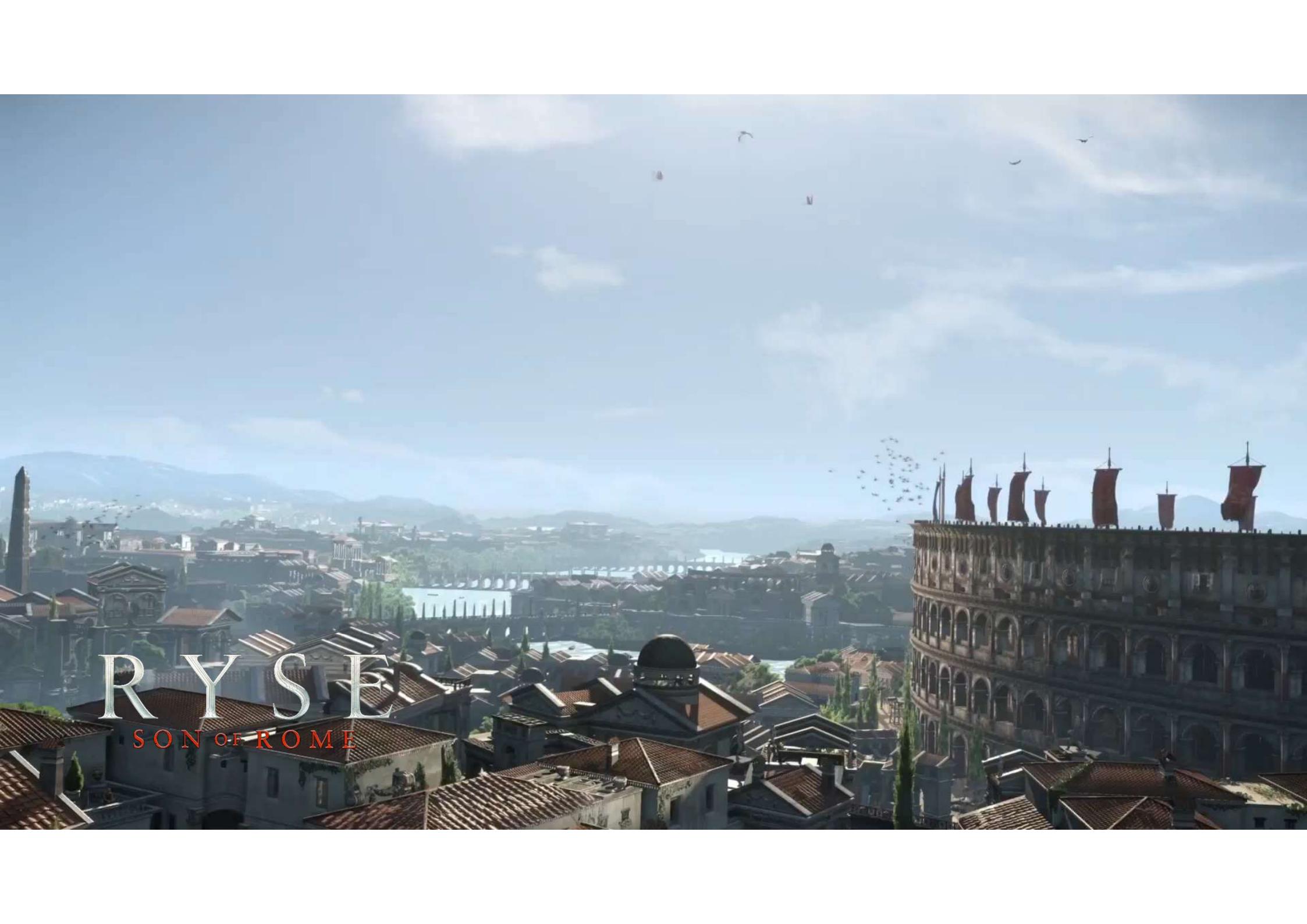


# Die Tricks der Spieleentwickler

Prof. Dr. Daniel Scherzer  
Hochschule Ravensburg-Weingarten



# RYSEE

SON OF ROME

Tri-Drop Shot

御三家

OBESHIIKA  
TAINTED BLOODLINES™

10 / 1120

△ Show Results



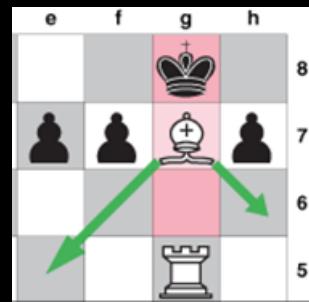
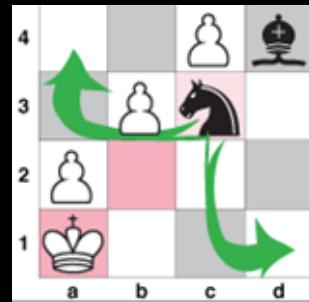
# Gemeinsame Prinzipien?



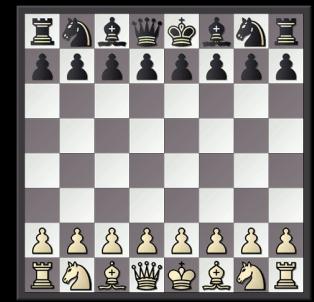
# Reales Spiel – Schach



Spieler



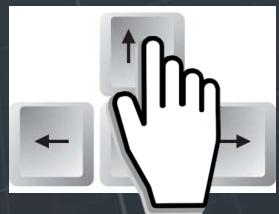
Regeln



Representation

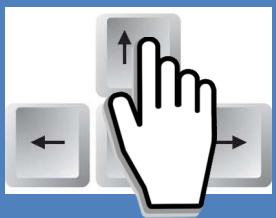
# Spieler ≈ Interaktion

- Auswirkung auf Spielwelt
- Zeitpunkt unbekannt ≠ Film



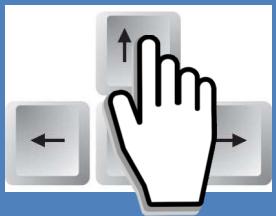
# Spieler ≈ Interaktion

Benutzer  
Eingaben



# Spielregeln?

Benutzer  
Eingaben

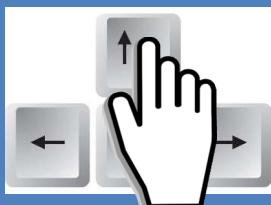


Spiele  
Mechanik



# Spiele Mechanik = Spielregeln + Spielstatus

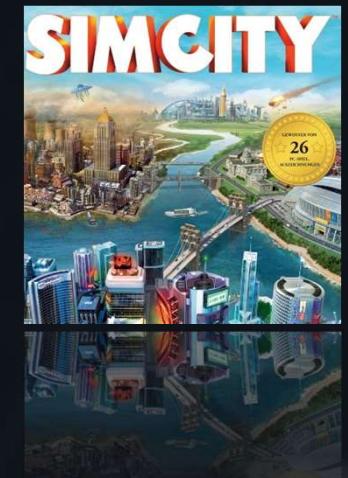
Benutzer  
Eingaben



- Poker, Schach, Monopoly

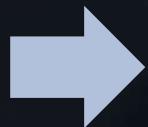
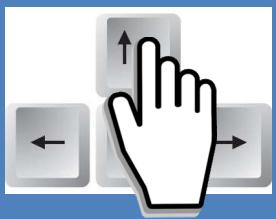


