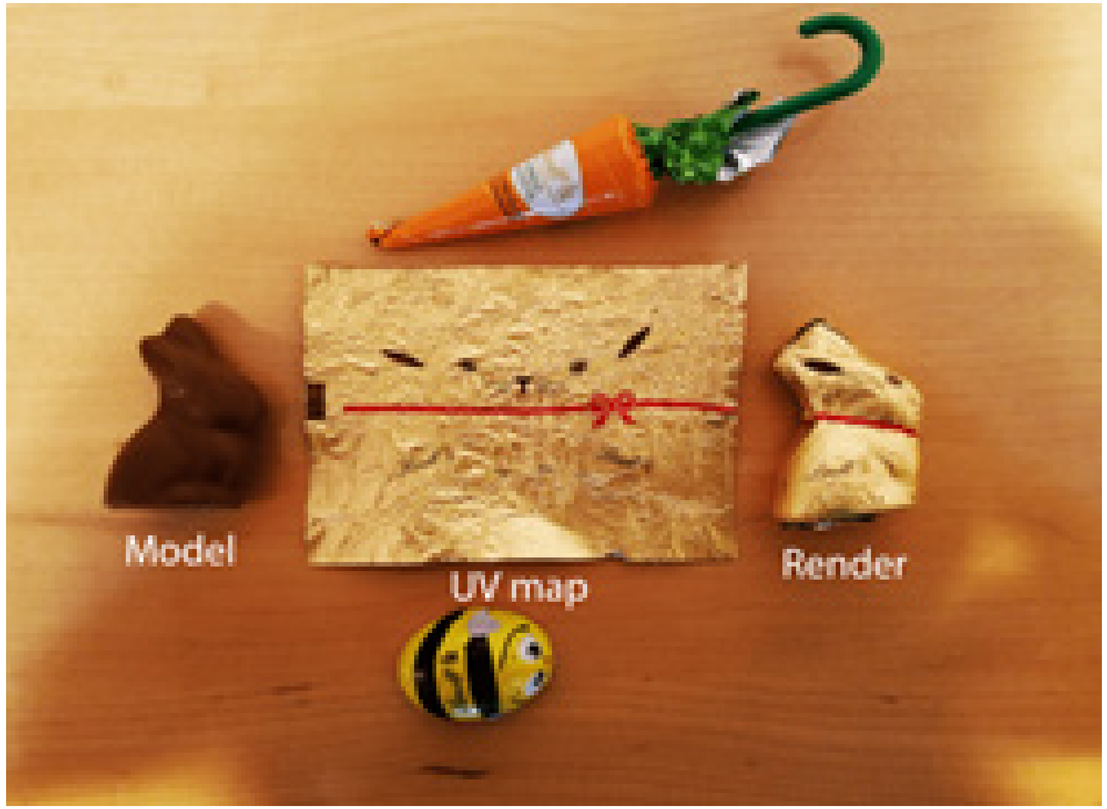
TEXTURE AND UV MAPPING

„HOW TO GUIDE“

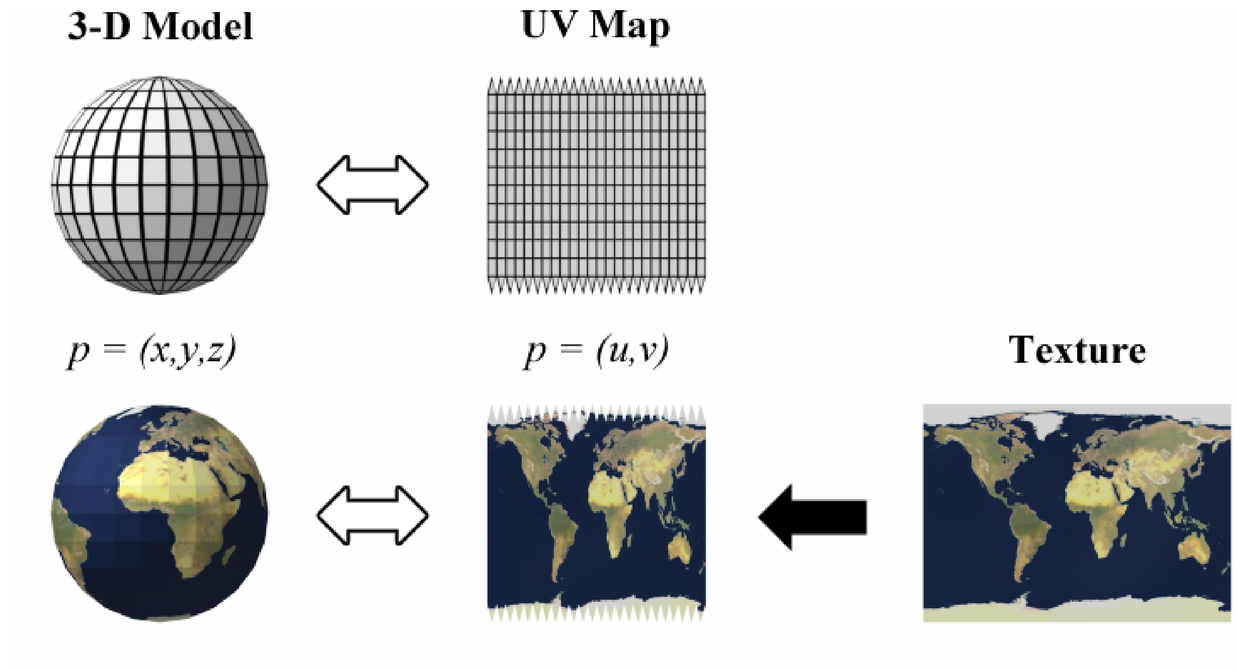
Texture mapping

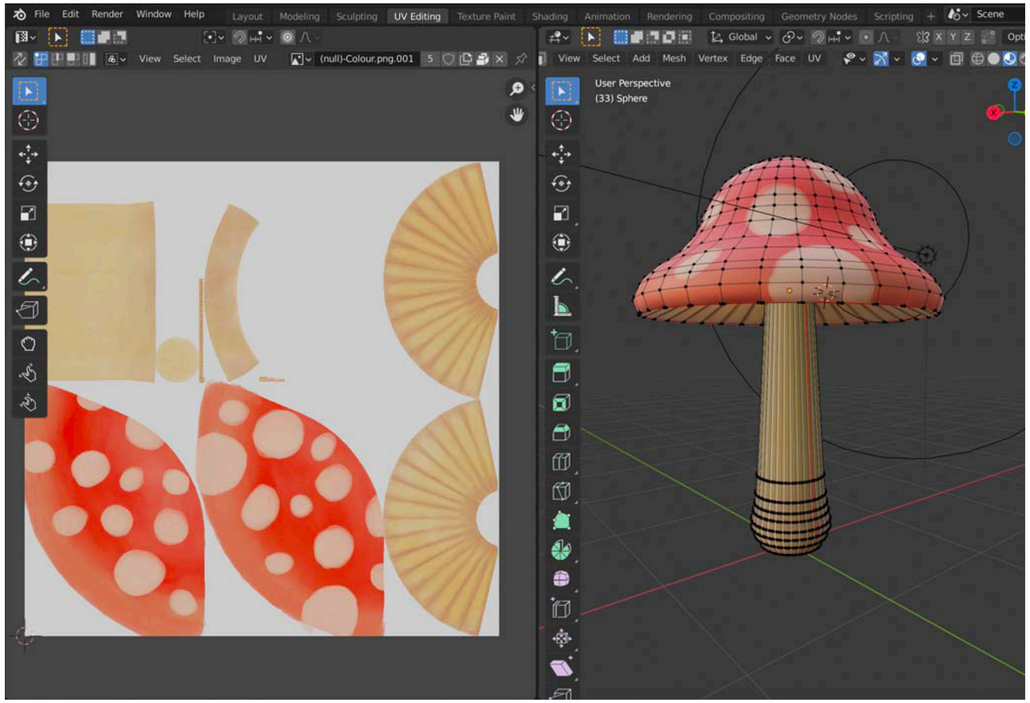
- 2D image/texture that is applied onto a 3D surface to add colour and detail.



UV mapping

- projecting a 3D models surface onto a 2D plane
- defines how a 3D model will appear
- UV≠ultraviolet





https://blender.stackexchange.com/questions/250287/texture-wrapping-to-uv-map-in-viewport-but-not-in-render

Process of UV mapping

1. Seams
2. unwrapping
3. UV layout
4. texture application

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Seams

Cuts in 3D model to make a 2D surface

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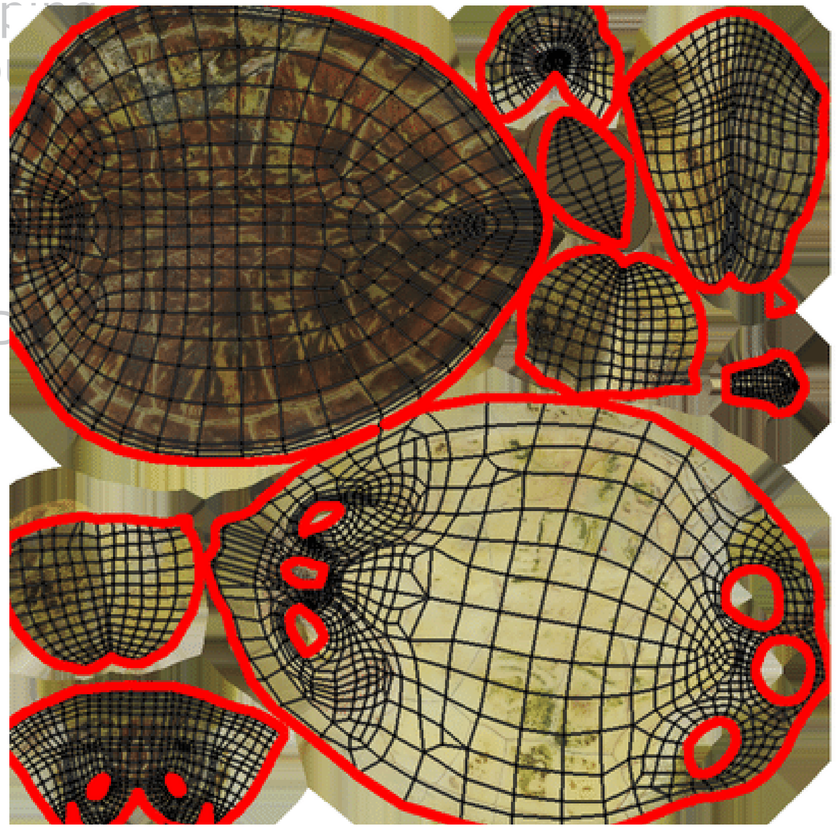
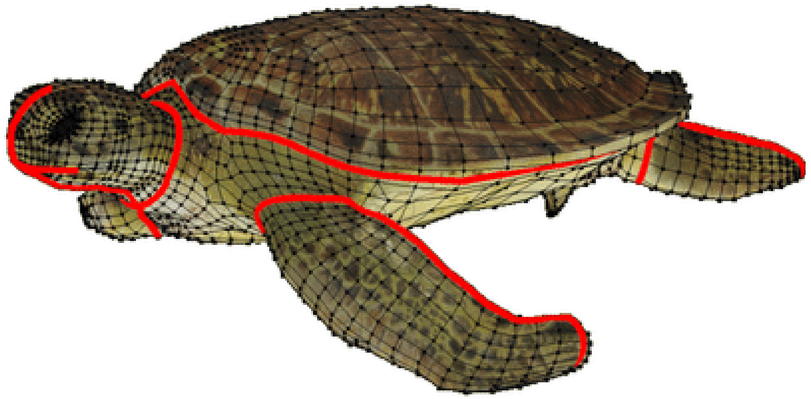
Cuts in 3D





https://miro.medium.com/v2/resize:fit:4800/format:webp/1*U5iOjlv7PmU5HOe1xN6ikA.jpeg

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Seams

Cuts in 3D model to make a 2D surface

Unwrapping

Flattening of the 3D model into 2D
Types: Conformal, angle based, optimization based, follow active quads, seam based

