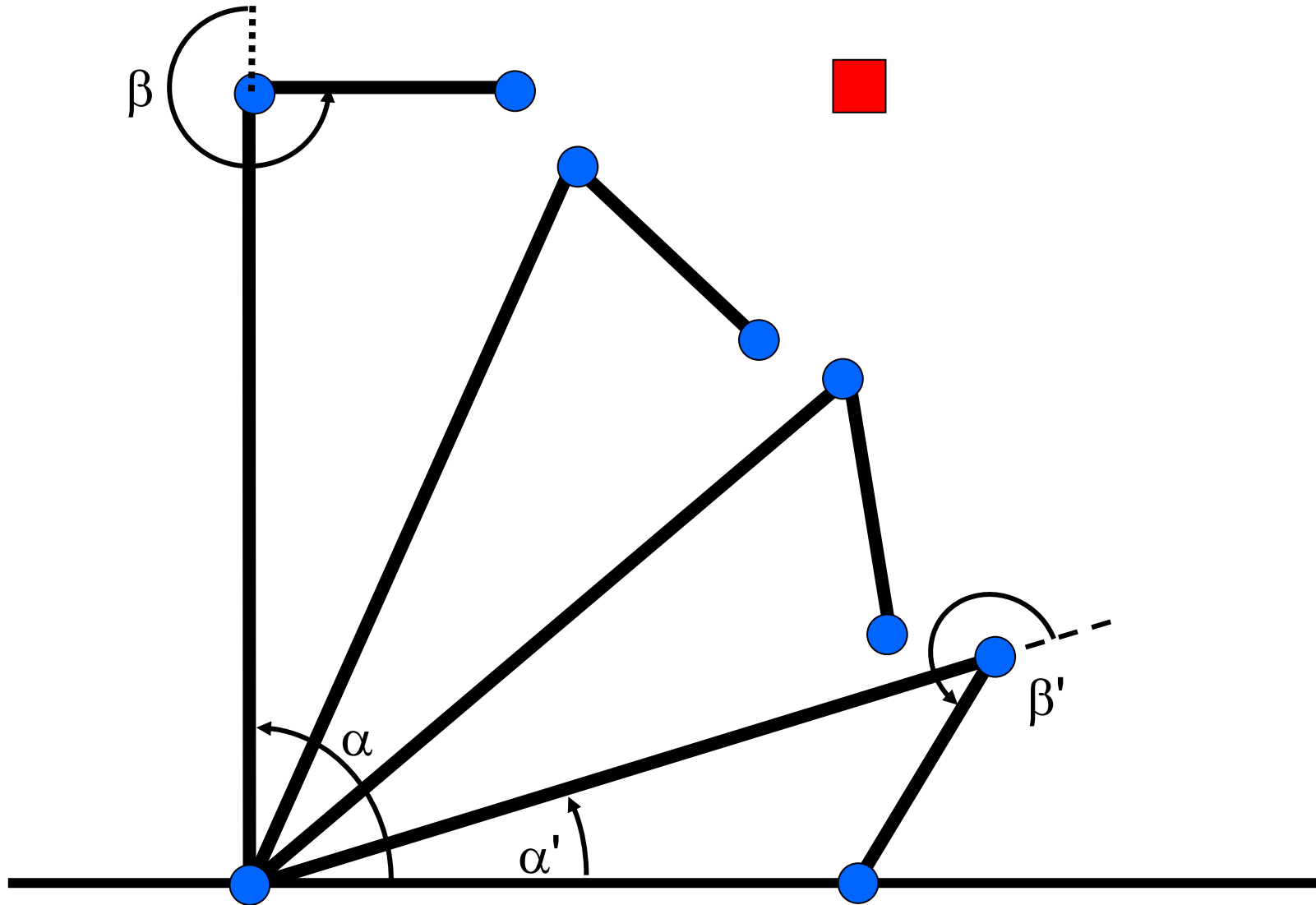
# Radiosity



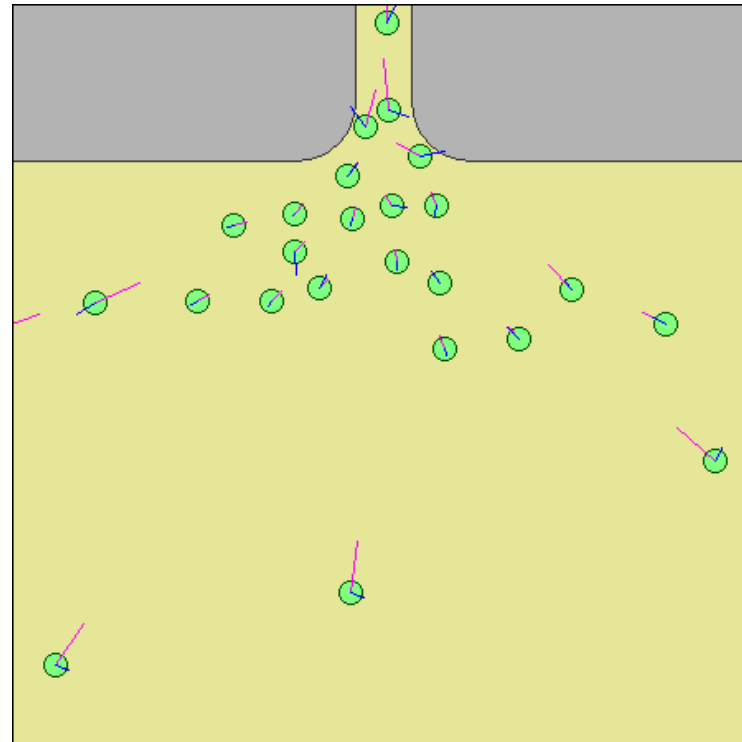