- Simulationen



# Representation?

Benutzer  
Eingaben



Spiele  
Mechanik

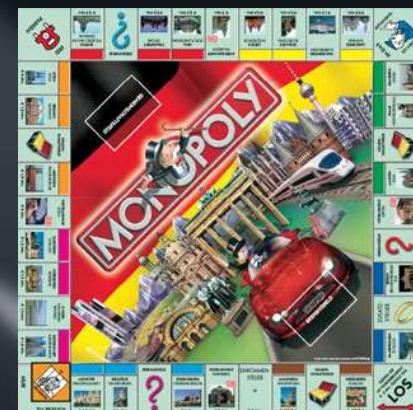


Spielwelt  
darstellen



# Am Computer anders!

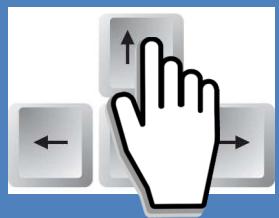
- Folge von Bildern am Display
- Realität



# Spiele Mechanik vs. Spielwelt darstellen



Benutzer  
Eingaben



Spiele  
Mechanik



Spielwelt  
darstellen

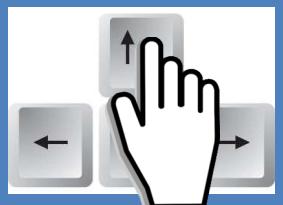


# Spiele Mechanik vs. Spielwelt darstellen

- Physik des Fahrzeugs



Benutzer  
Eingaben



Spiele  
Mechanik



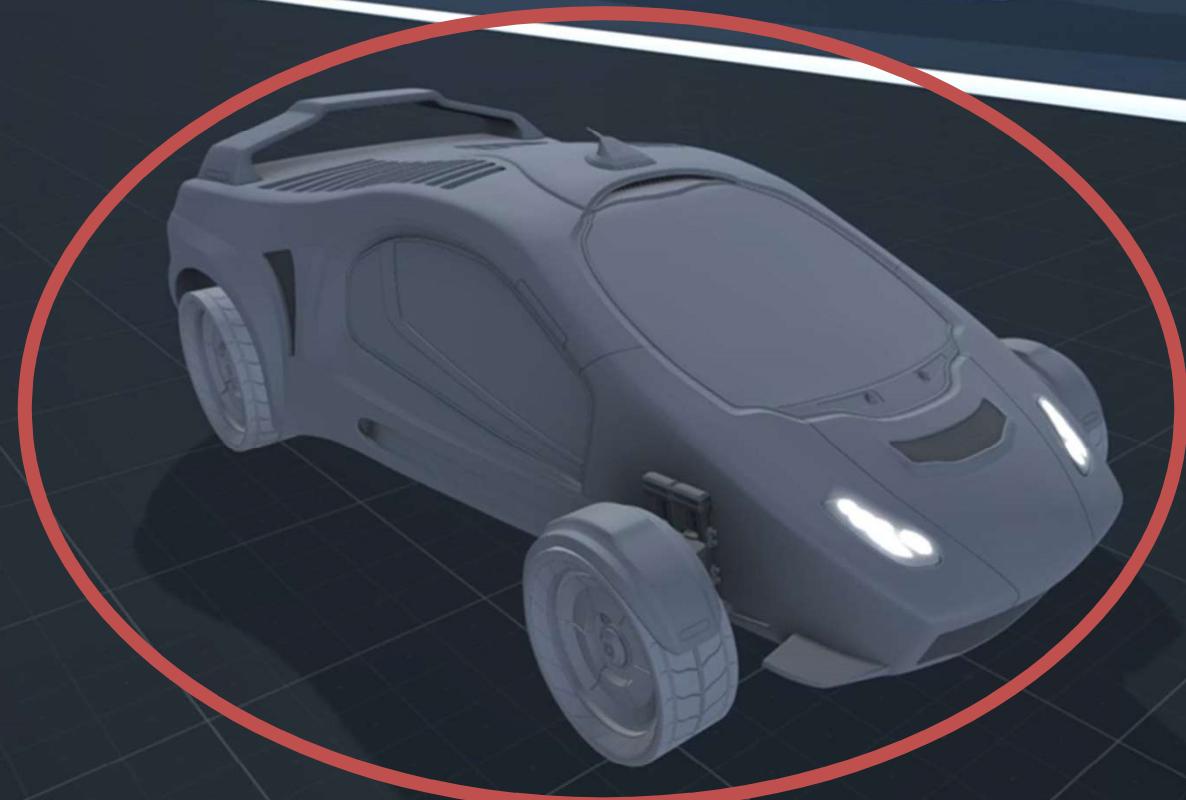
Spielwelt  
darstellen



60 mal pro  
Sekunde



# Spielwelten realisieren?



# Spielwelten realisieren?



A scenic landscape featuring a dirt path winding through a field of tall grass and wildflowers. A rustic wooden fence runs along the left side of the path. In the background, majestic mountains rise under a bright, slightly hazy sky. The scene is framed by the branches of a large tree in the foreground.