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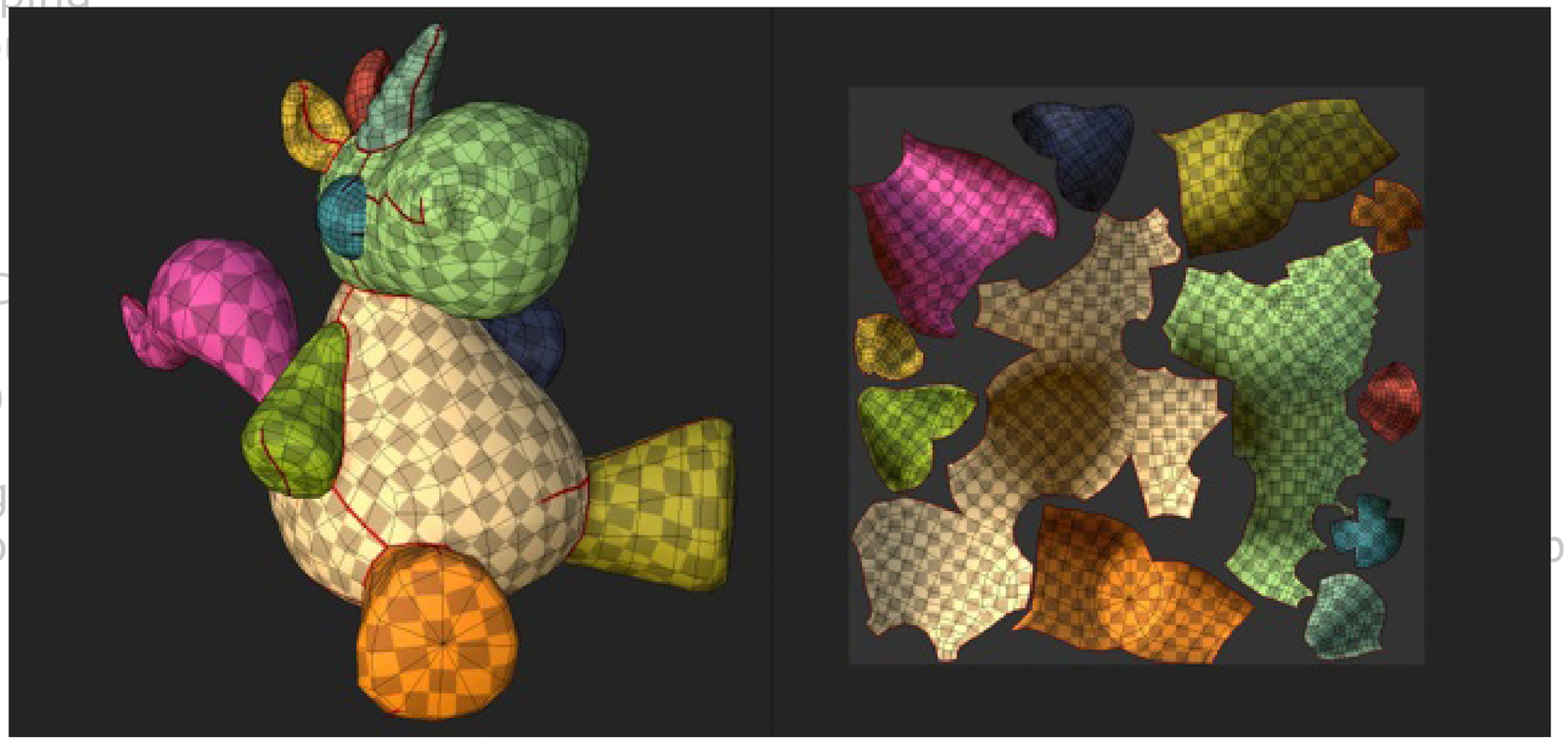
Cuts in 3D

Unwrap

Flattening
Types: Co



based

https://community.adobe.com/t5/substance-3d-painter-discussions/failed-to-compute-tangents-need-uv-data/m-p/14295970

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UV layout

A 2D plan of a 3D model
Uses UV axes

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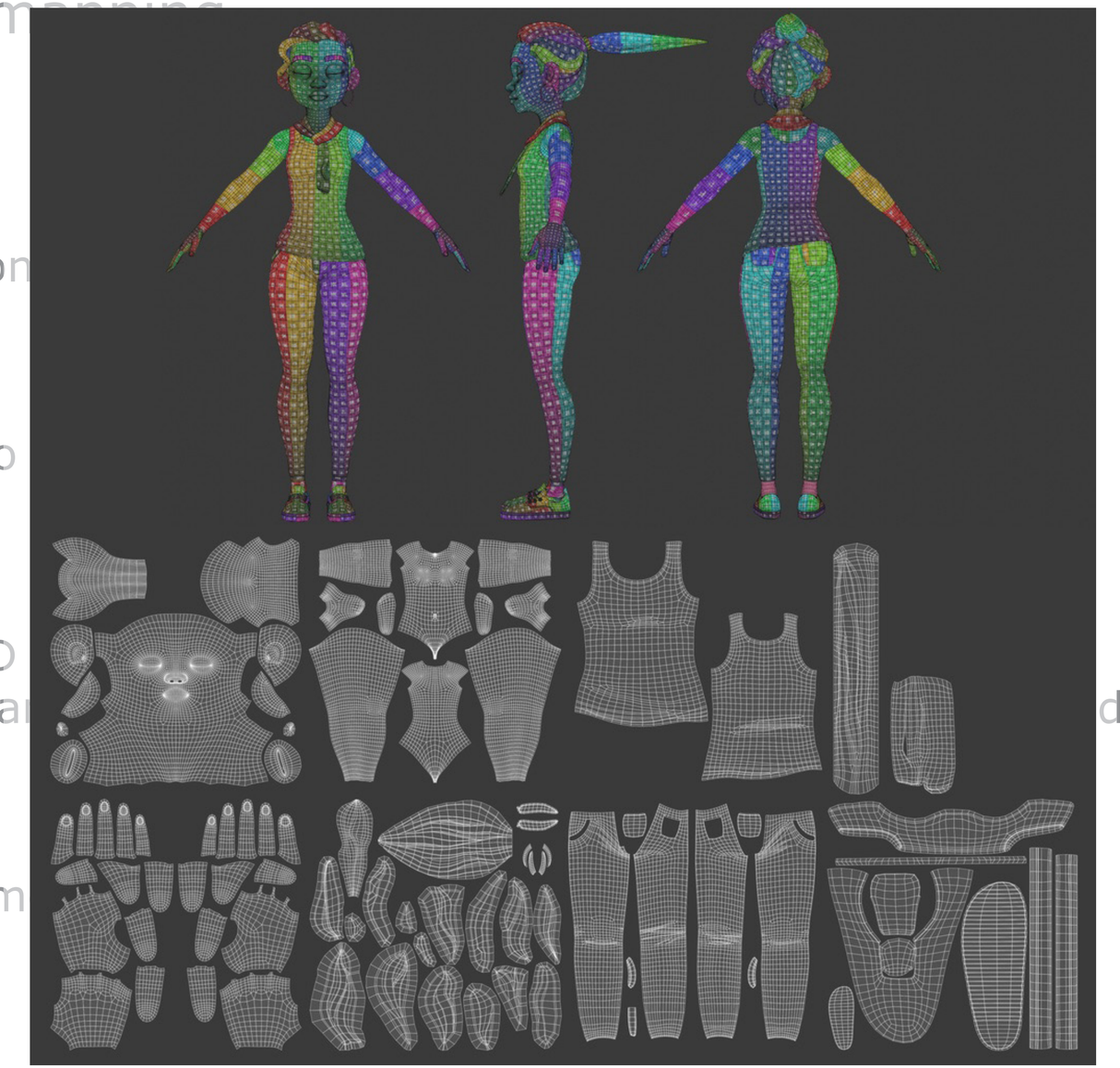

https://studio.blender.org/training/stylized-character-workflow/5d529a4c1afa2dafe69820ce/

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A 2D plan of a 3D model
Uses UV axes

