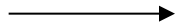


# 3D computer graphics

Viktor Novičenko



Smithy of ideas 2011

Main idea – I define for computer objects forms, colors, materials define lights source and it position. And computer will calculate how the objects is look like, looking from camera.



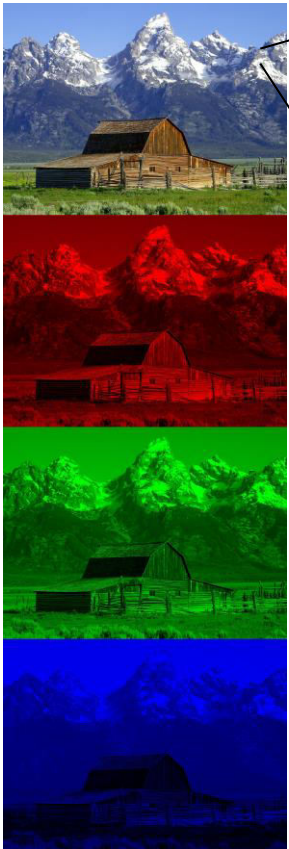
This picture is “drawing” by computer!

# 2D computer graphics

## Primitive element - pixel



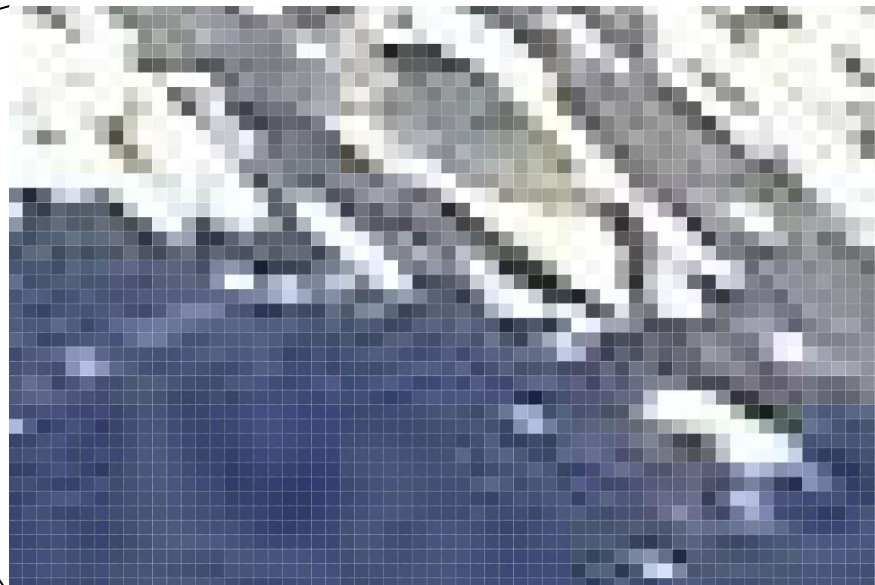
features: color – defined by integer number from 0 to 255



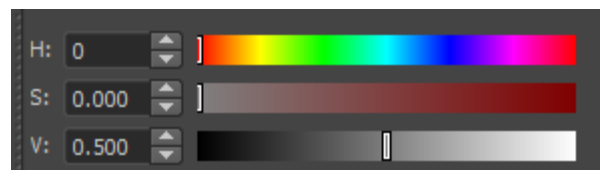
red

green

blue

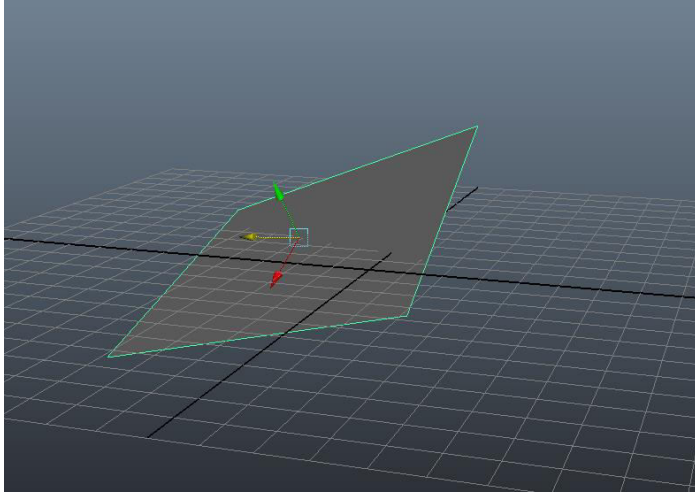


There are another color palettes: HSV, CMYK

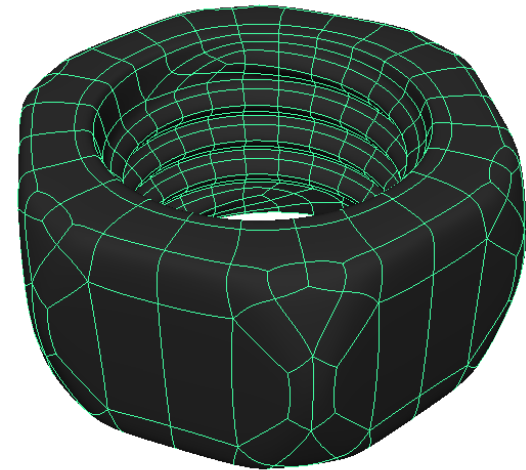


## 3D computer graphics

Primitive element – polygon (restricted plane somehow oriented in virtual 3d space)