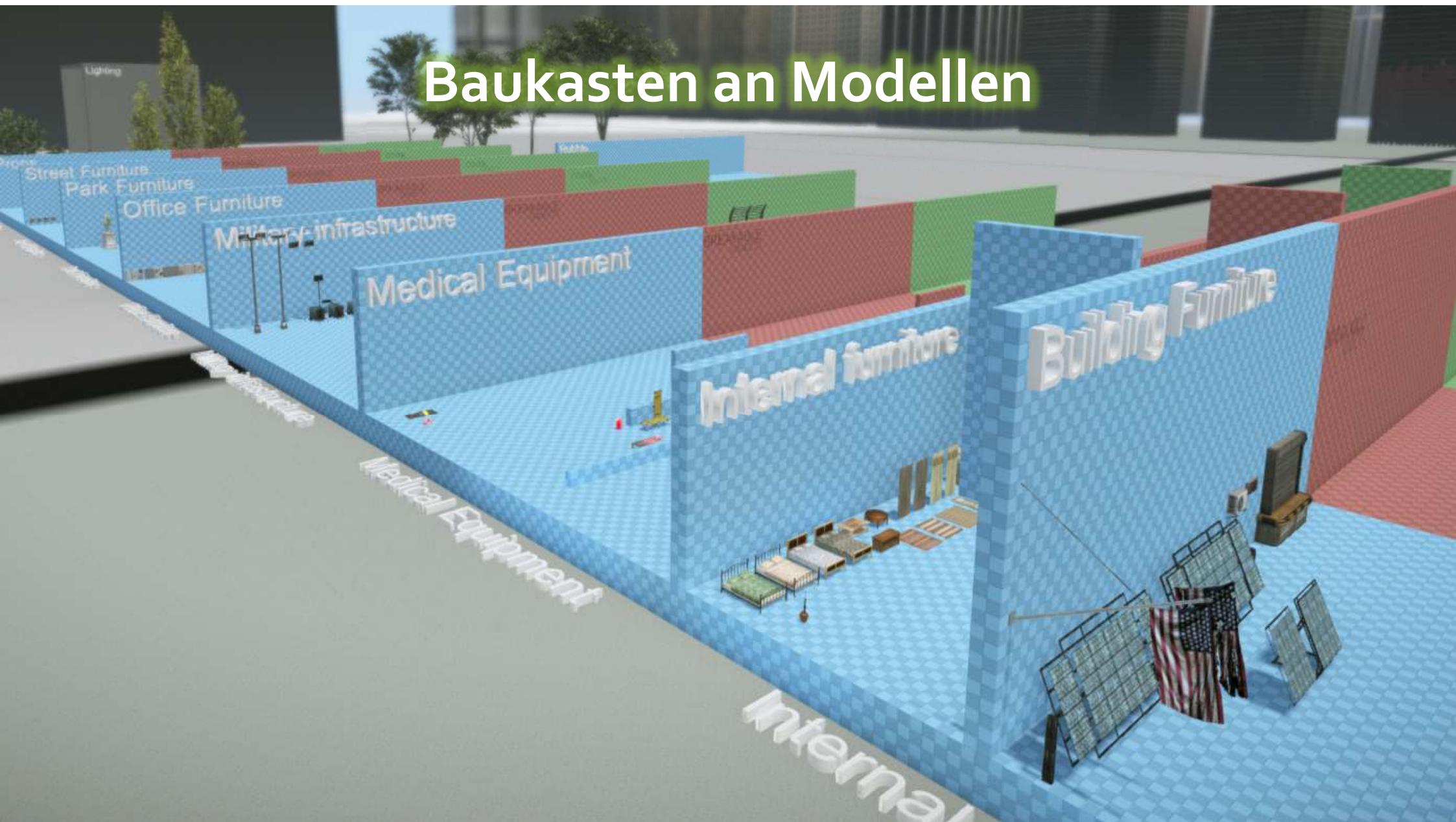
Spielwelten realisieren?