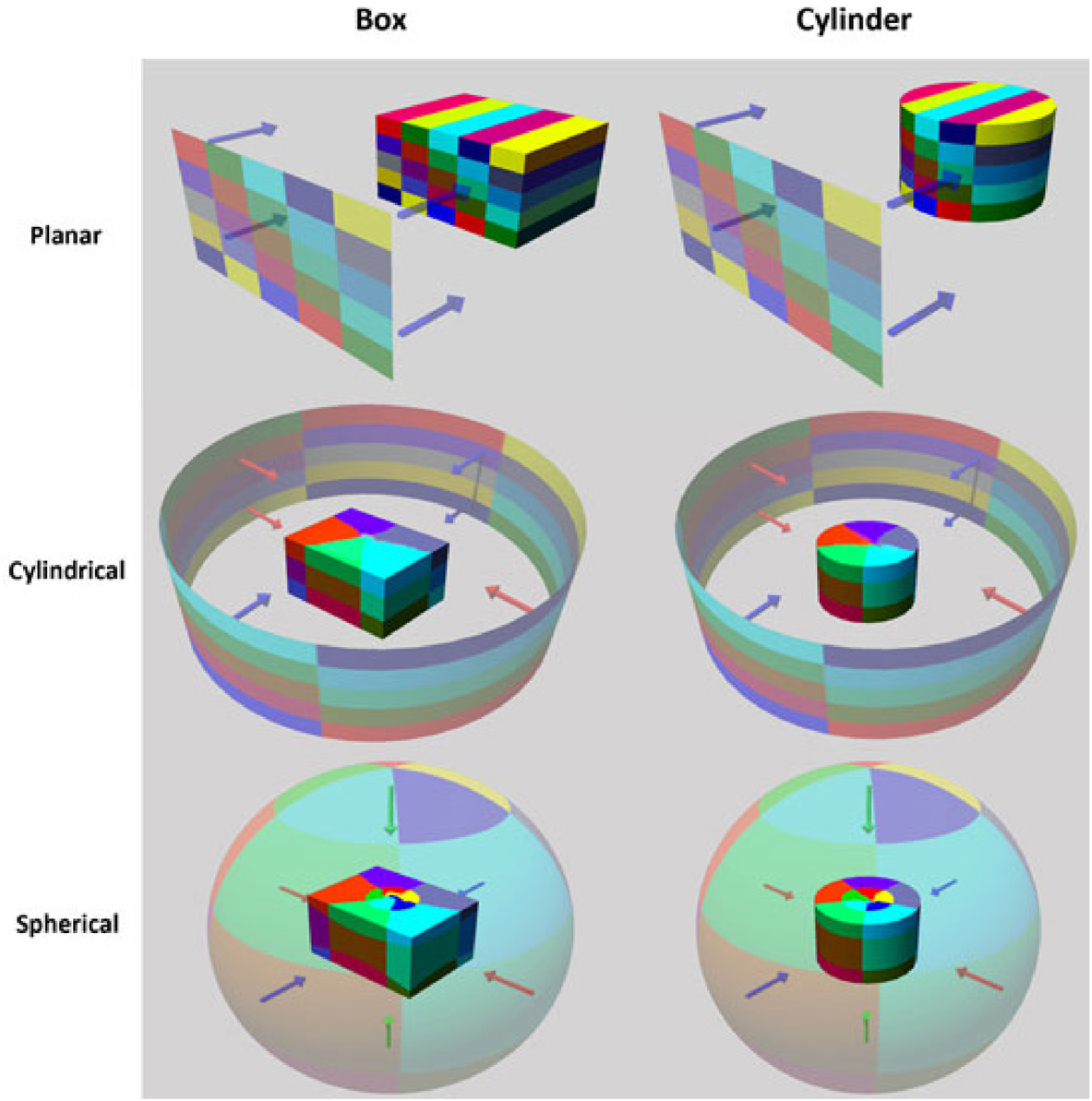
Texture application

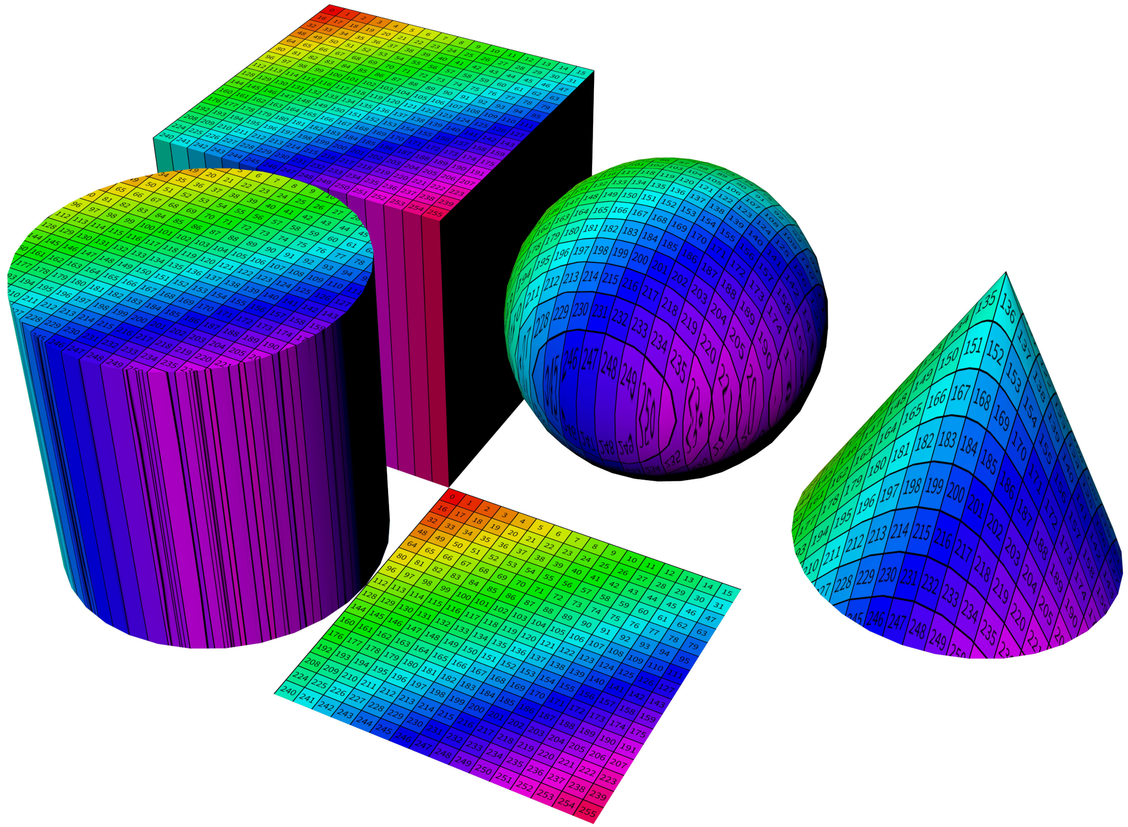
Linking UV coordinates with XY texture coordinates

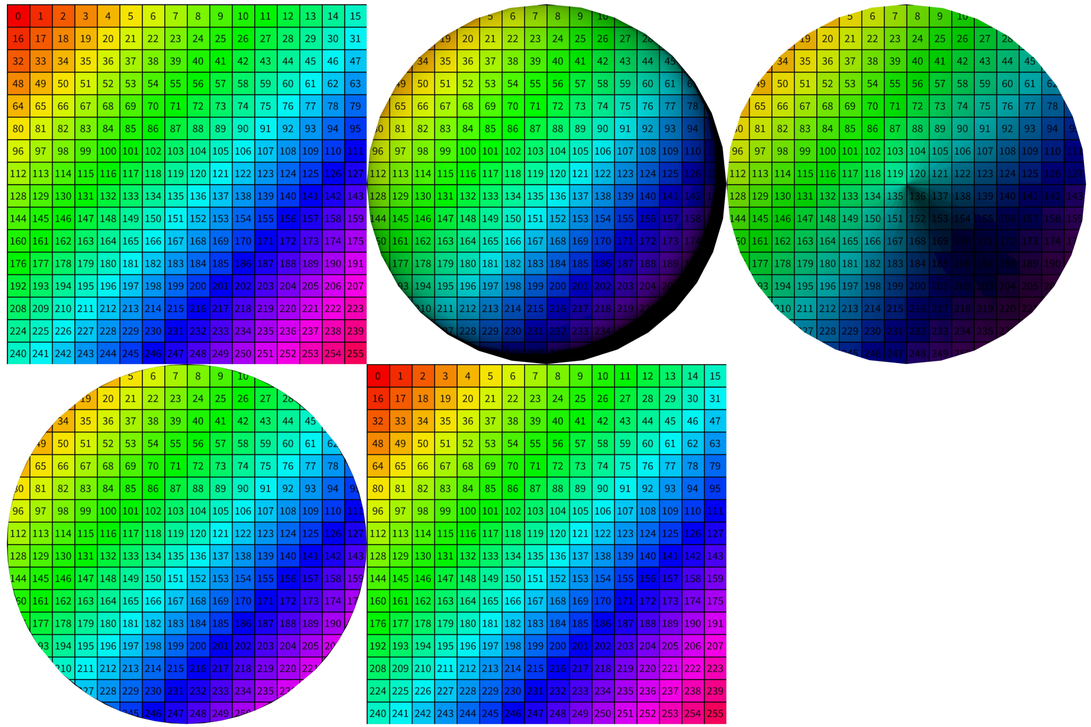
Types of UV mapping

Based on the 3D object we differentiate four main types of mapping:

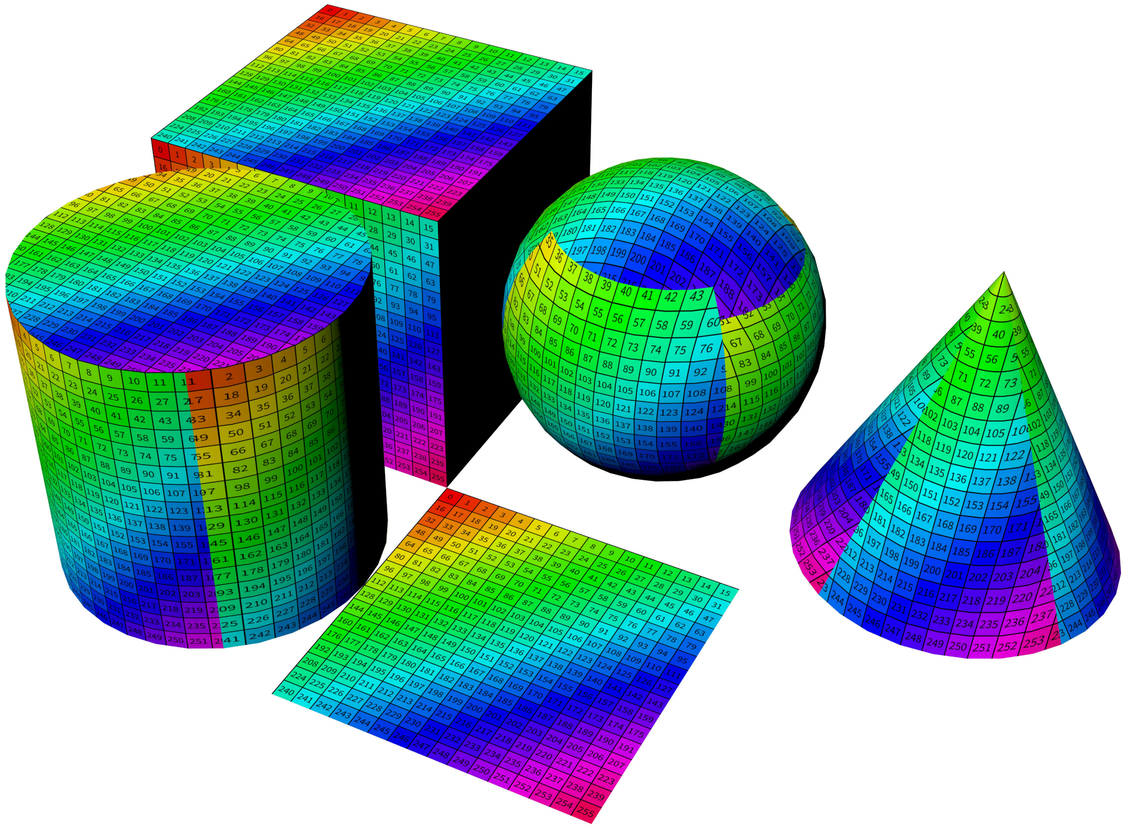
1. Planar
2. Box
3. Cylindrical
4. Spherical