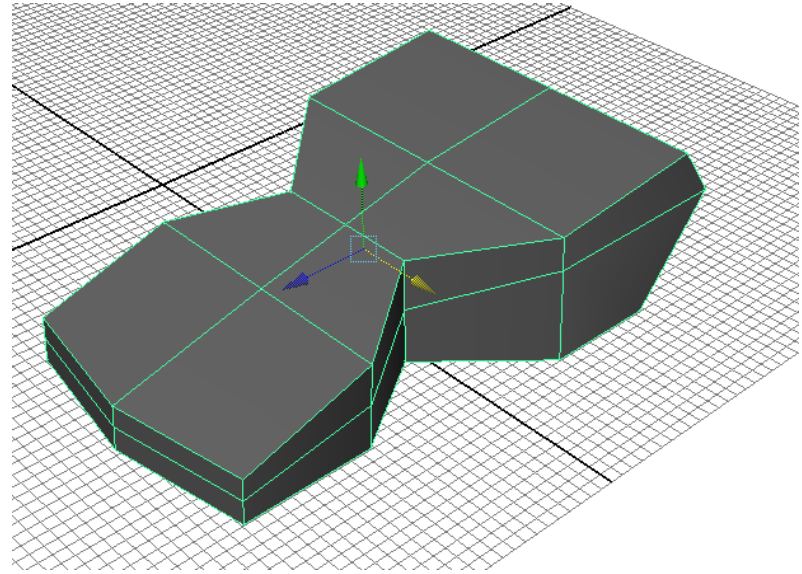
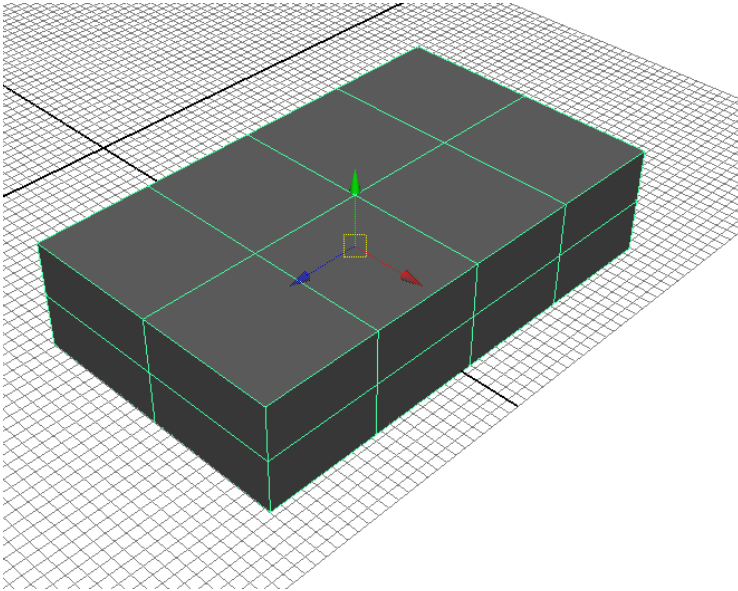
Each object form can be constructed from polygons. Example screw:

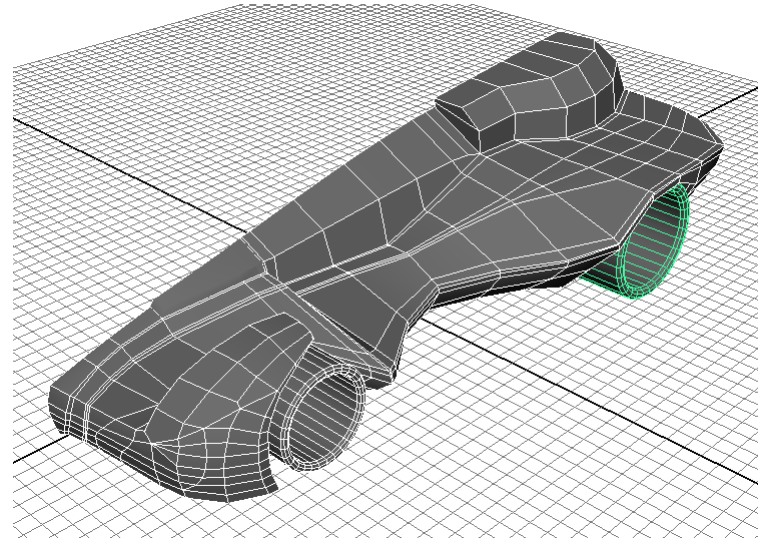
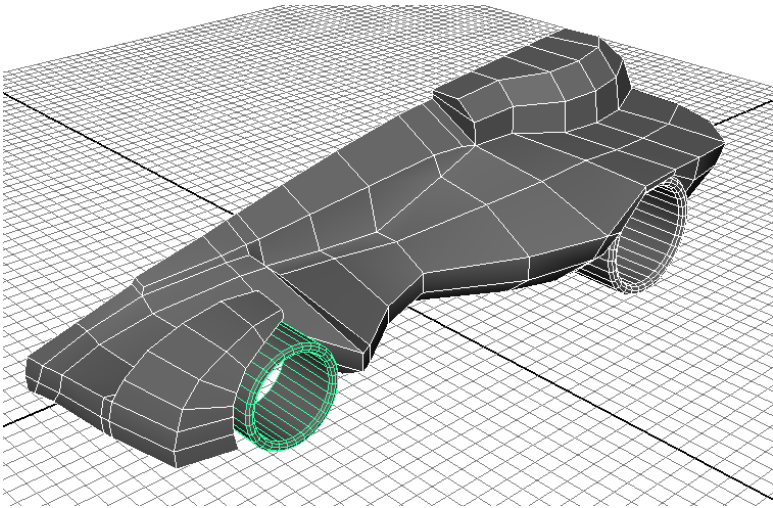
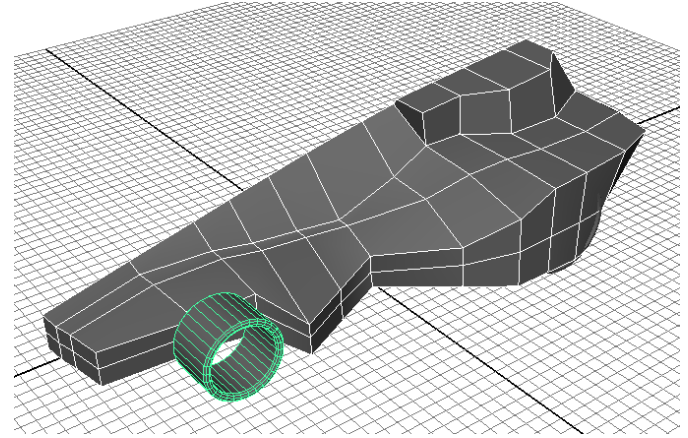
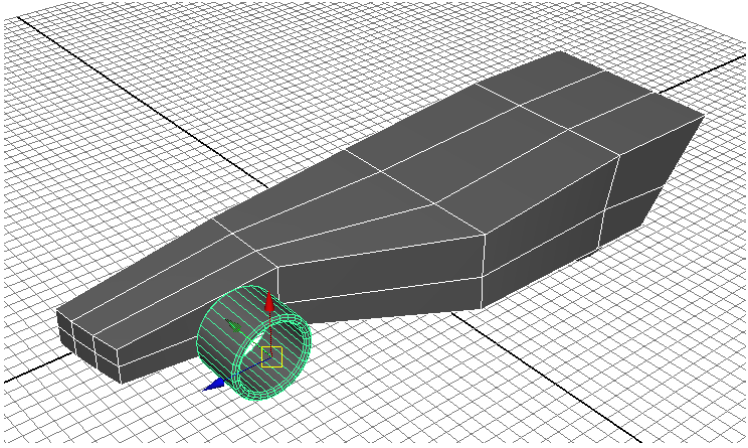


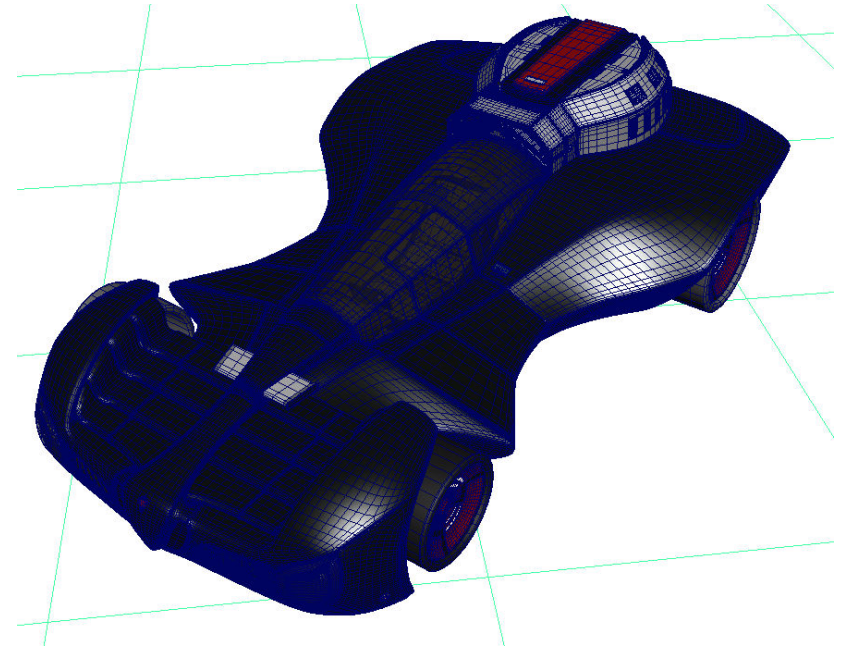
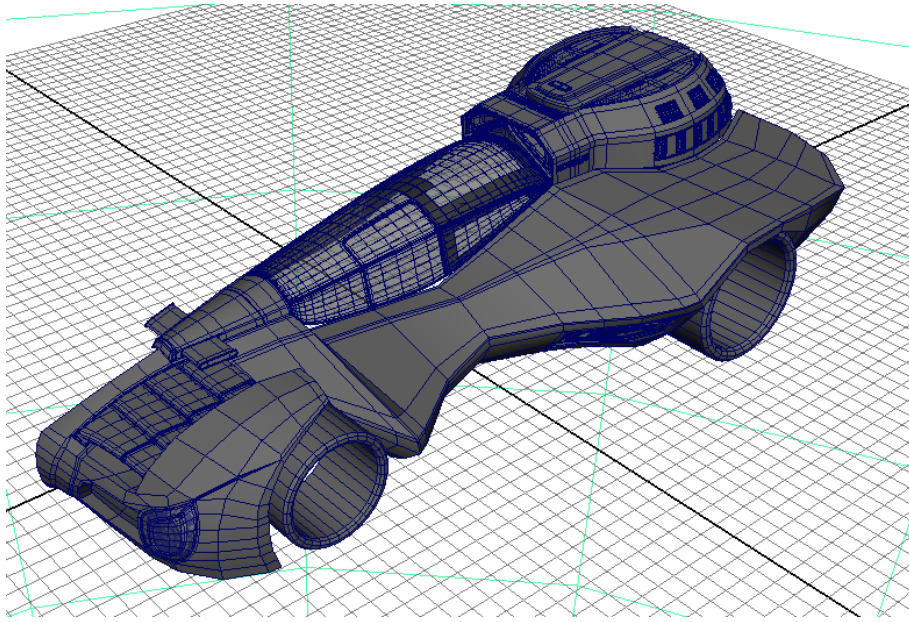
Computer per 7 min. 38 sec. will calculate how screw is look like using some kind of environment.