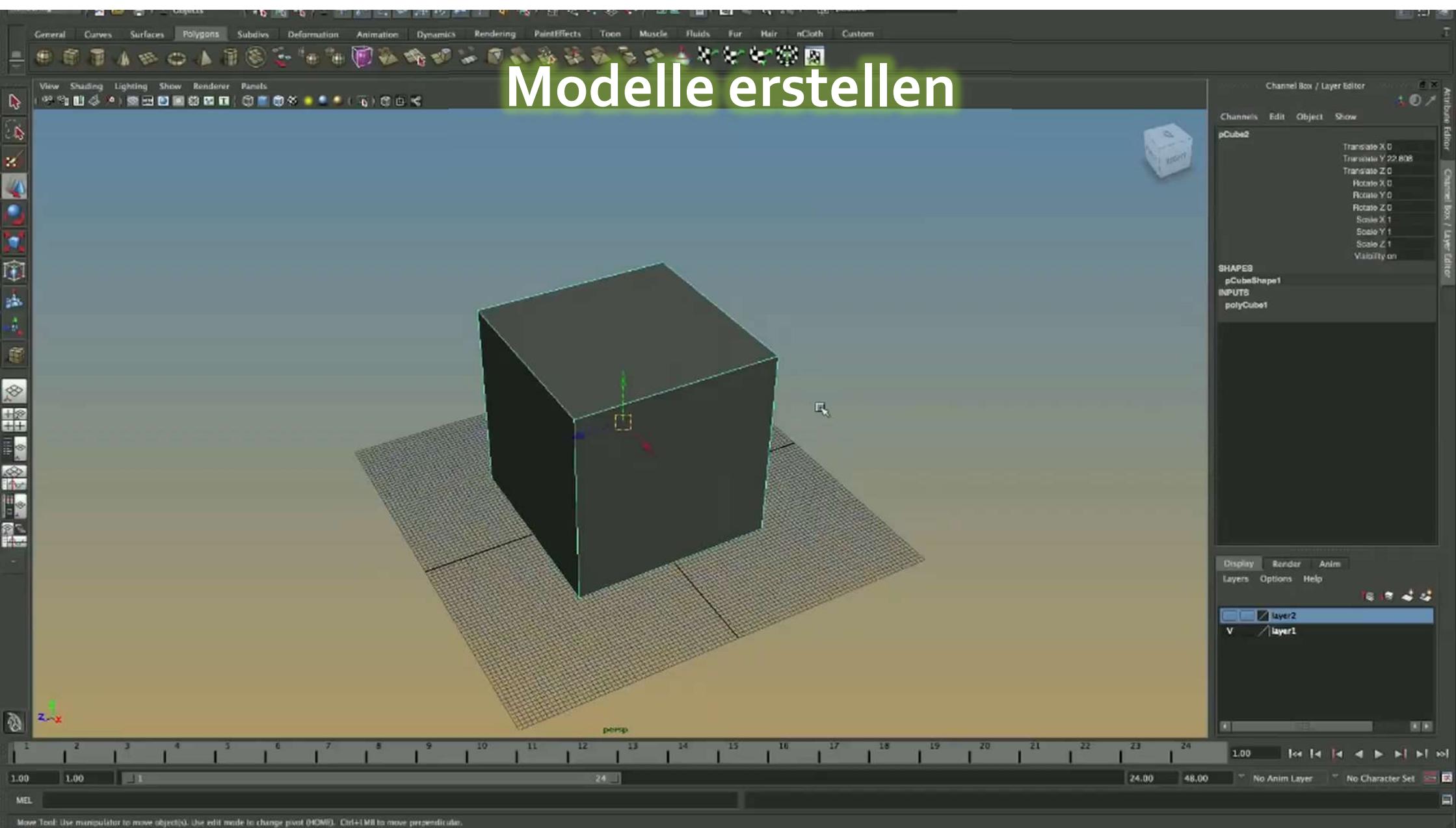
# Baukasten an Modellen



# Baukasten an Modellen

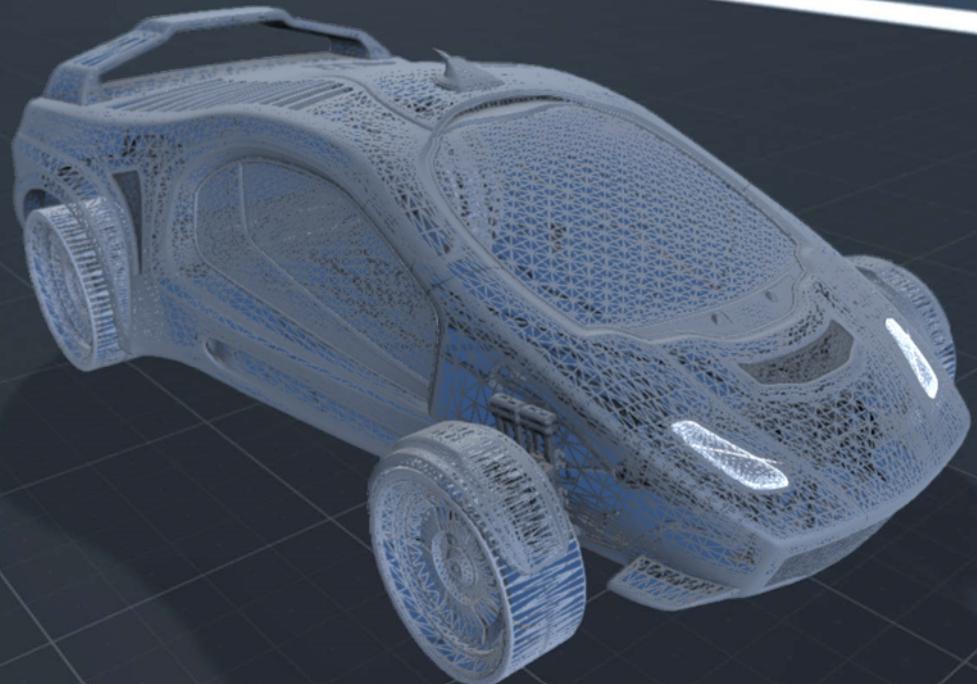


# Modelle erstellen



Move Tool: Use manipulator to move object(s). Use edit mode to change pivot (HOMO). Ctrl+MMB to move perpendicular.

# Modelle bestehen aus Primitiven



# Szenen bestehen aus Primitiven

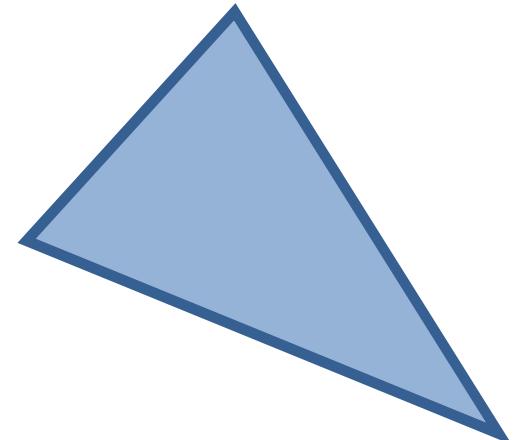
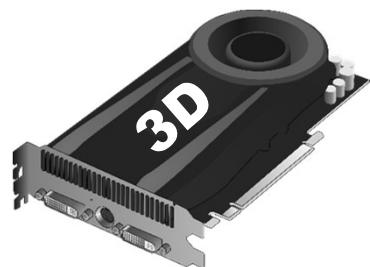