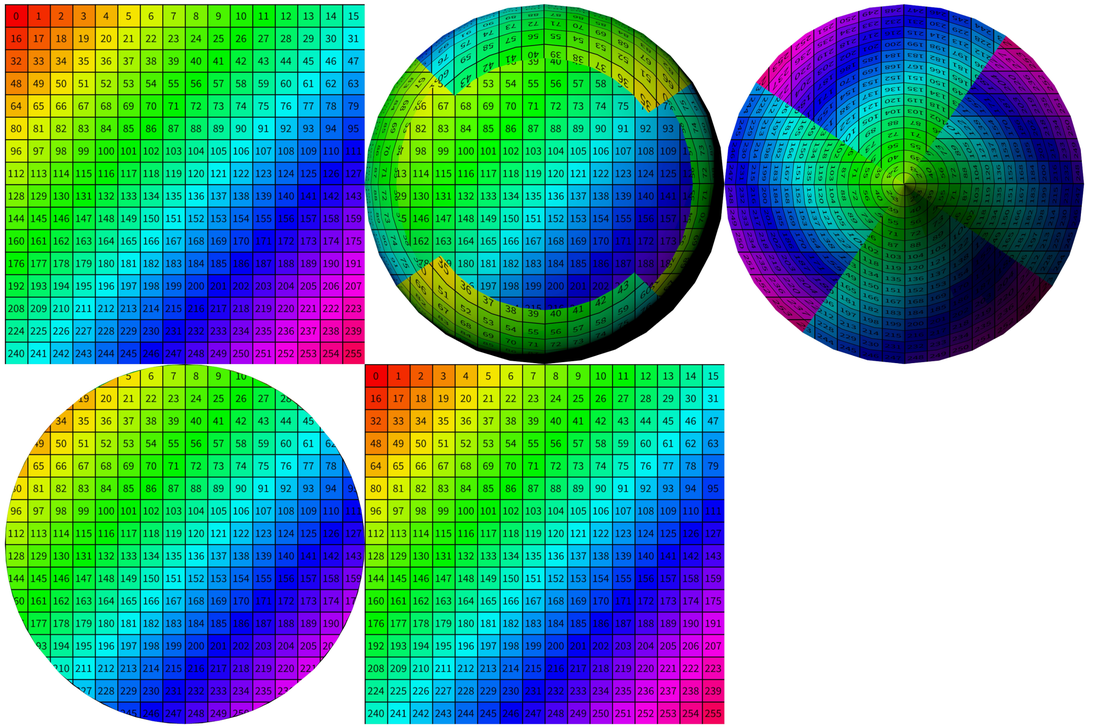




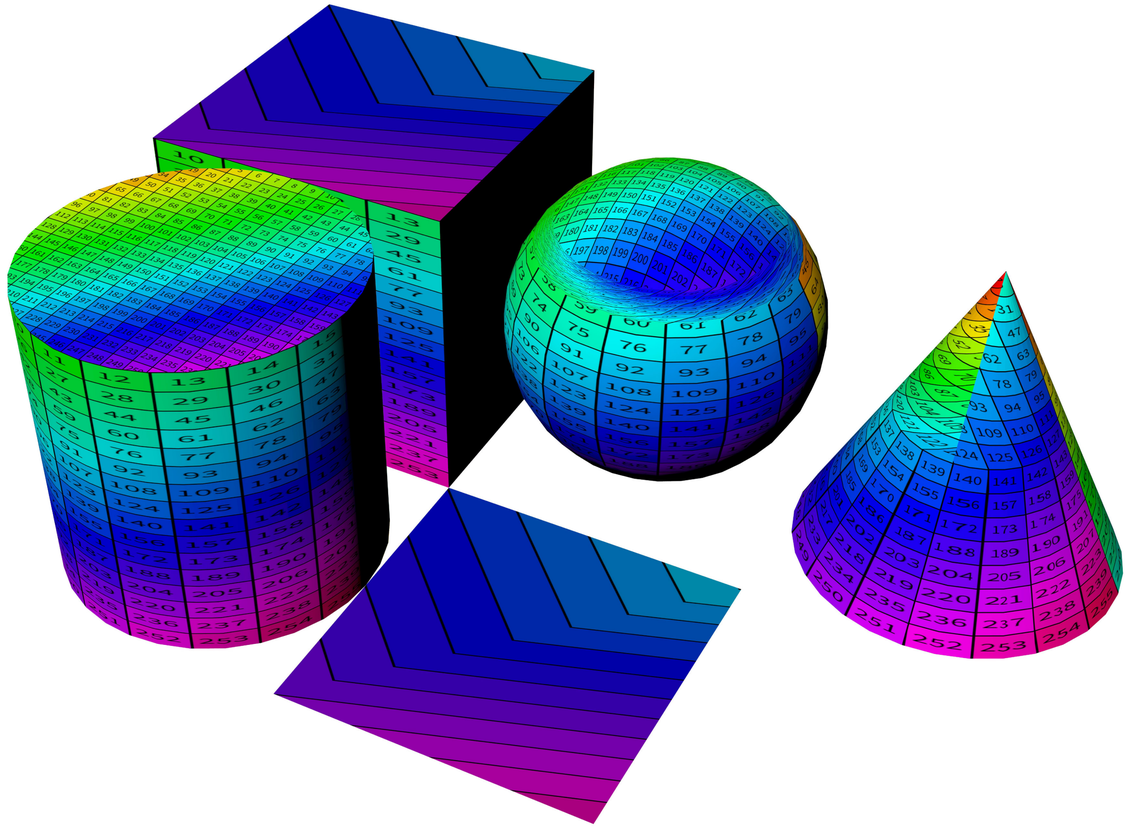


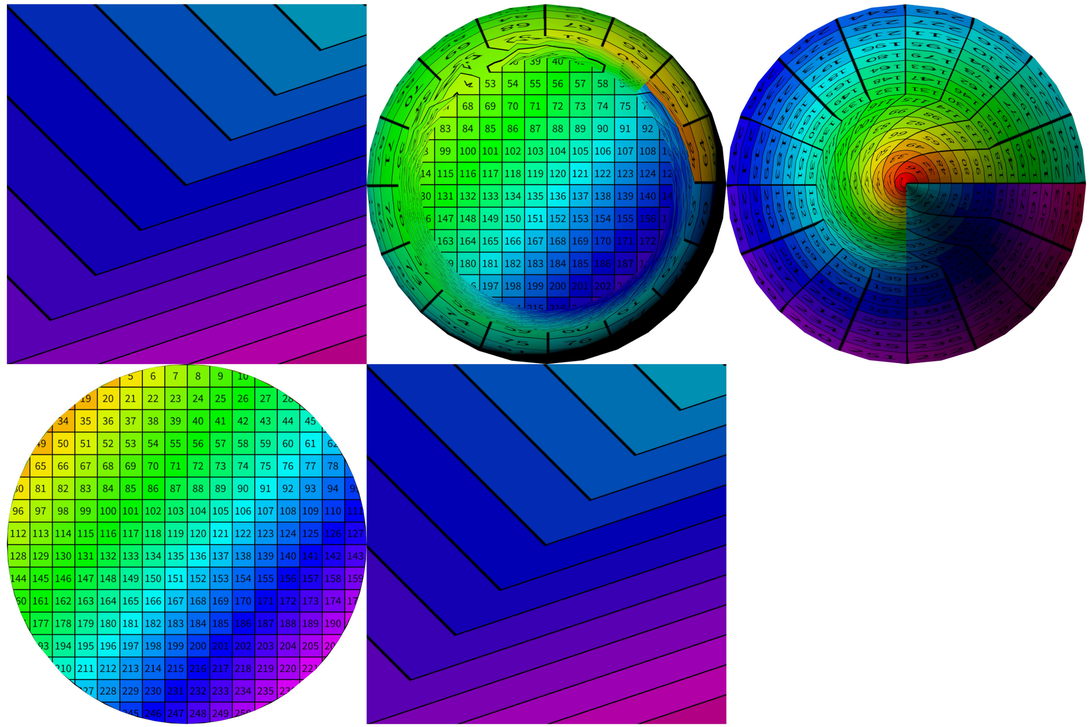
Planar mapping



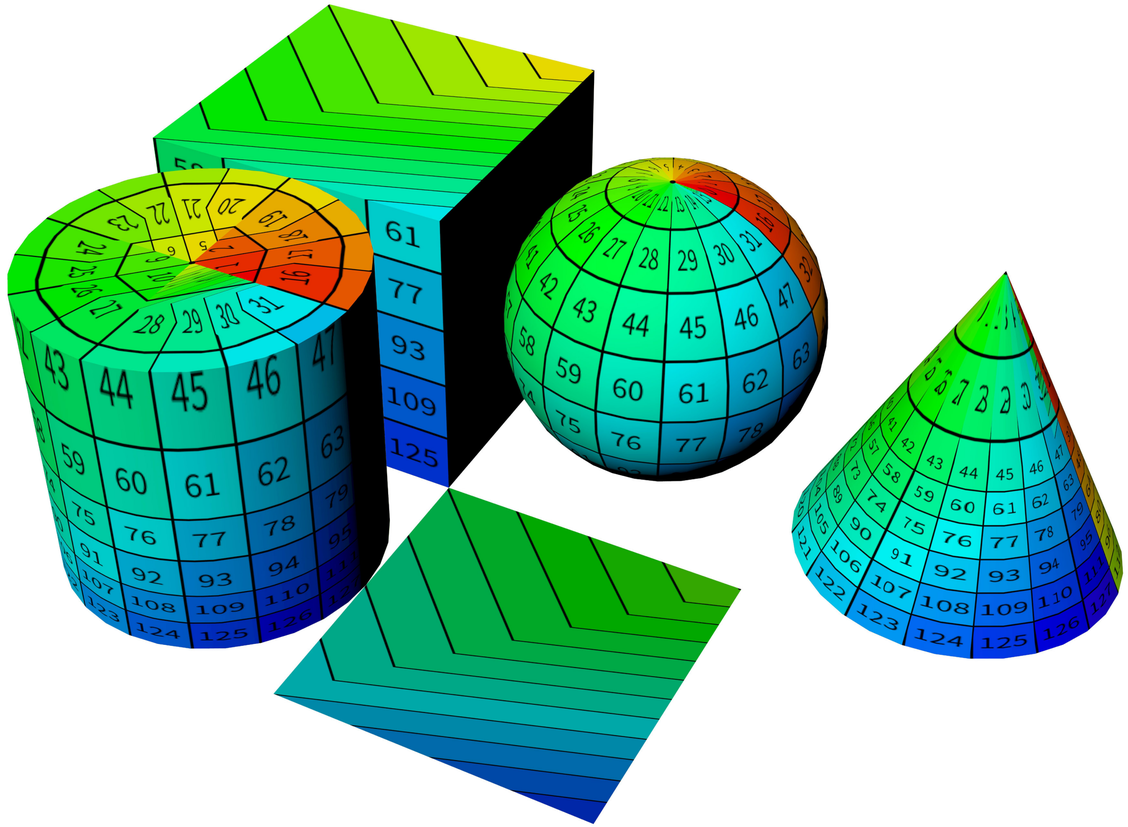


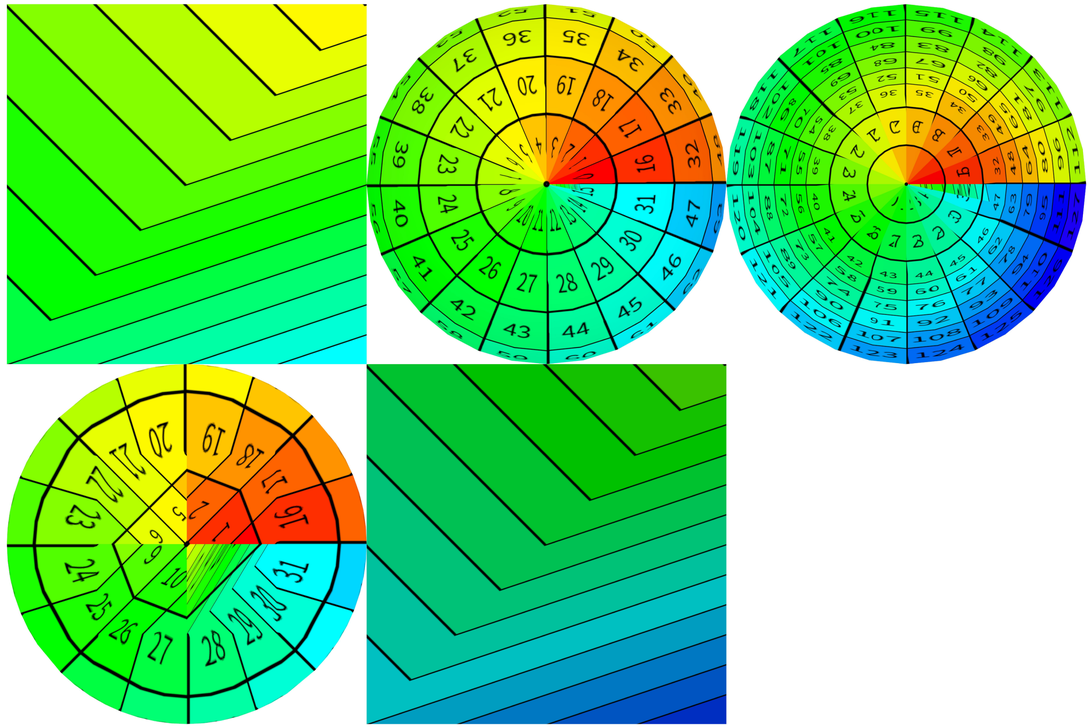
Box mapping



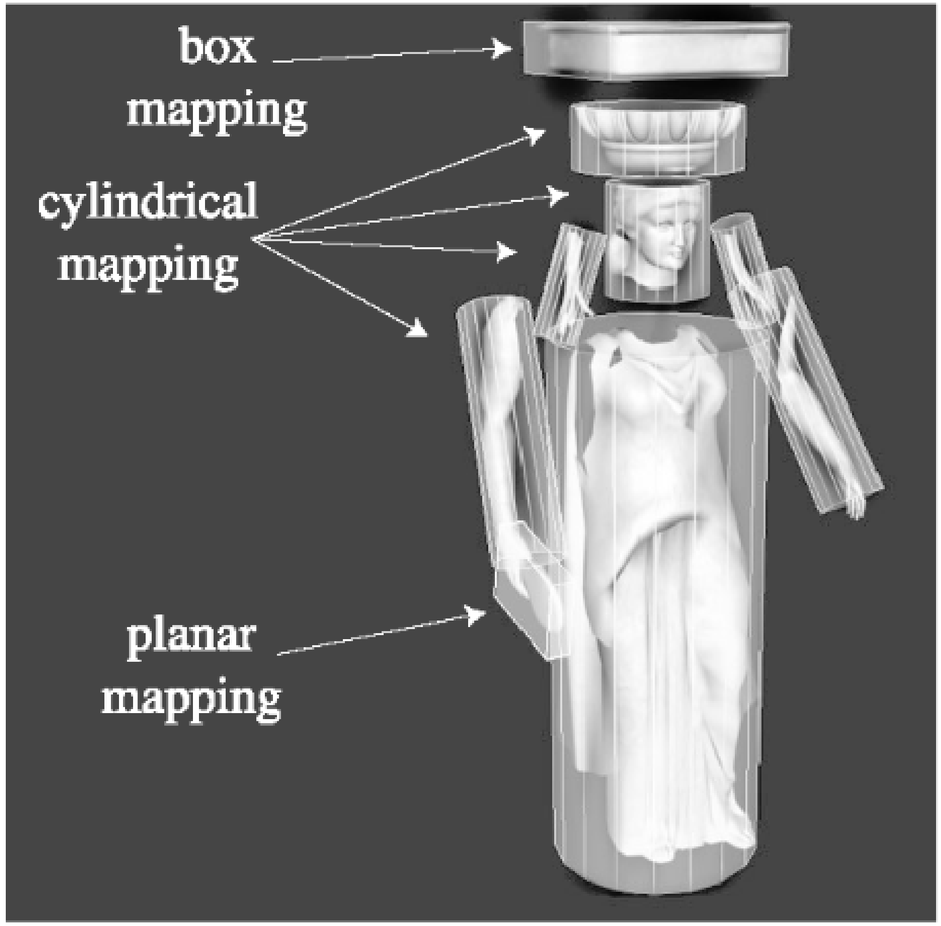


Cylinder mapping





Spherical mapping



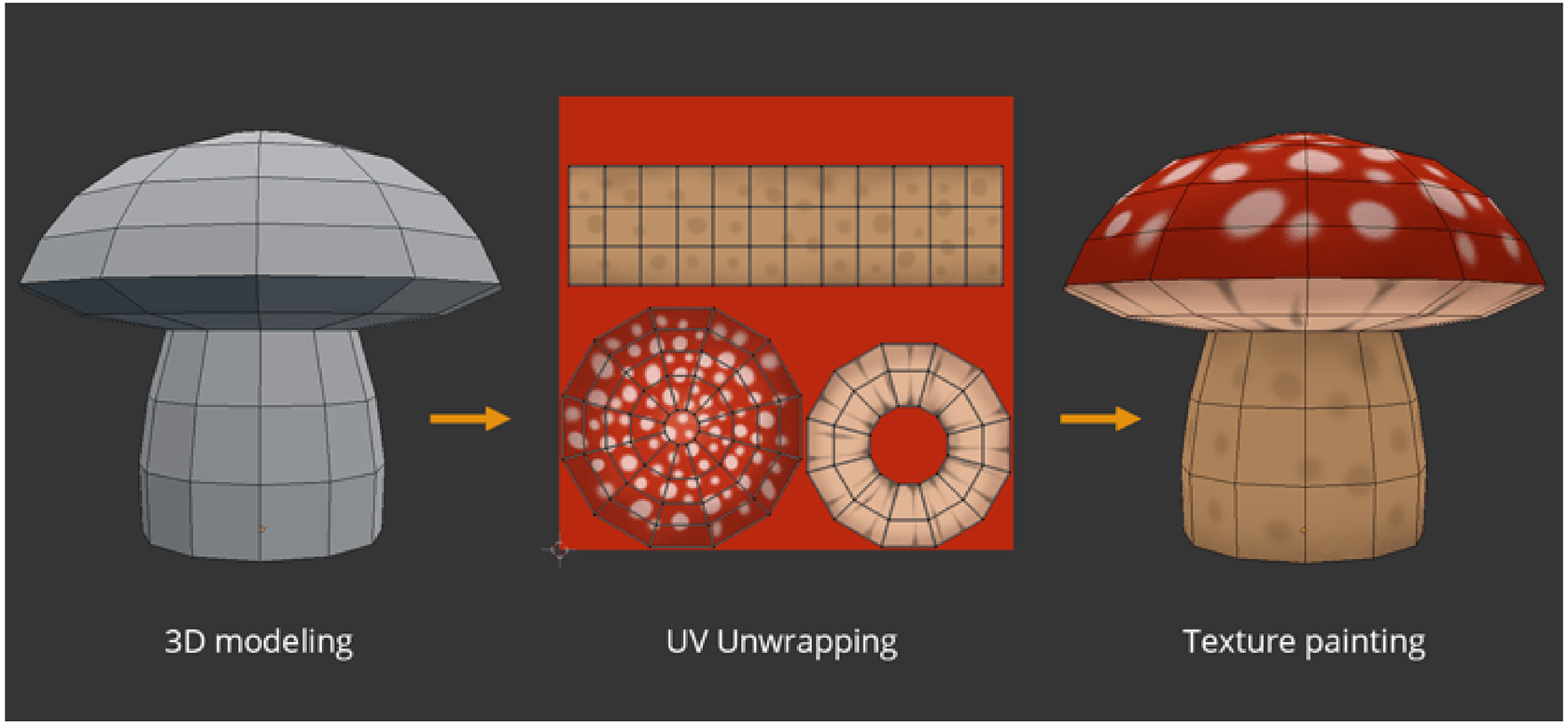
https://cseweb.ucsd.edu/classes/wi18/cse167-a/lec9.pdf

Texture mapping

- Attributes:
  Scale
  Rotation
  Origin

Texture mapping

= process of applying 2D textures onto 3D objects



https://www.blendernation.com/2017/04/22/tutorial-modeling-uv-unwrapping-texturing-mushroom/#prettyPhoto

Texture mapping

= process of applying 2D textures onto 3D objects

PBR vs non-PBR

Physically based rendering - uses accurate lighting to achieve photorealistic textures

Non-Physically based rendering - uses artistic approximations and shaders (less consistent)