workflow:

- modeling – object form construction from polygons
- texturing, shading – define object material and accept colors, using 2d picture (texture)
- animation (if we want make movie) – define movement of polygons in scene
- rendering – final picture calculation







And after render we have ....

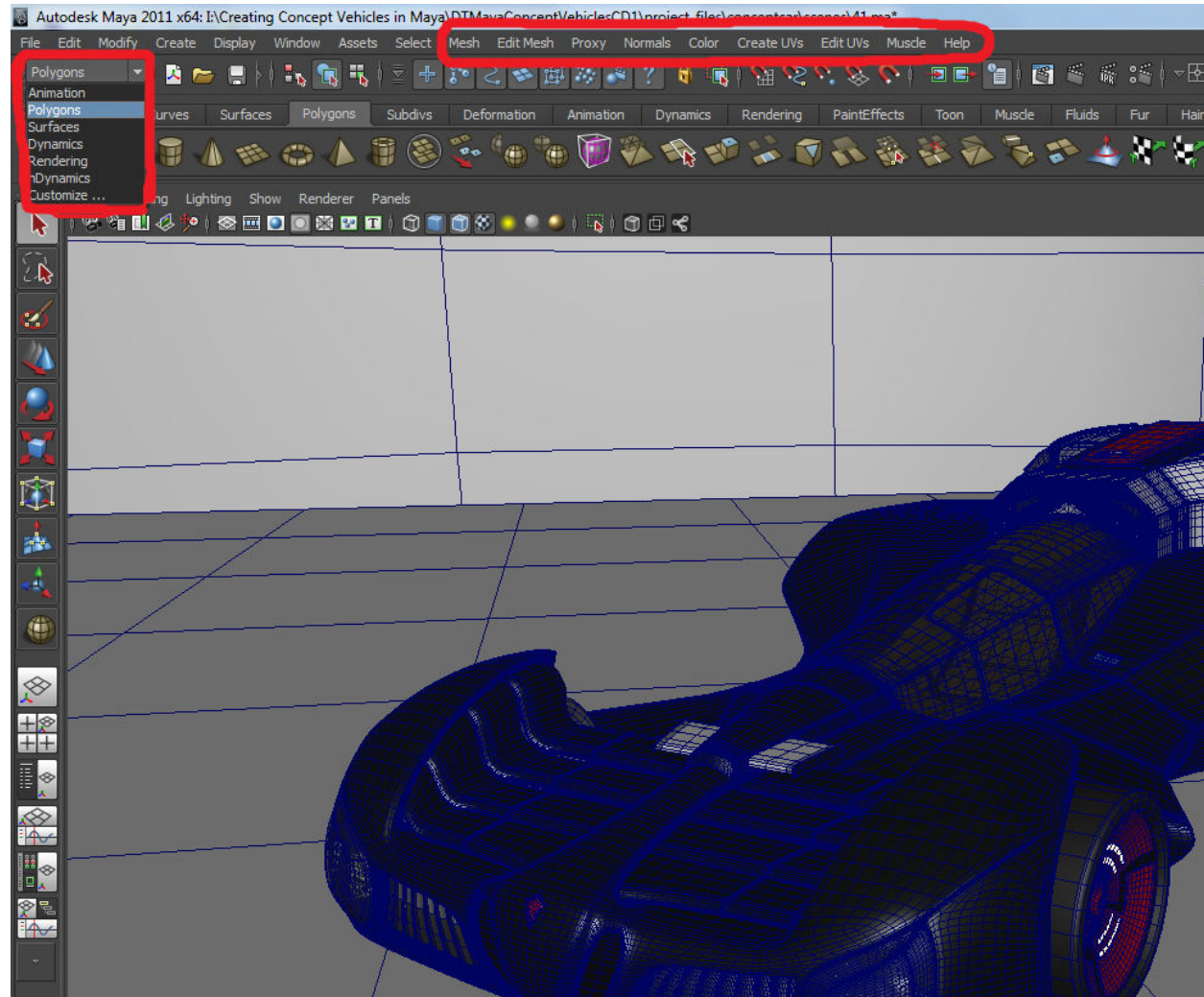
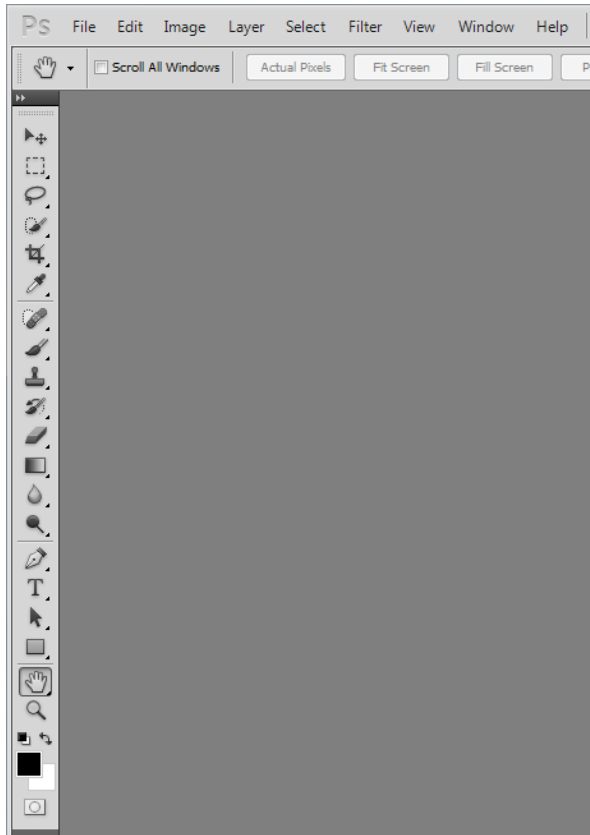