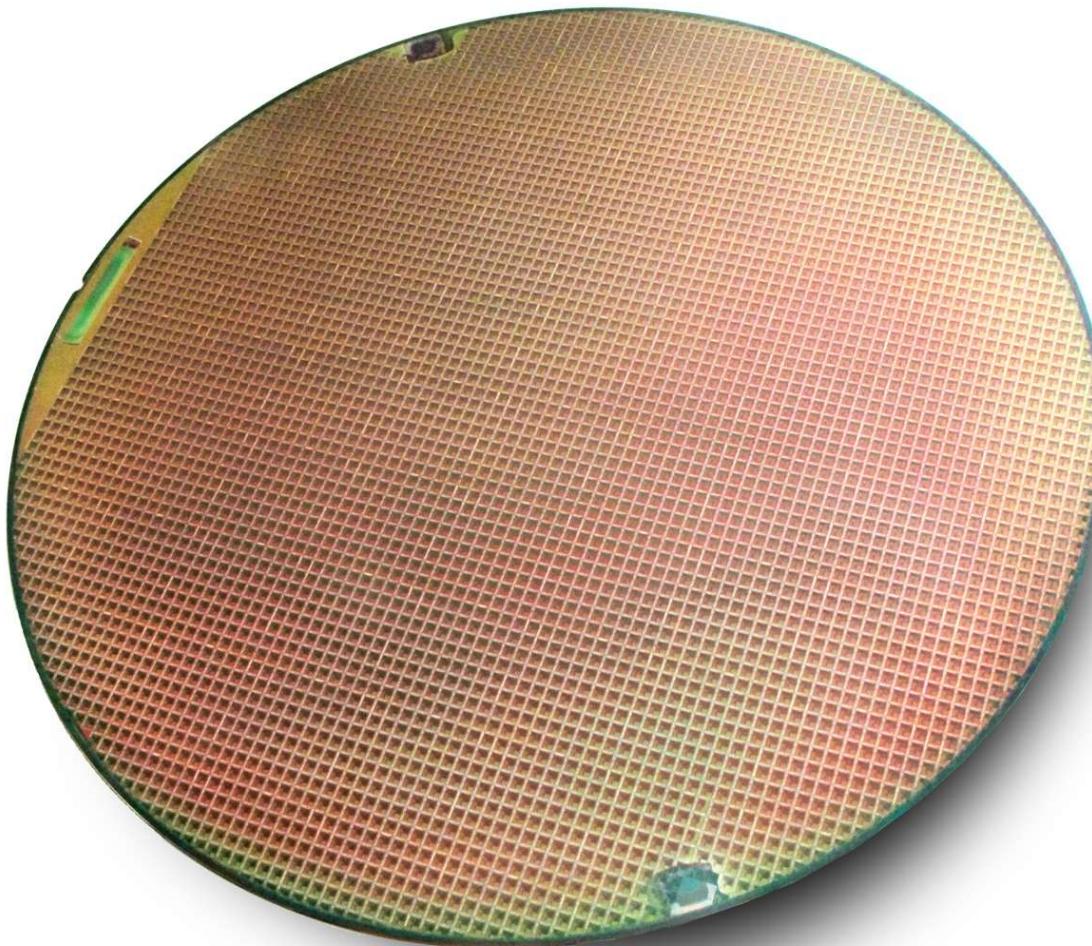
Szenen bestehen aus Primitiven

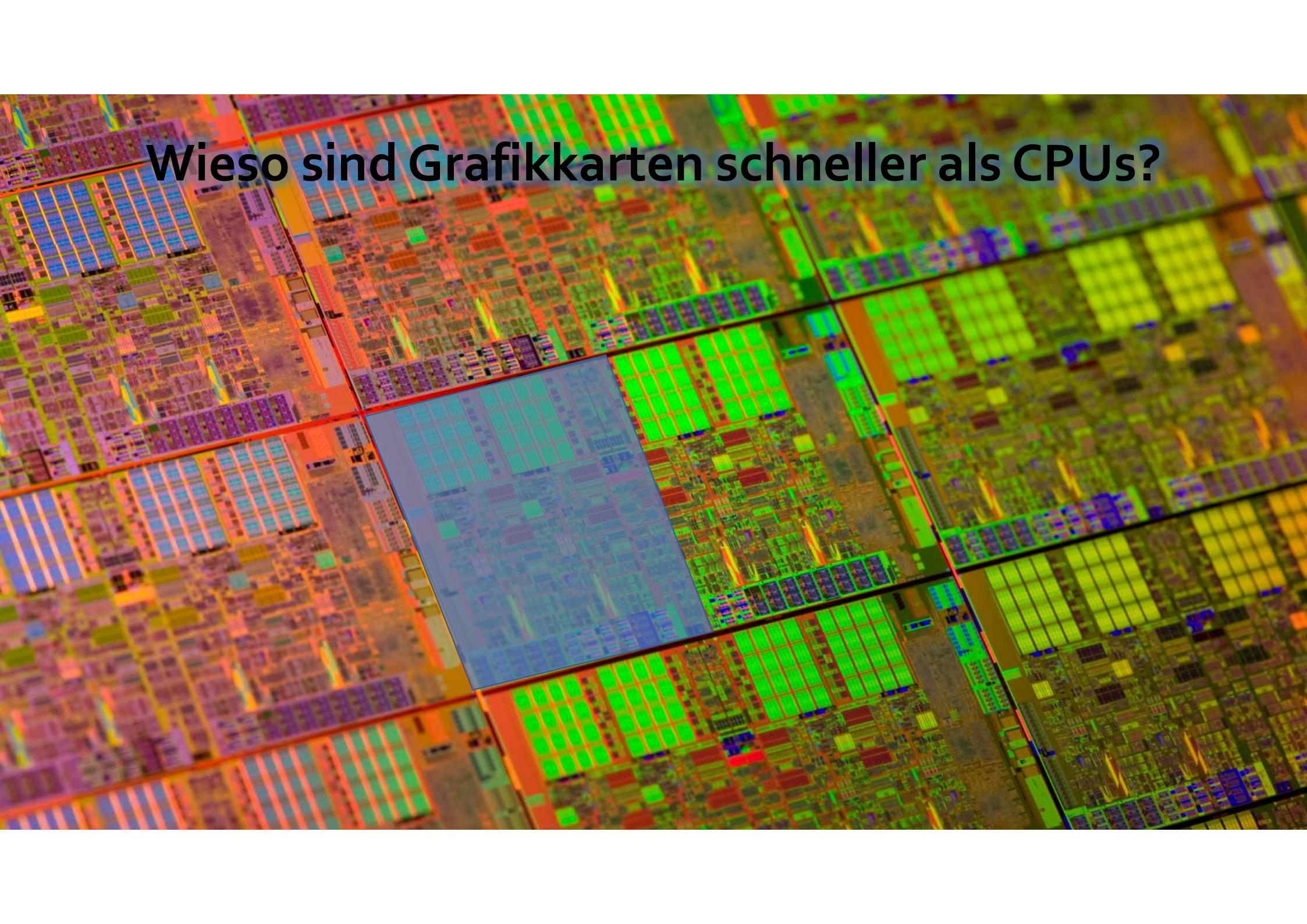
# Wieso Dreiecke?

- Alles mit Dreiecken darstellbar
- Mathematische Eigenschaften
- Effiziente Hardware für Verarbeitung
  - Grafikkarten (~5 Mrd. Dreiecke/Sekunde)



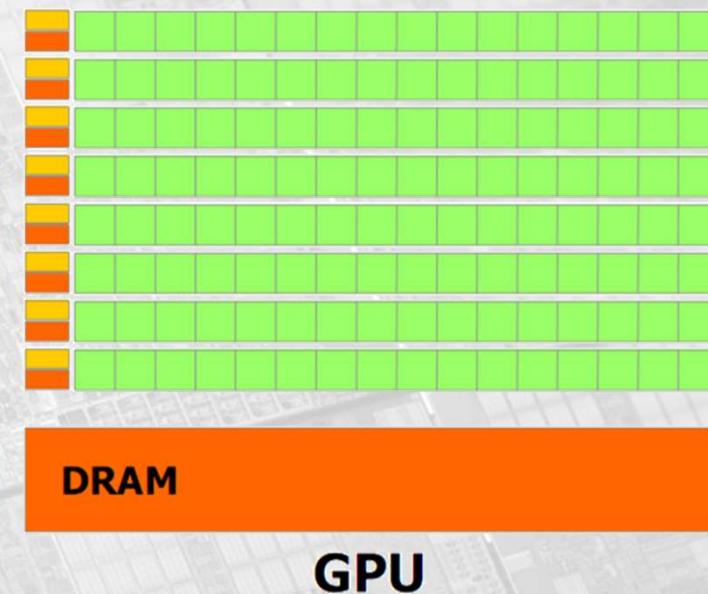
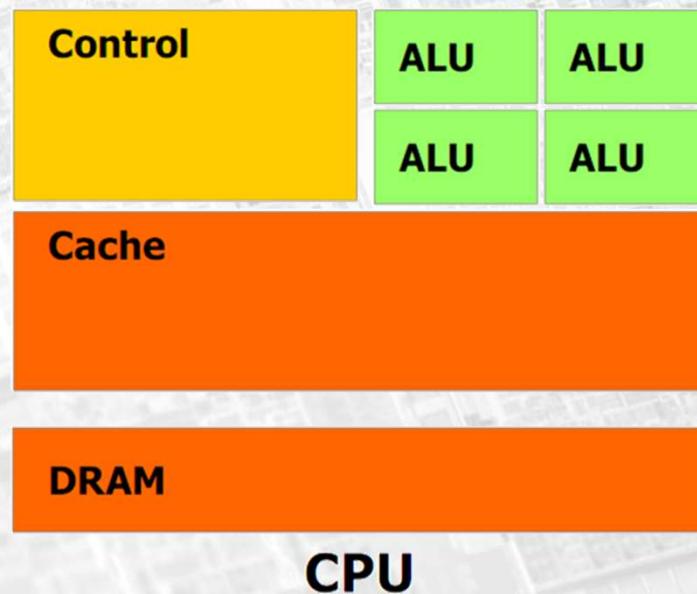
# Wieso sind Grafikkarten schneller als CPUs?