Texture mapping

= process of applying 2D textures onto 3D objects

PBR vs non-

Physically based
photorealistic te

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https://diffeomorphic.blogspot.com/2017/12/pbr-shader.html

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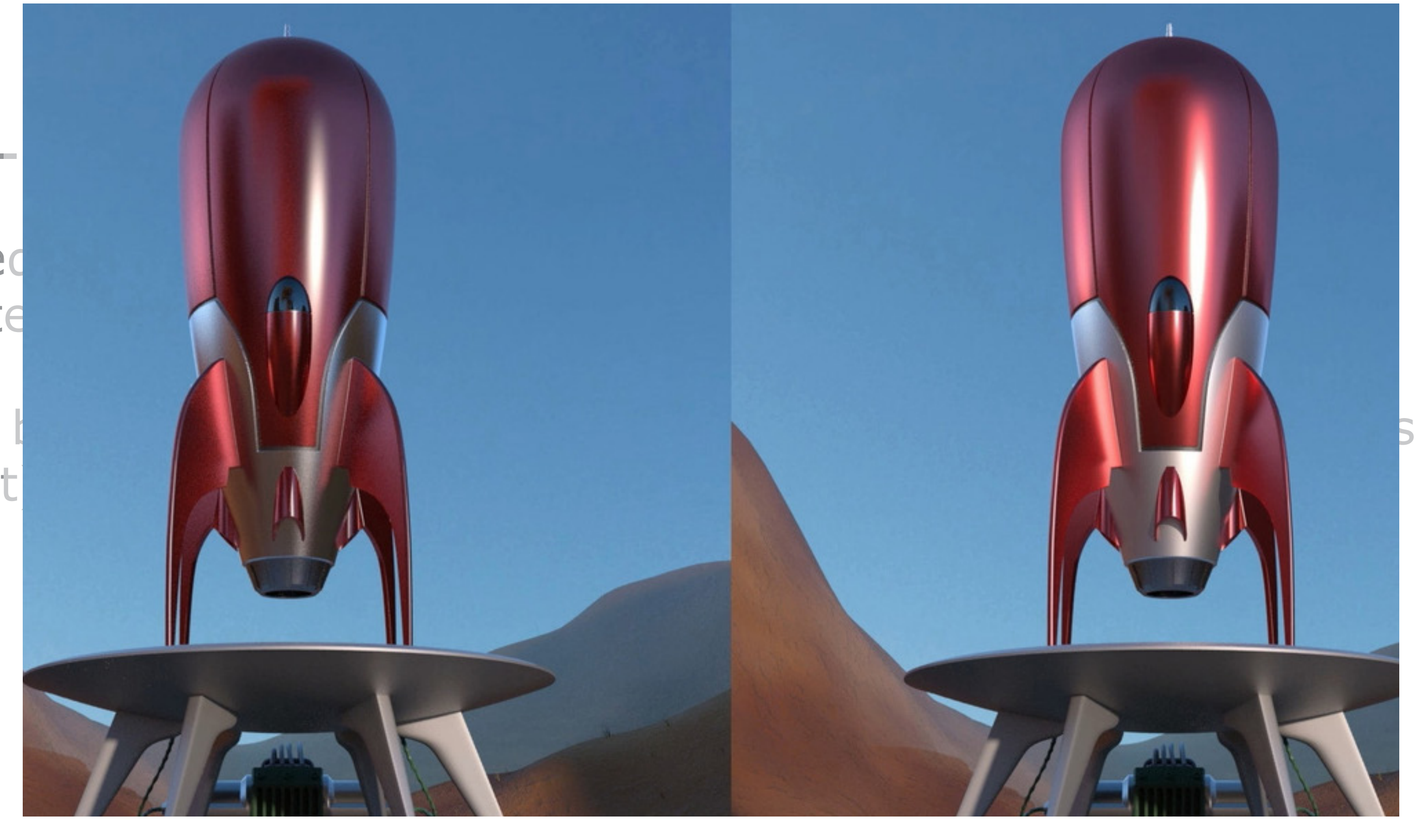

https://community.foundry.com/discuss/post/984729/content/70744;

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PBR vs non-PBR

Physically based rendering - uses accurate lighting to achieve photorealistic textures

Non-Physically based rendering - uses artistic approximations and shaders (less consistent)

Metallic roughness workflow vs Specular glossiness

Metallic - material are defined by metalness and rougness (maps)
Specular - material are defined by specular and glossines (maps)

Texture mapping

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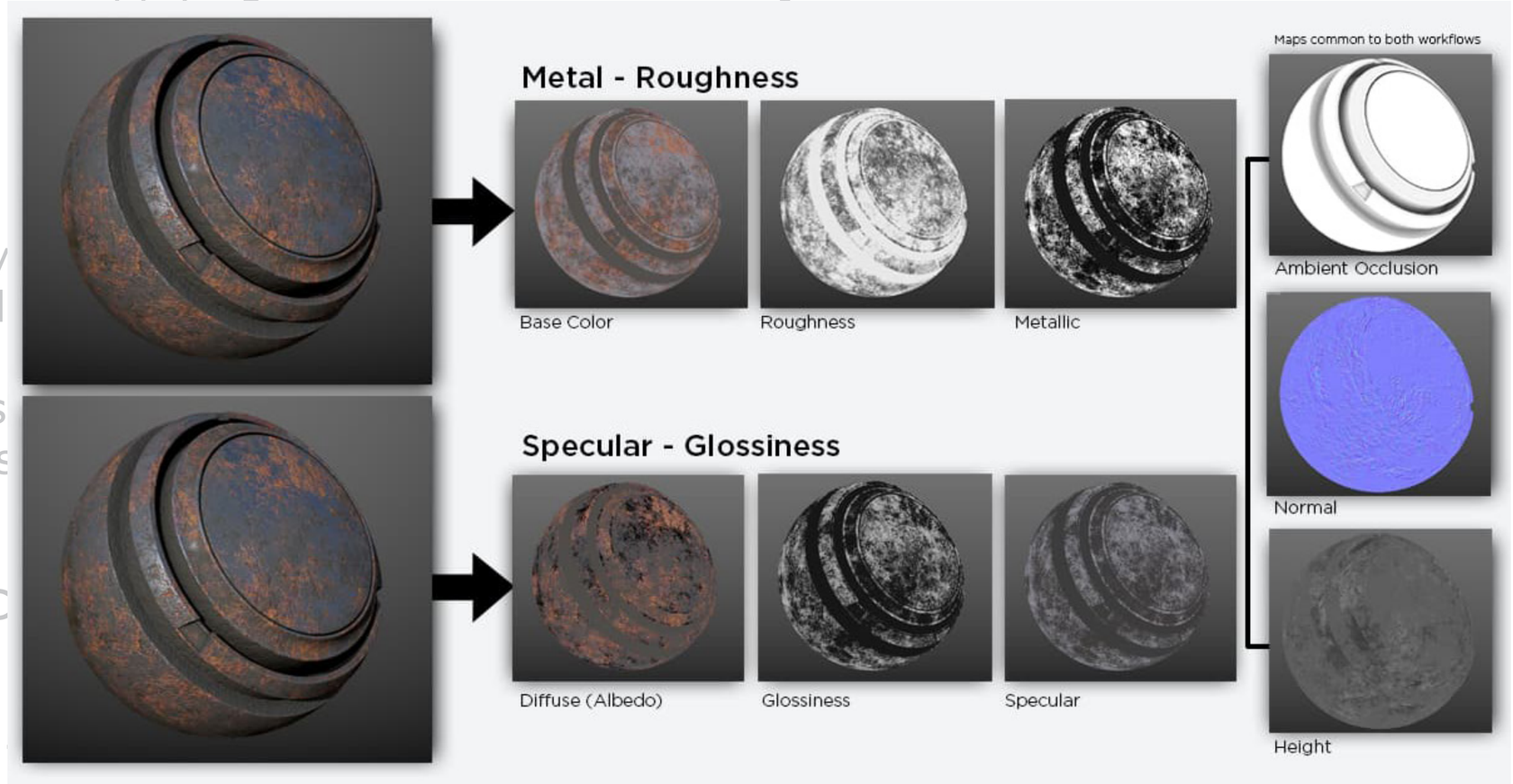
Metallic