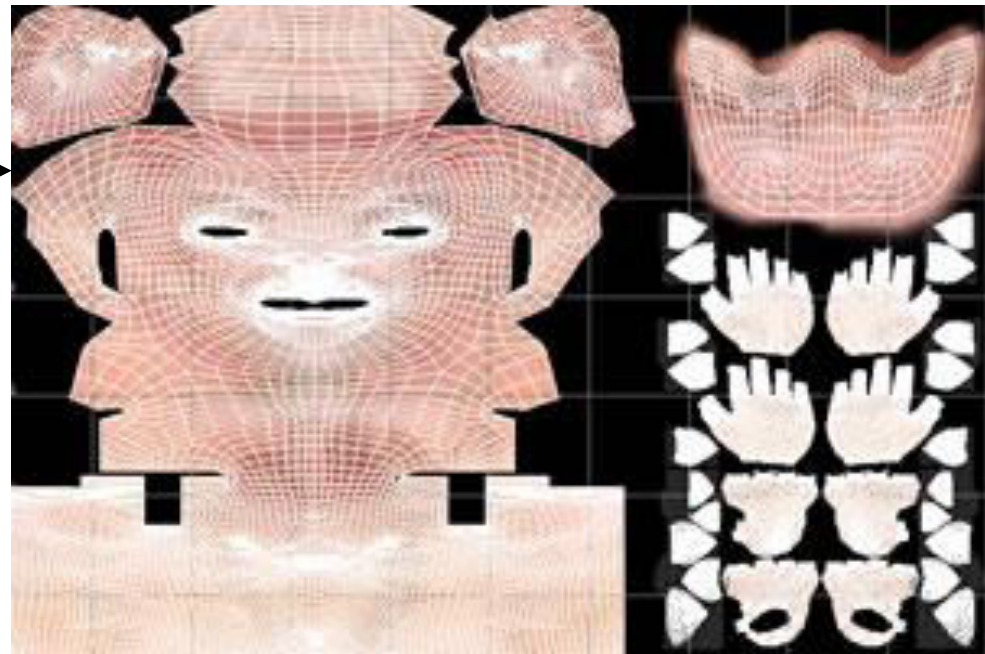
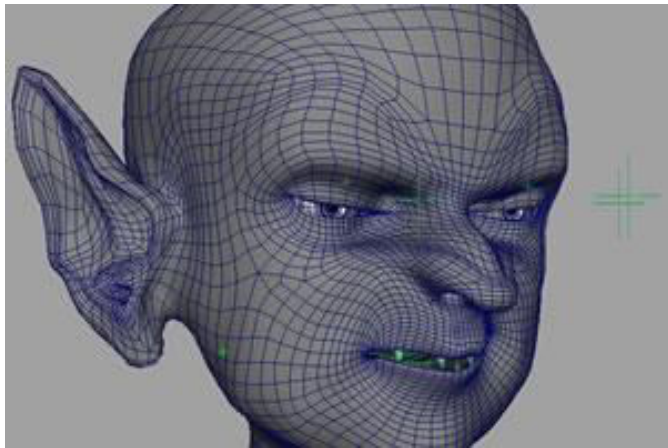
Plenty of tools in 3d packages:

Photoshop – 2d graphic redactor

Maya – 3d graphic redactor

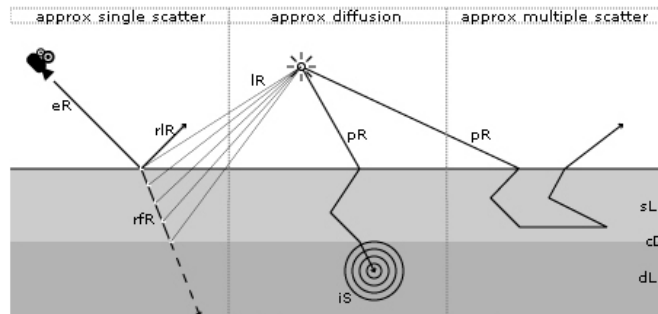
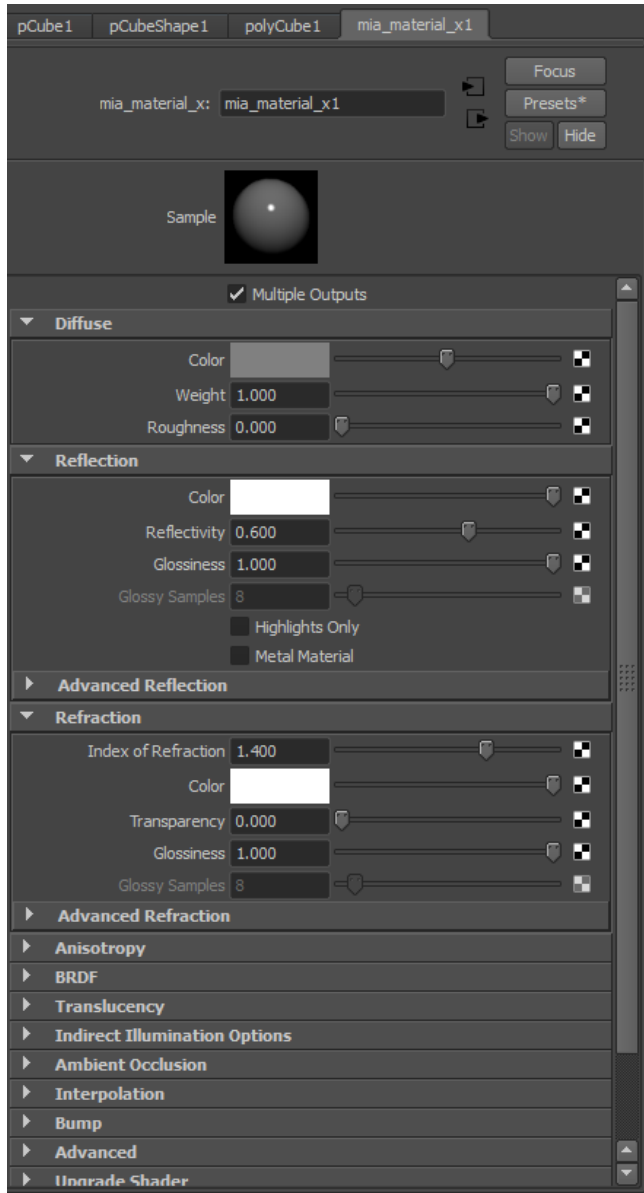


Texturing – we must make UV layout to define each polygons pixel's color.



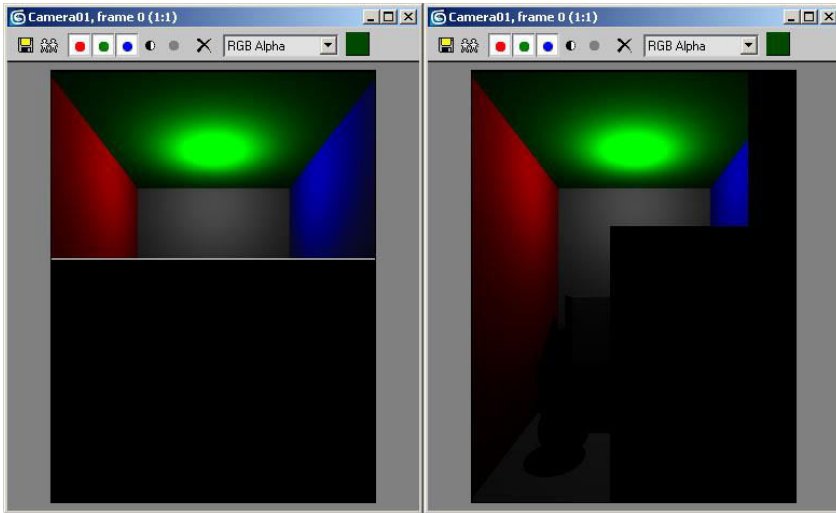
Material definition (shading) – a lot of parameters, which influence of reflection and refraction algorithms.

Most heavy materials is “subsurface scattering”  
Materials.