A detailed micrograph of a Graphics Processing Unit (GPU) die. The die is densely packed with various functional blocks, represented by different colors: blues, purples, reds, and greens. A large, solid blue rectangular area is highlighted in the center-left portion of the die, likely representing the GPU's memory controller or a similar complex logic block. The surrounding areas show a grid-like pattern of smaller blocks, typical of a GPU's compute and memory architecture.

**Wieso sind Grafikkarten schneller als CPUs?**

# Wieso sind Grafikkarten schneller als CPUs?



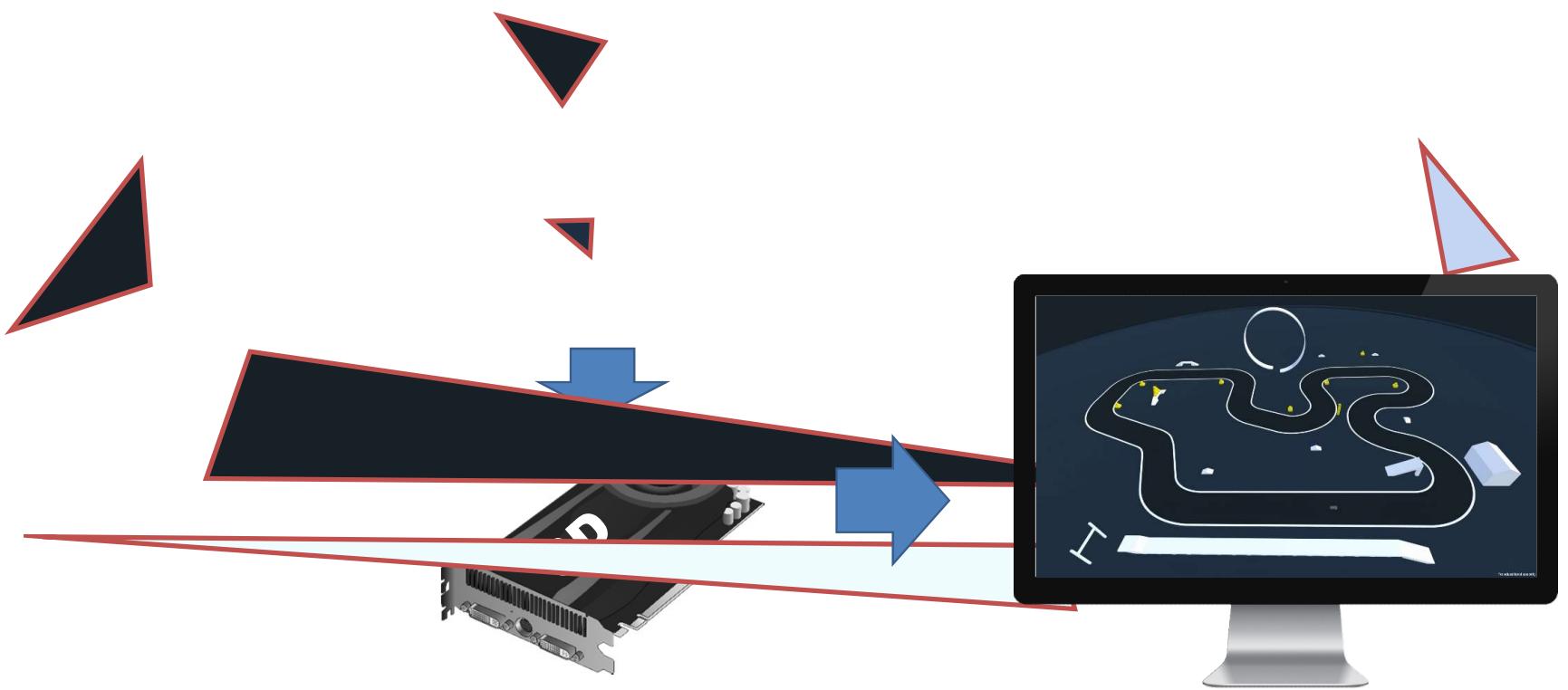
# Szene zeichnen = zeichne Liste von Dreiecken



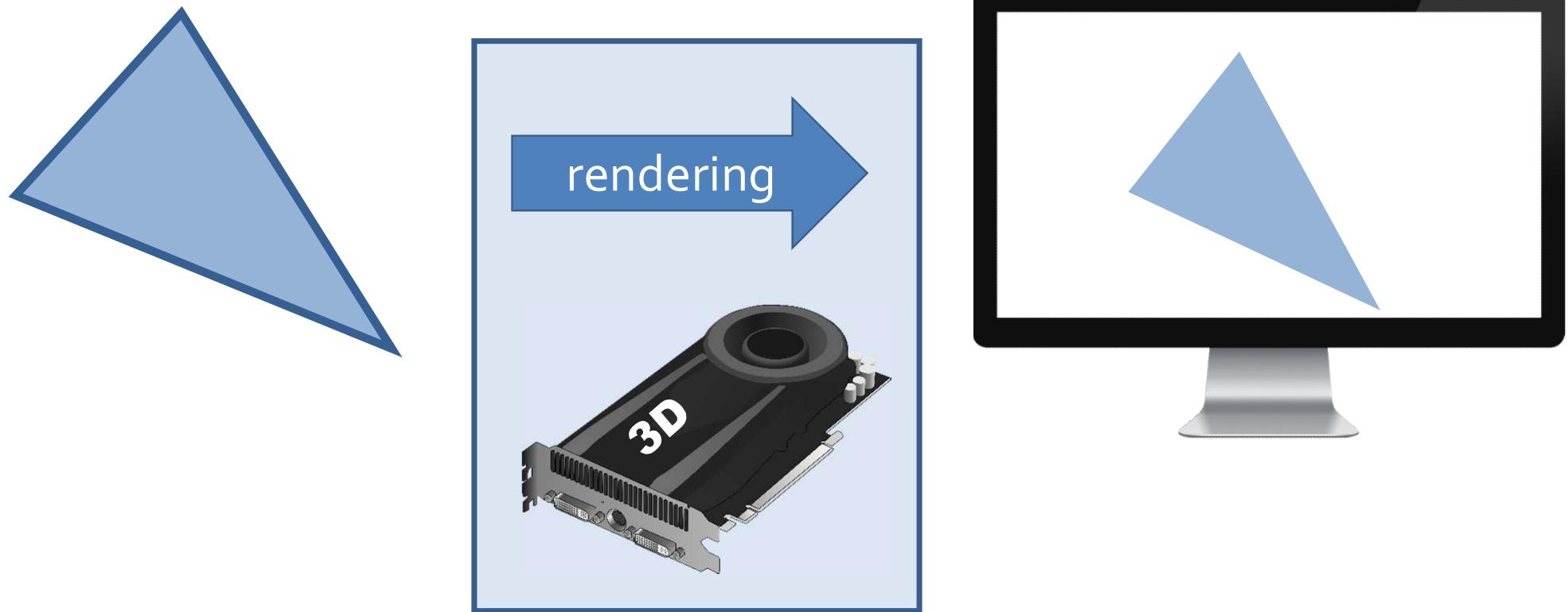
# Szene zeichnen = zeichne Liste von Dreiecken