# Ray Tracing



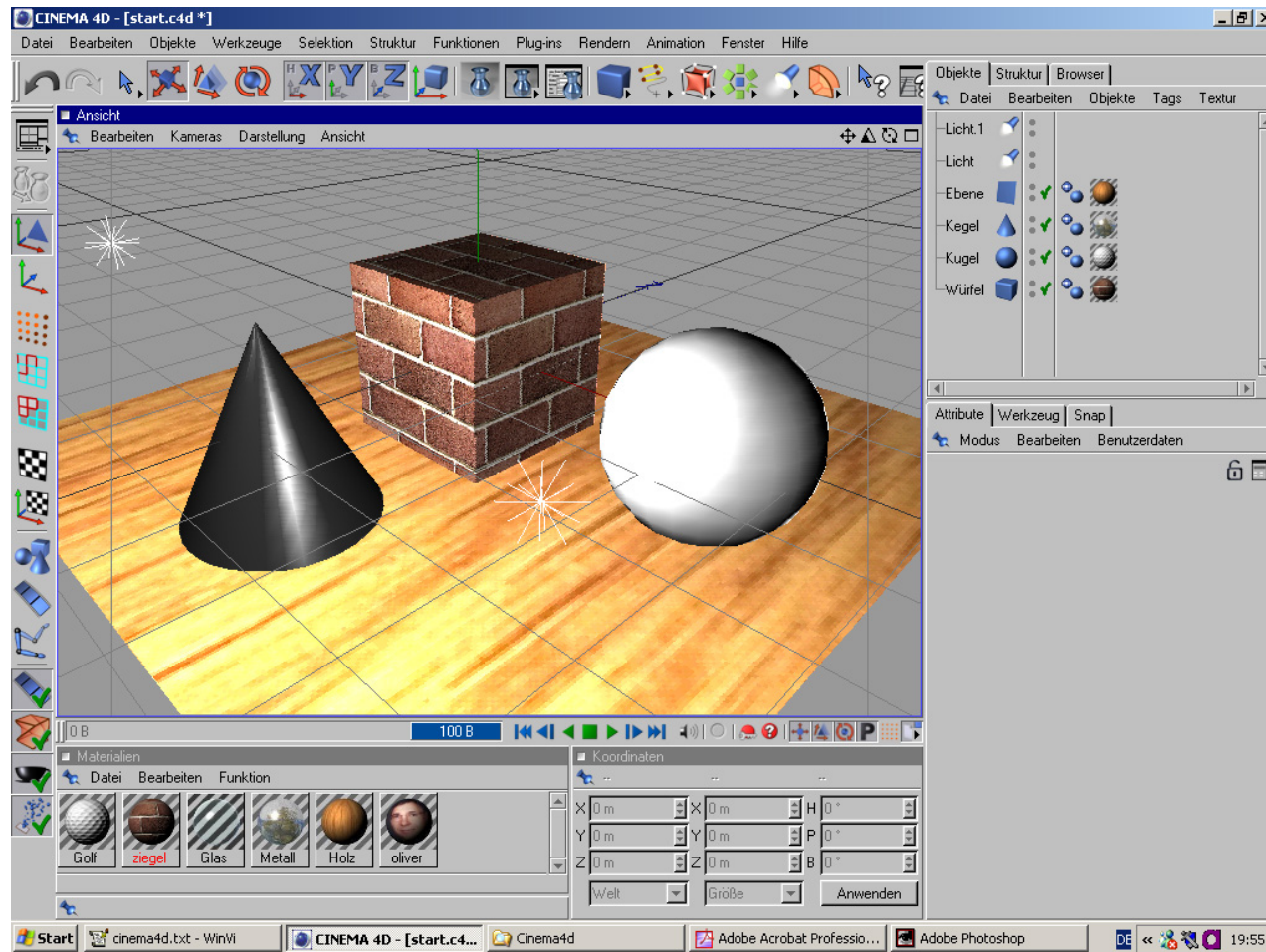
# Inverse Kinematik