Metallic -
Specular



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Texture mapping - overview:

Albedo
Ambient occlusion
Normal
Roughness
Metalness
Displacement
Specular

Opacity
Refraction
Bump

Texture mapping - overview:

PBR

Albedo

Ambient occlusion

Normal

Roughness

Metalness

Displacement

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Non-PBR

Opacity

Refraction

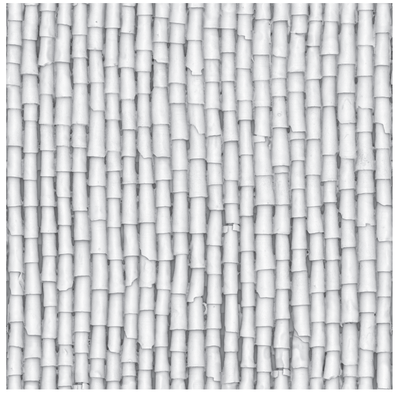
Bump

Albedo (Base)

- PBR version of color texture
- can be called Base color or Diffuse
  - Diffuse is the non-PBR version
- map scale: RGB or black-and-white color map

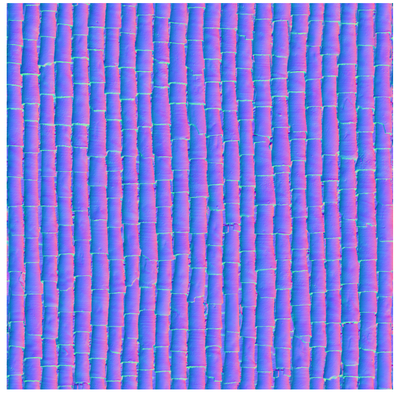
Ambient occlusion (AO)

- PBR version of „shadow“ texture
- provides subtle details, that DO NOT change the geometry
- map scale: grayscale map
  - from 0 to 1



Normal map

- uses calculation to fake dents and bumps
- captures 3D data in 2D texture, but DOES NOT change the geometry
- map scale: RGB map
  - RGB values translate to X,Y and Z values of each point on the mesh



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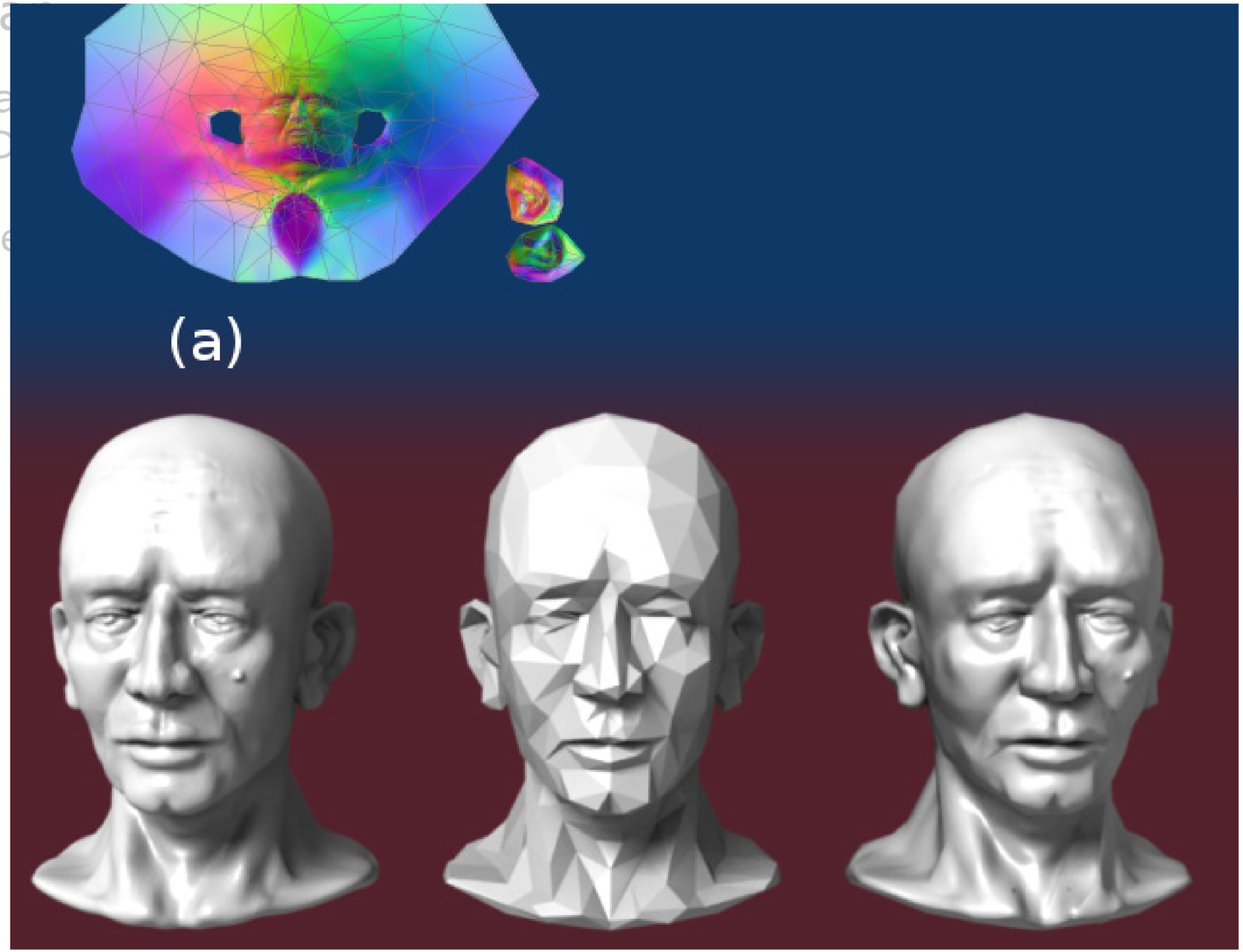

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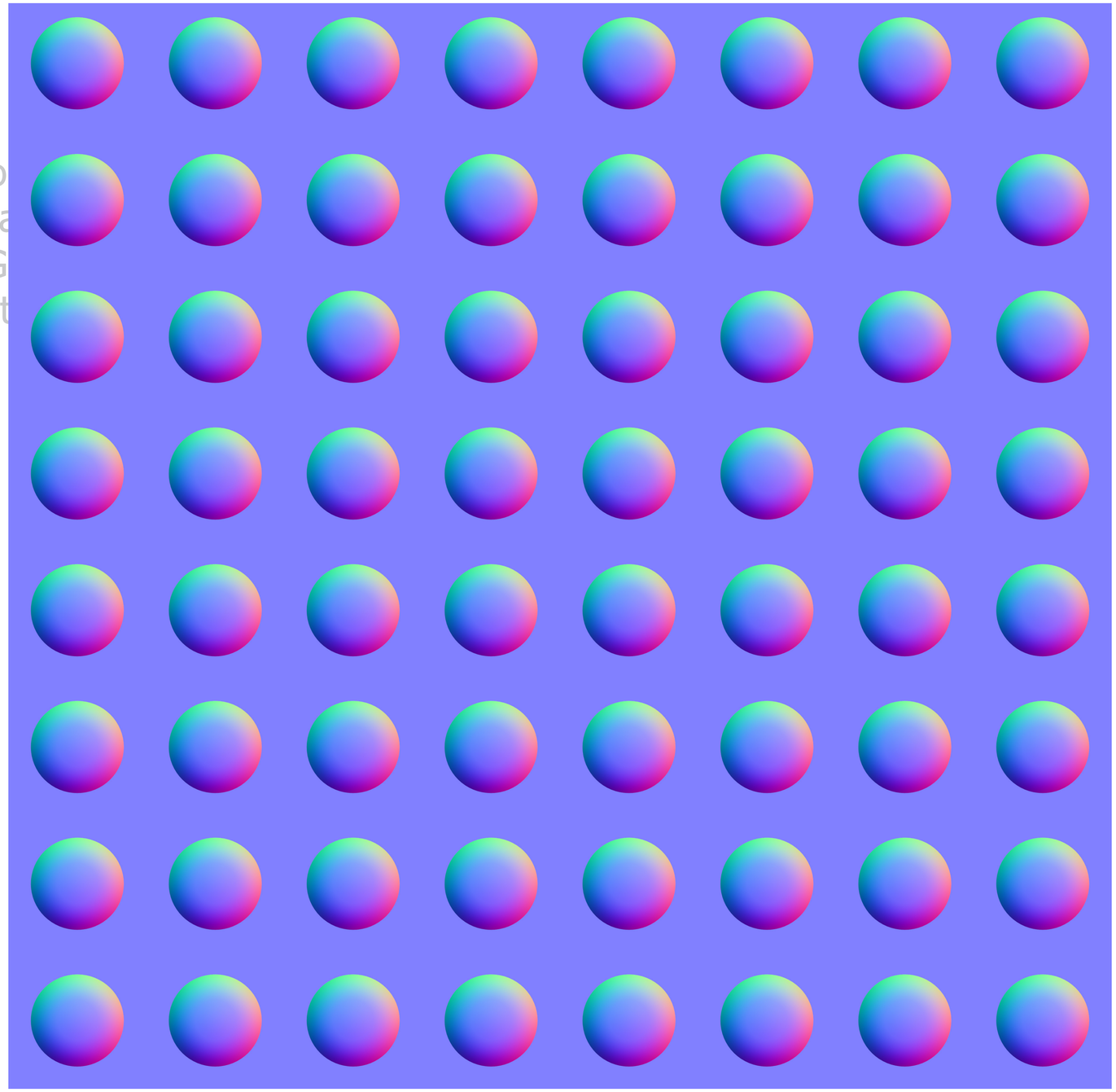

Normal map

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- map scale:
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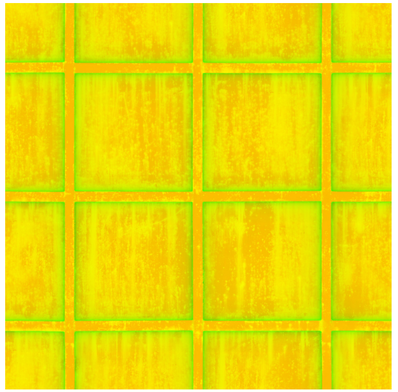
Roughness map (Rough)

- determines the roughness of the model
- can be called Glossiness
- map scale: greyscale map
  - from 0 to 1

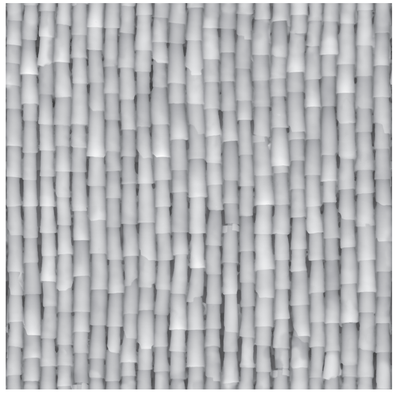
Metalness

- determines how much a surface reflects its surroundings
- splits surface into metal and not metal (albedo)
- map scale: black-and-white map
  - from 0 to 1