# Grafikkarte erzeugt aus Dreiecken Bilder



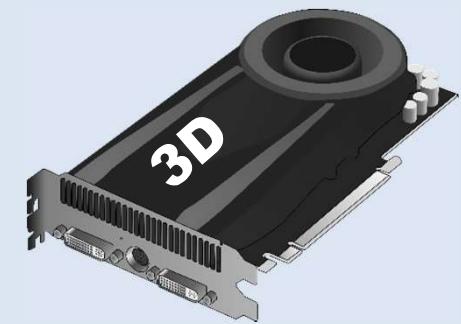
# Rendering = Von der Representation zum Bild



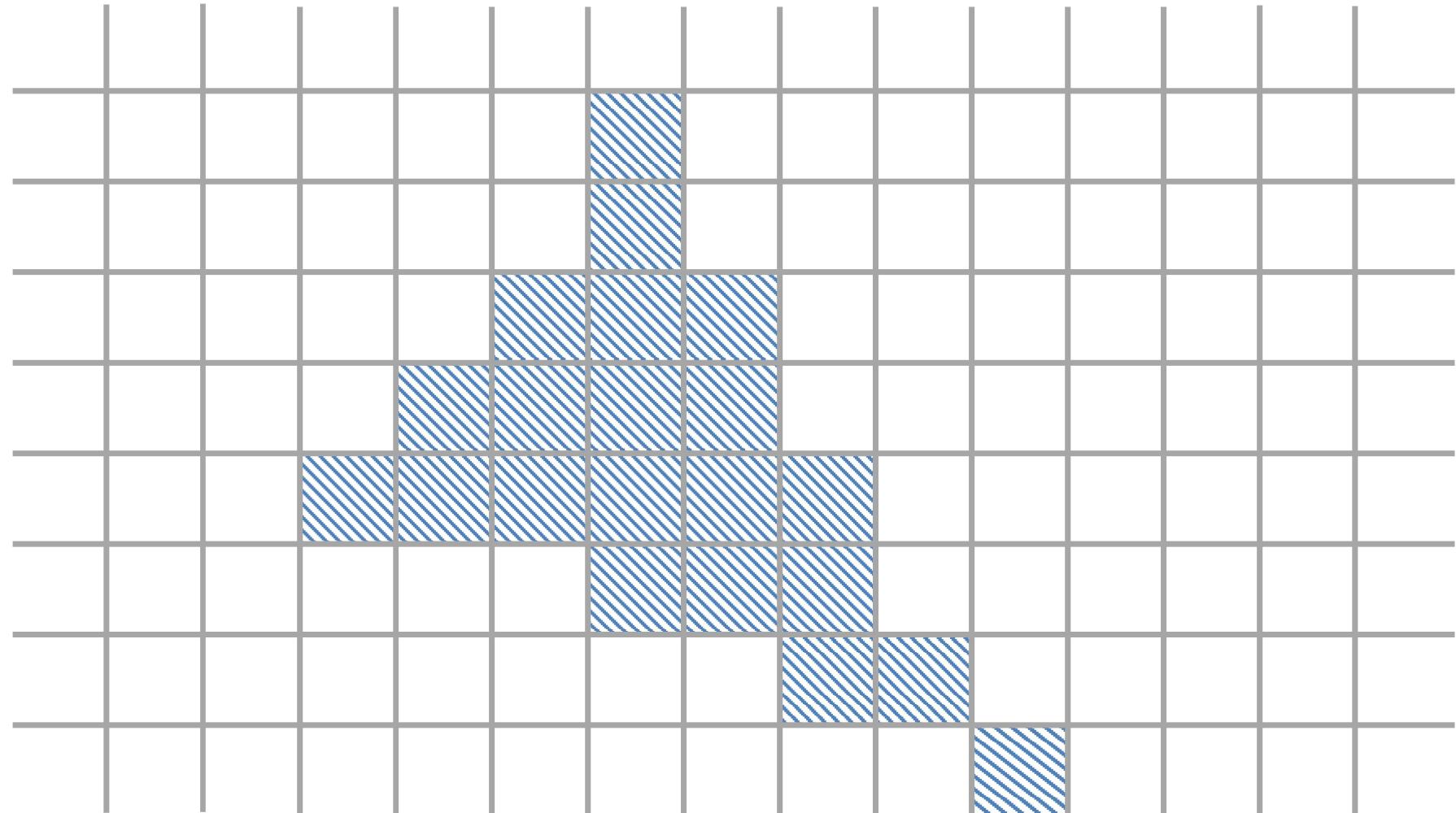
# Rasterisieren

~2 Mio. Pixel

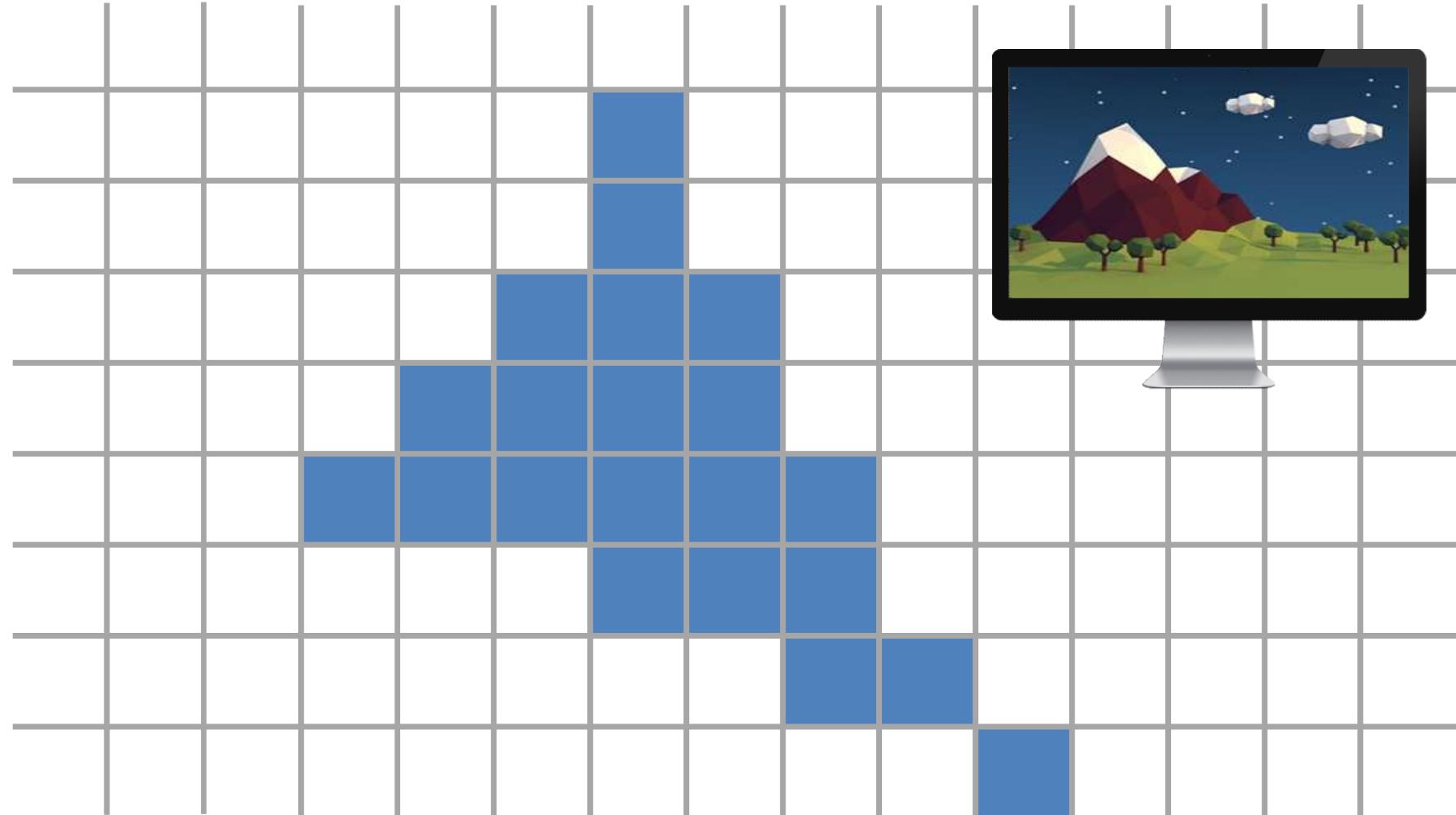
~80 Mrd. Pixel/Sekunde