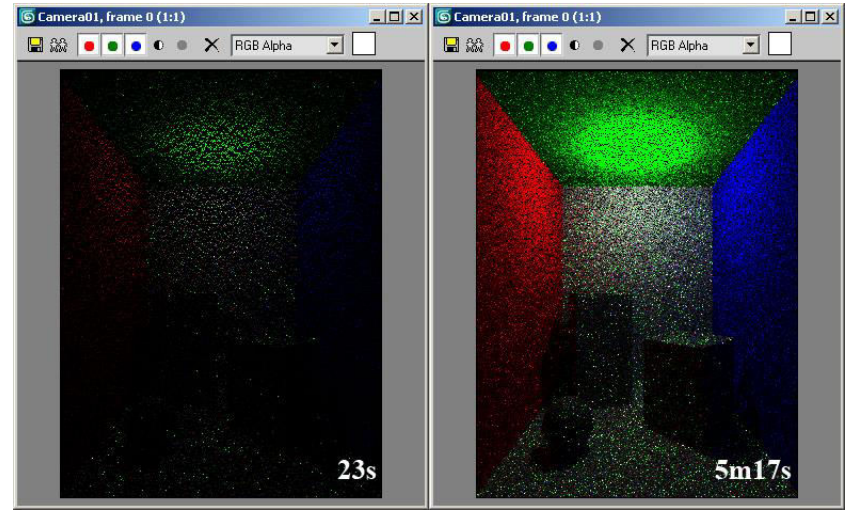


Render – program which on input has scene file (polygonal objects, materials, textures, lights sources and camera position) and on output is final 2d picture.

bias



unbias



Vray (bulgarija)



Mental ray (vokietija)



Renderman (JAV)



Final-Render (D.Britanija, Kanada) 

Indigo render



Maxwell render

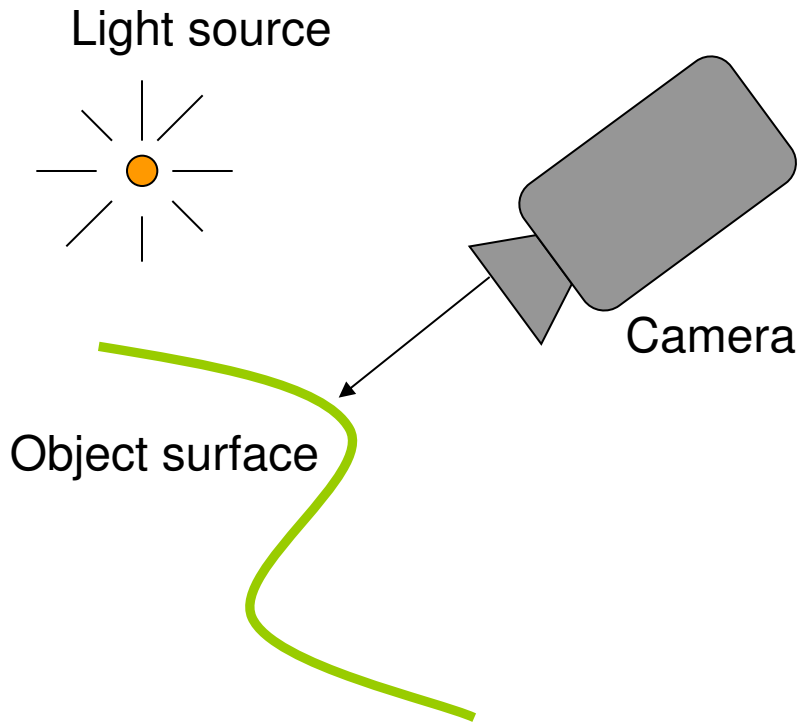


Octane render



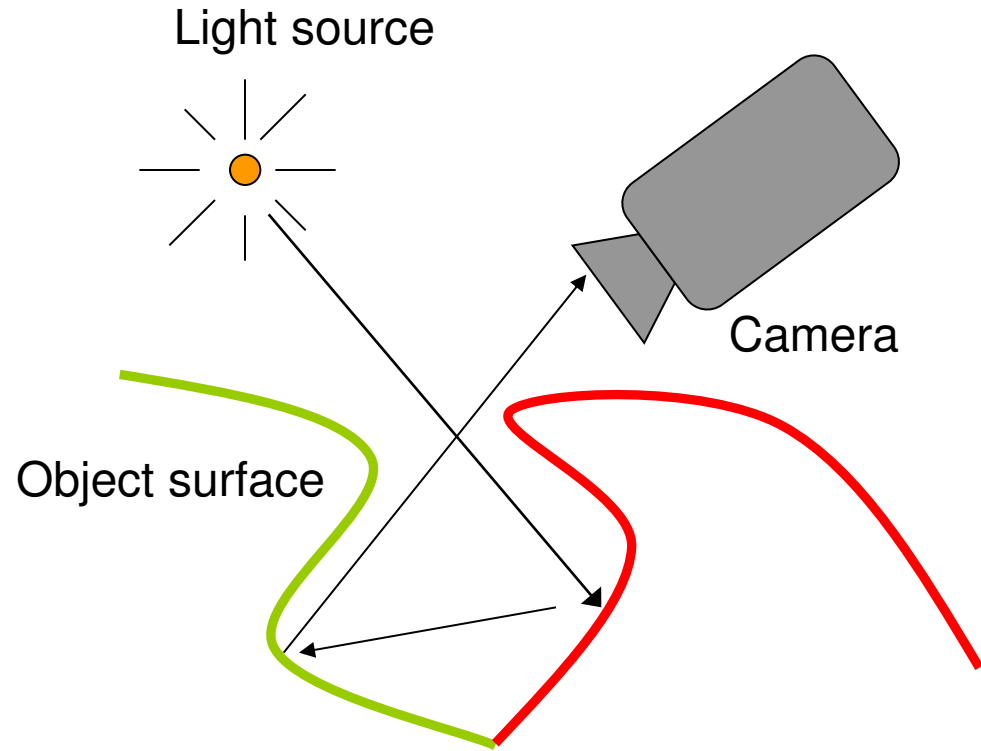
5 years ago computers is too slow for using unbiased rendering algorithms.