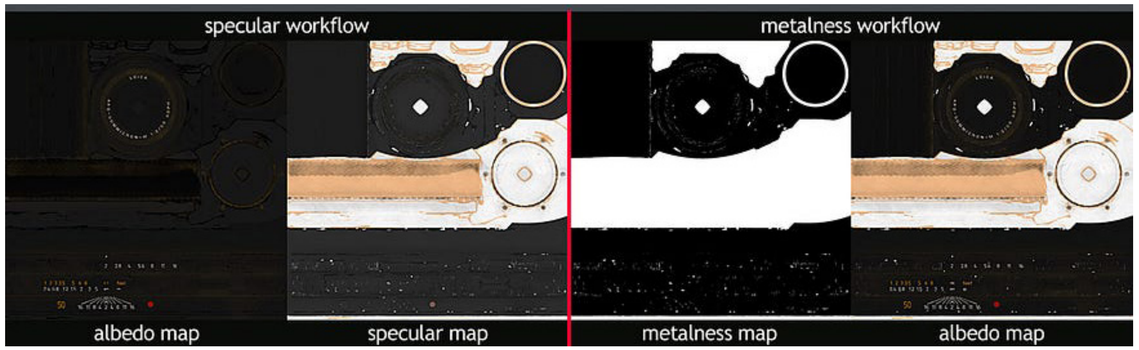
Displacement

- best details under any lighting conditions
- can be called Height; DOES alter the geometry of the model
- map scale: greyscale map
  - from 0 to 1



Specular

- defines reflectivity of metals and non-metals
- sRGB can determine the material (and its‘ reflectivity)
- dielectrics range from 40 to 75 sRGB, metal range from 180 to 255 sRGB
- map scale: RGB map

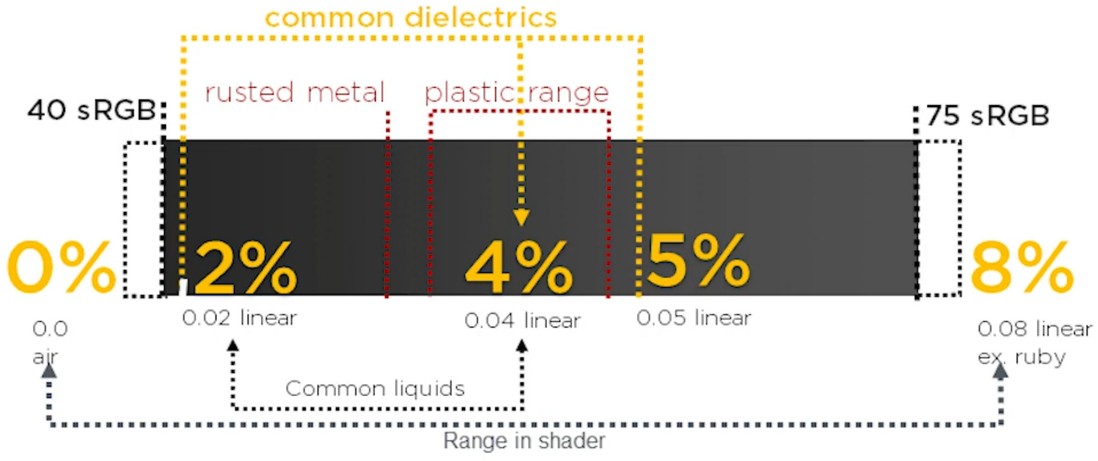


Dielectric

Values in sRGB

Plastic	Rusted Metal	Water	Ice	Glass
(59,59,59) range 55 - 63	(52,52,52)	(43,43,43)	(41,41,41)	(57,57,57) range 56 - 61

Common dielectric ranges don't drastically deviate in value

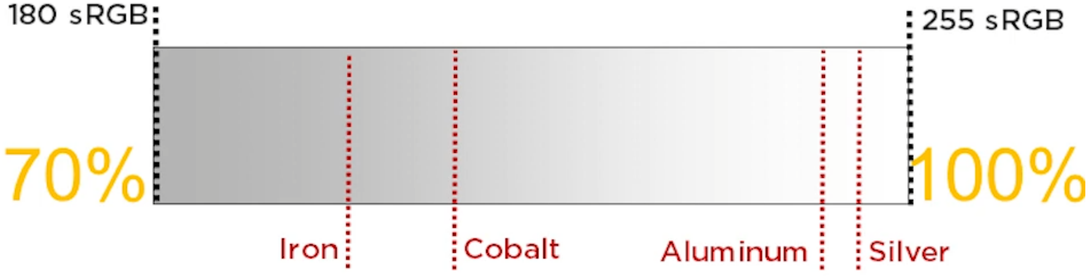


Metal

Values in sRGB

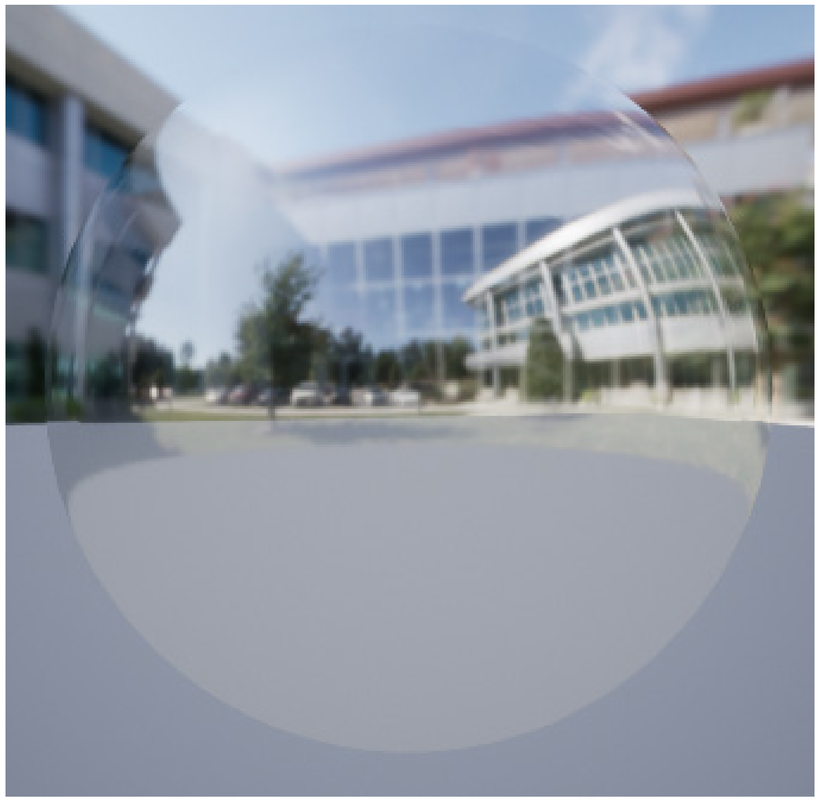
Gold	Silver	Aluminum	Iron	Copper
(255,226,155)	(252,250,245)	(245,246,246)	(196,199,199)	(250,208,192)

Titanium	Nickel	Cobalt	Platinum
(193,186,177)	(211,203,190)	(211,210,207)	(213,208,200)



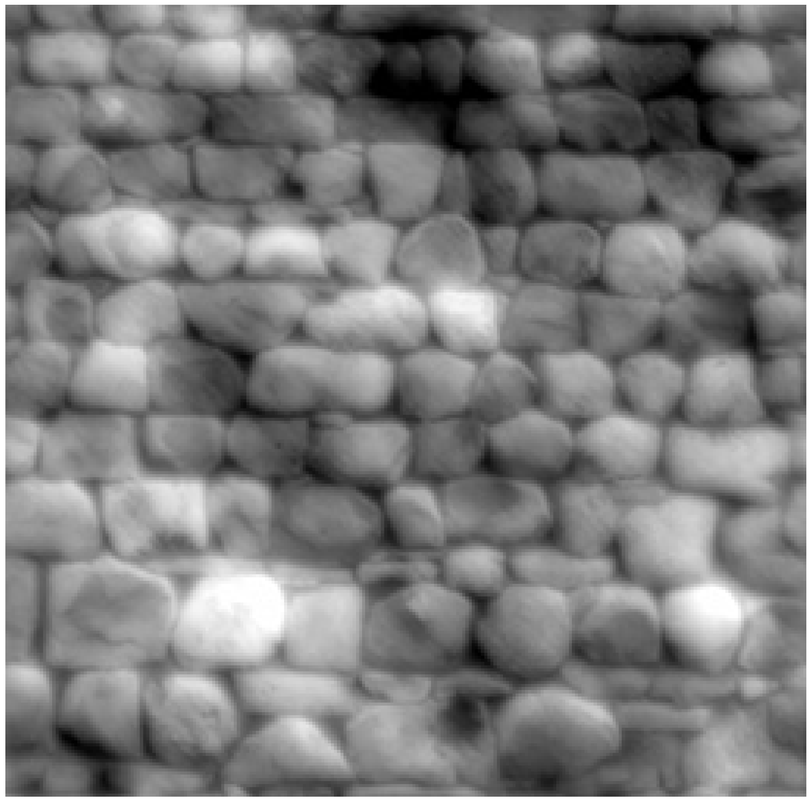
Refraction

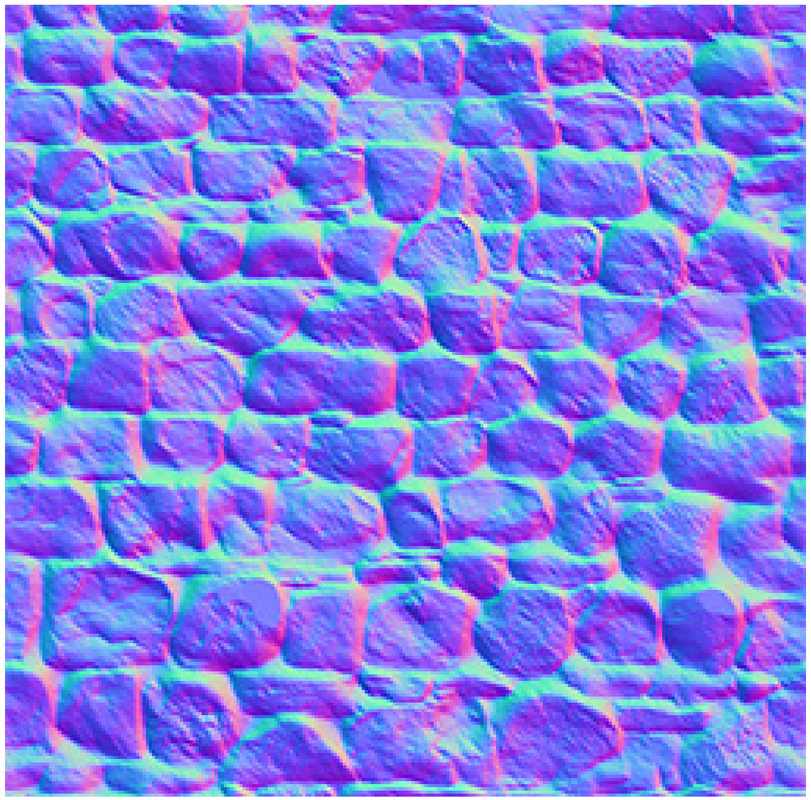
- used to describe how light changes directions in a medium
- usually used for light and water