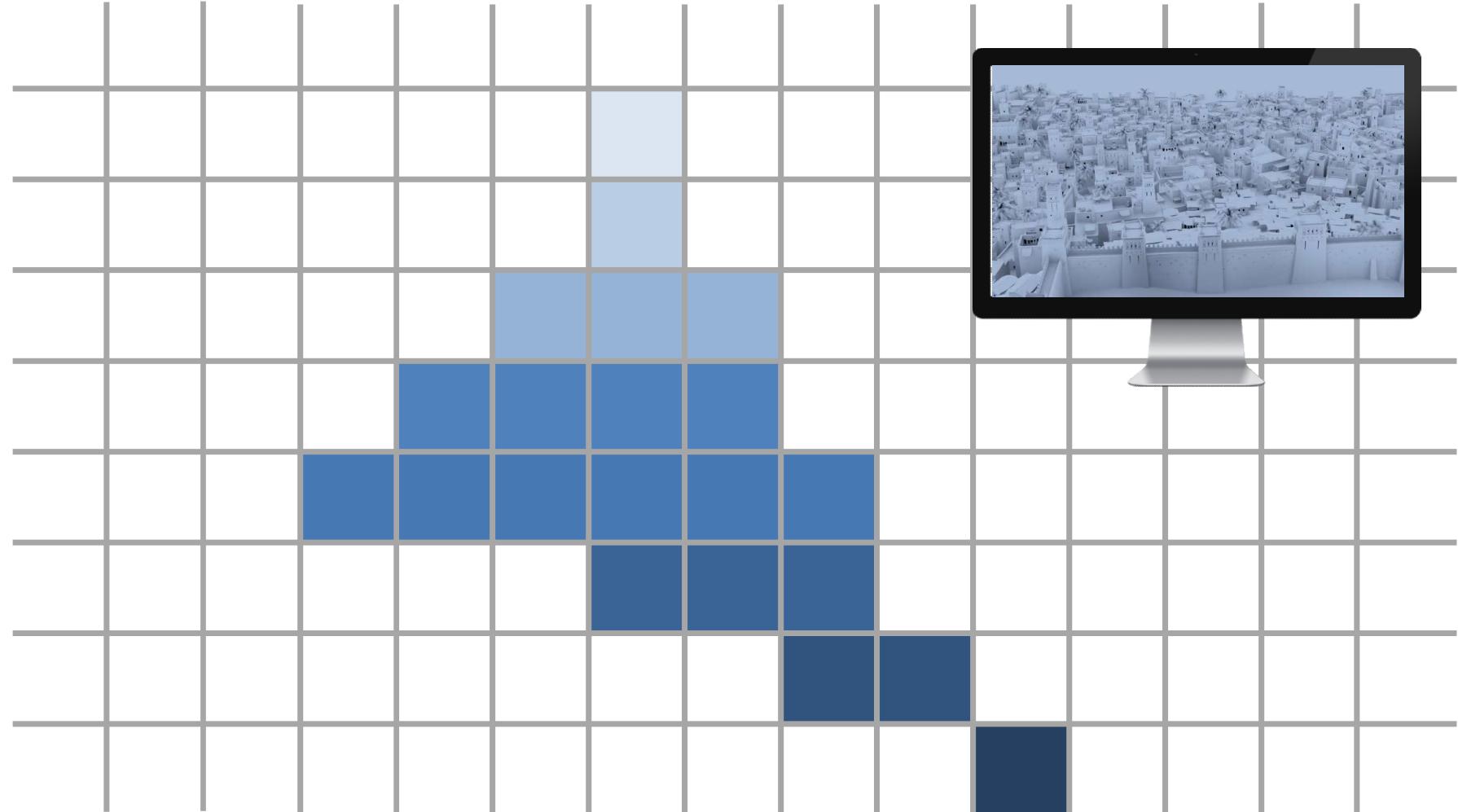
# Farbe eines Pixels?



# Farbe eines Pixels?



# Farbe eines Pixels?



# Farbe eines Pixels

- Große Freiheit gefordert
- Programmierbar
- Shader



# Shader bestimmt Farbe eines Pixels

- Programme auf Grafikkarte



# Vielen Dank für die Aufmerksamkeit!