## Bias



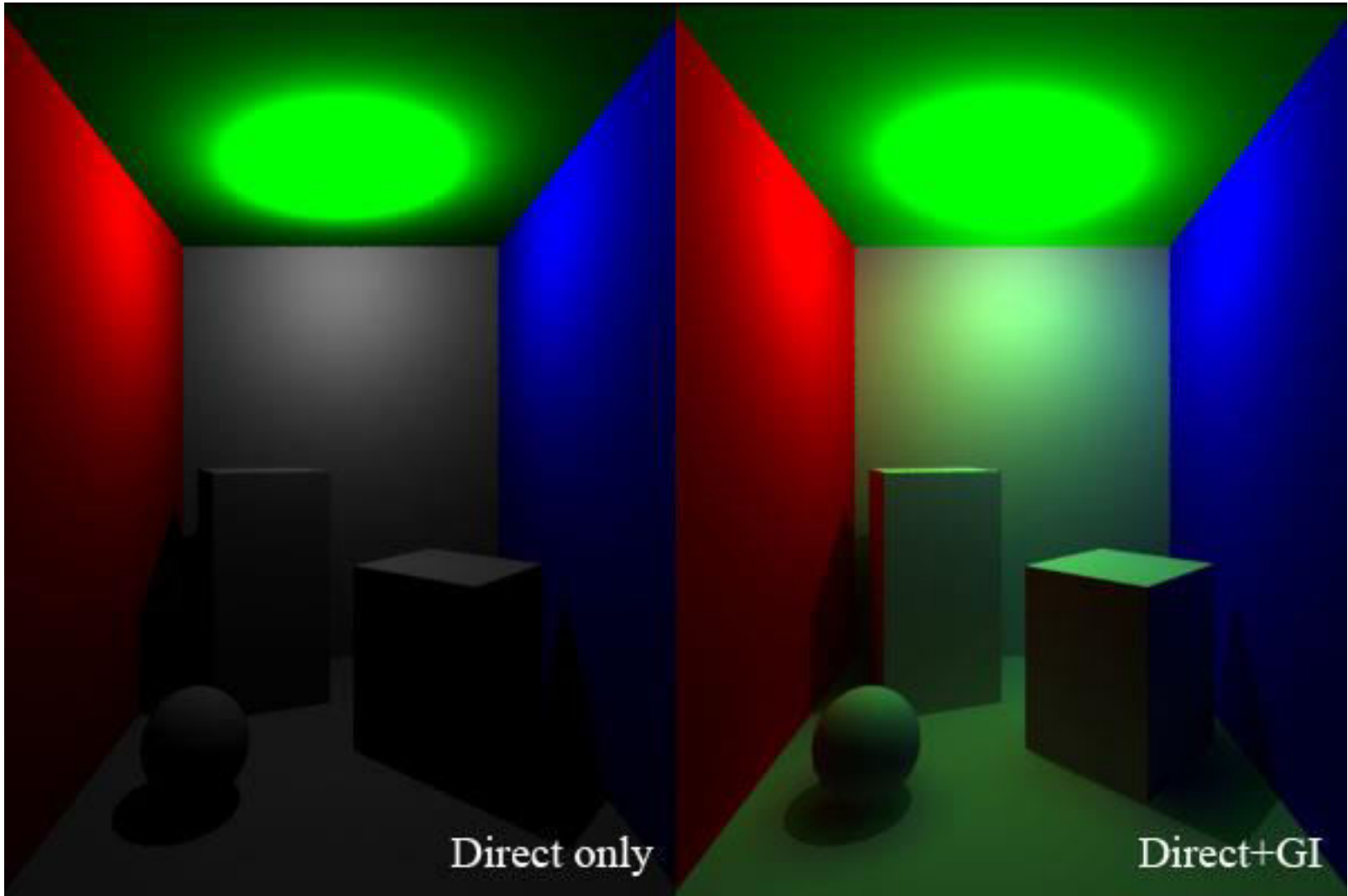
Bias renders has direct and indirect light calculations algorithms

## Unbias



Unbias renders is closed to real world. All lights are just "lights". There are no different between direct and indirect lights.

Example of bias render with direct light only and direct + global illumination



## 3D softwares:

- Autodesk 3D MAX
- Autodesk Maya
- Autodesk SoftImage
- Blender (Linux/GNU license)
- Sidefx Houdini
- MAXON Cinema 4D



3D Max



VS

Maya