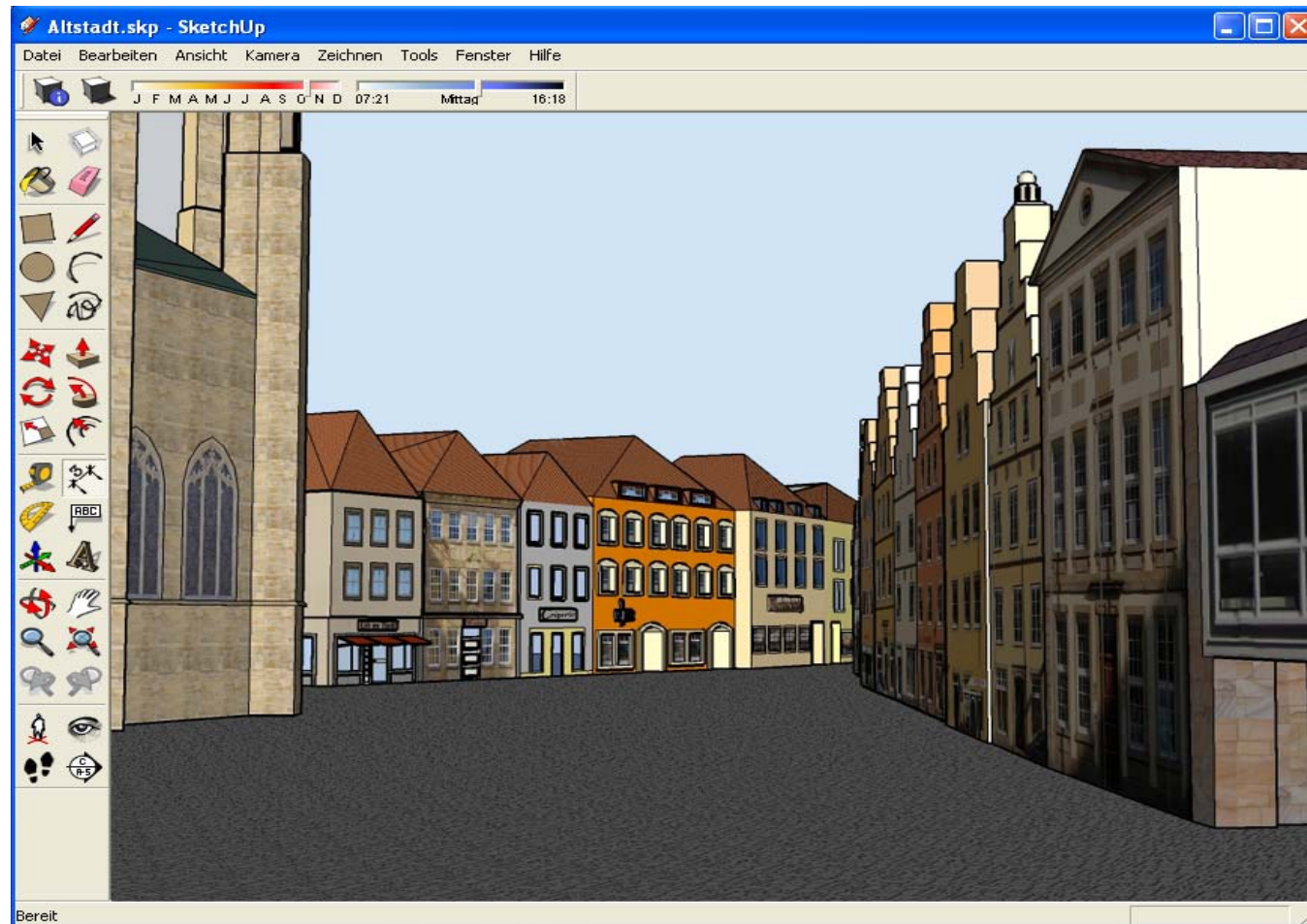
# Partikelsysteme



# Maxon Cinema4D



# Google SketchUp



# Google Earth