Bump

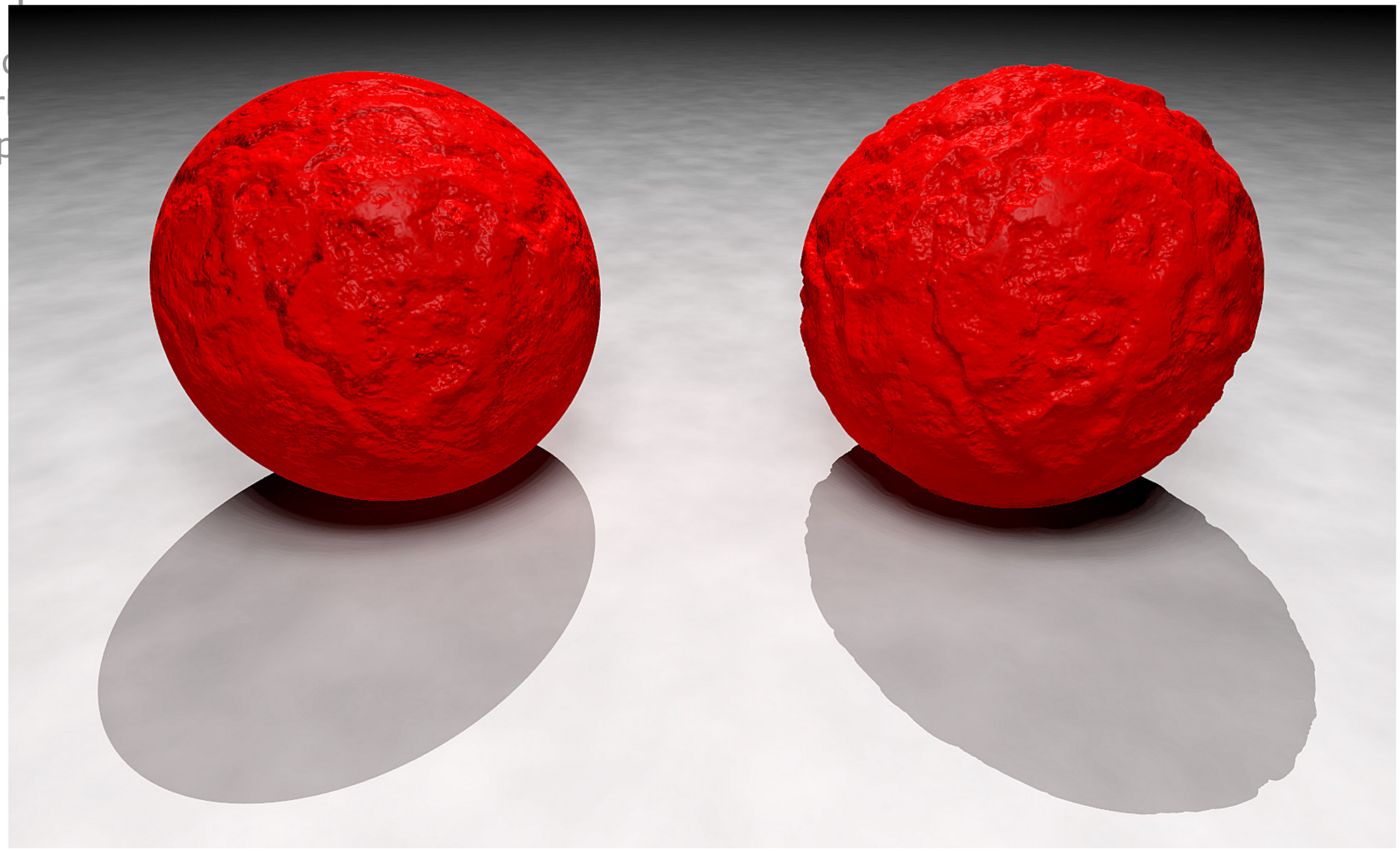
- used for faking texture on the surface
- works in up and down direction; DOES NOT alter the geometry of the model
- map scale: greyscale map





Bump

- used
- wor
- map



Bump

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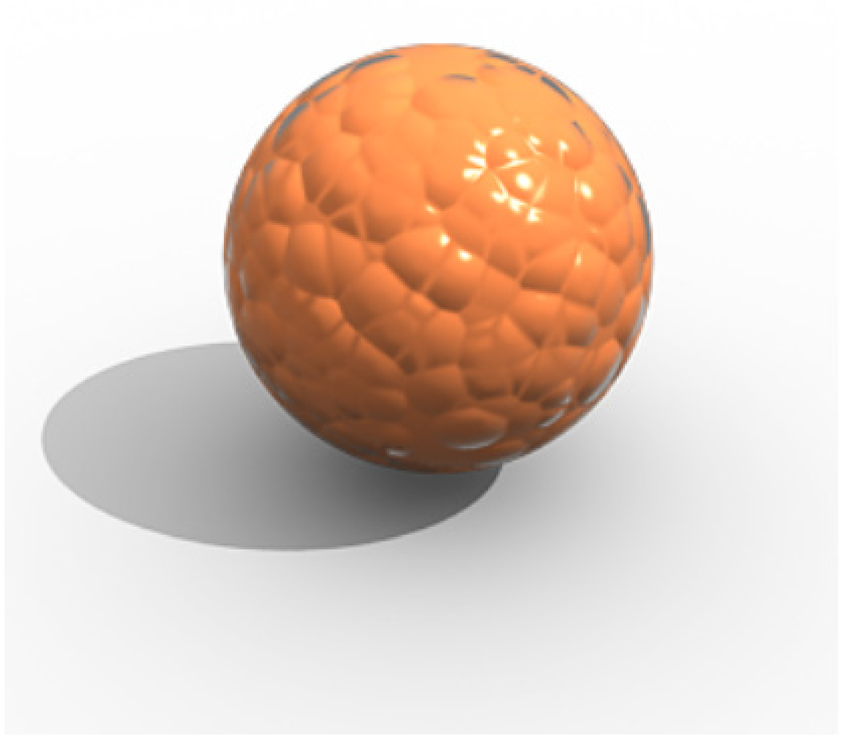
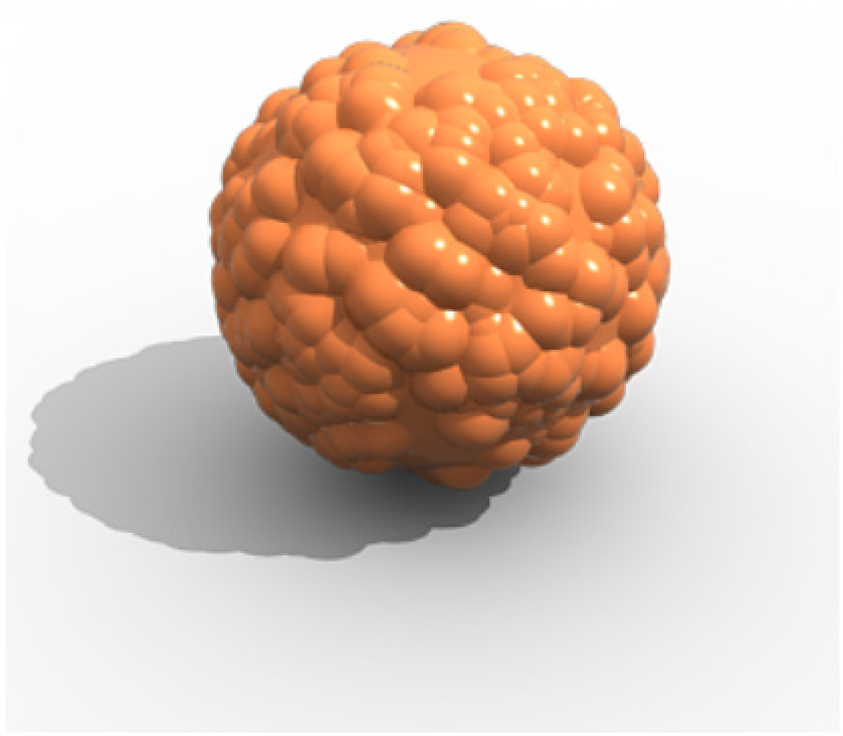
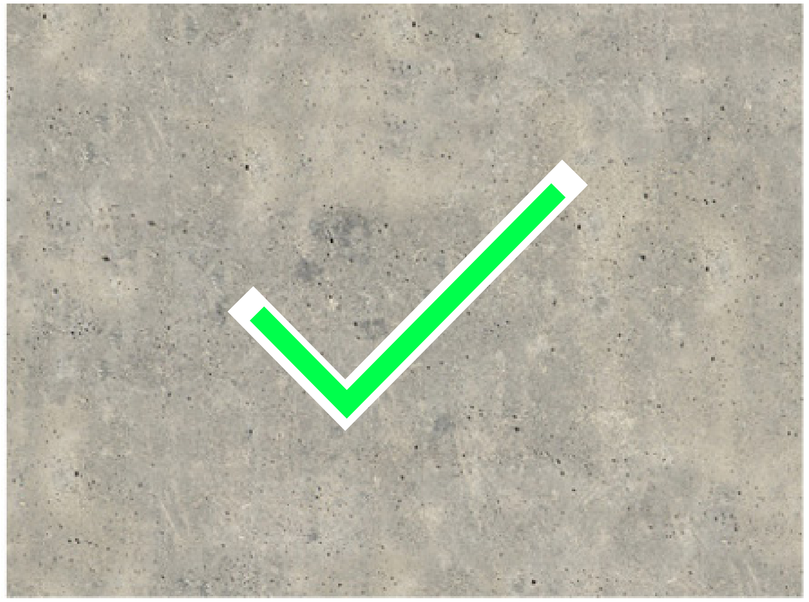




Texturing for **ARCHITECTS**

ei. best practises for modelling/rendering

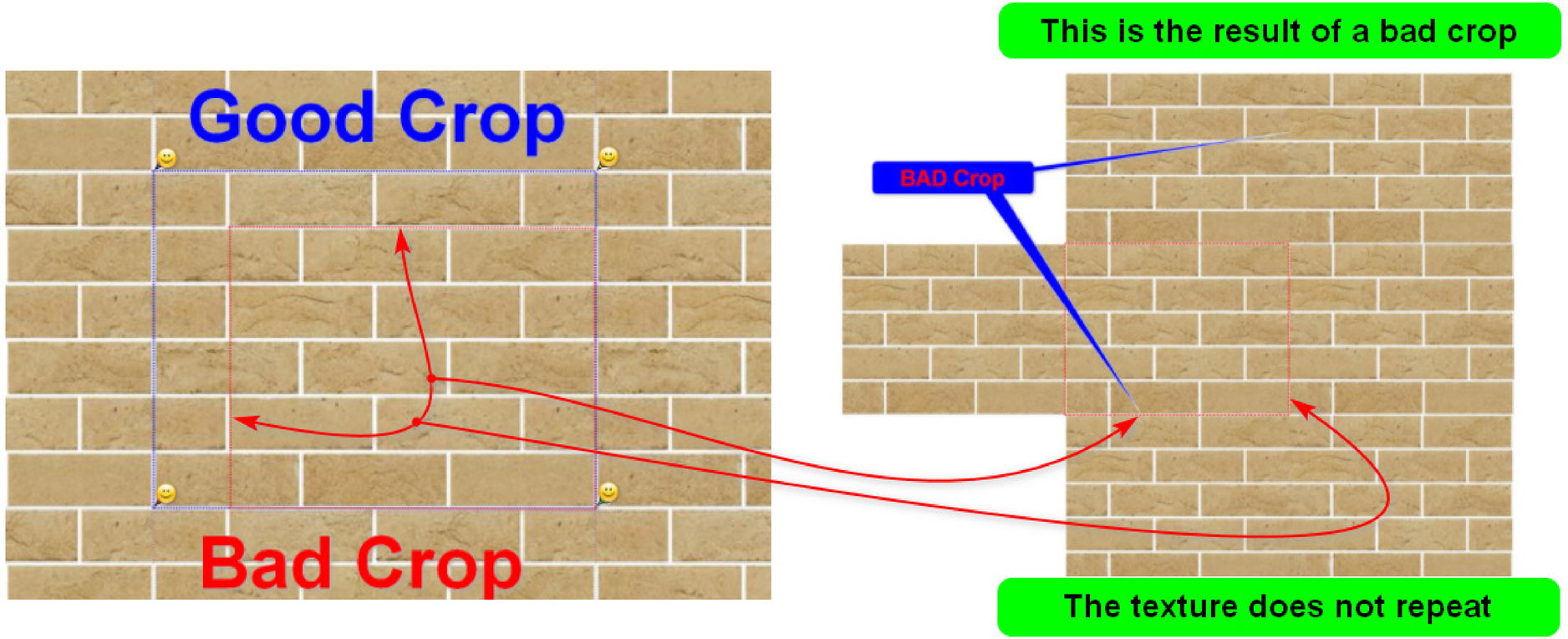


Problem: **Seamless texture**

Solution: Create / aquire seamless texture

Tutorial for seamless texture creation: http://www.davidhier.co.uk/Tutorials/concrete2.html

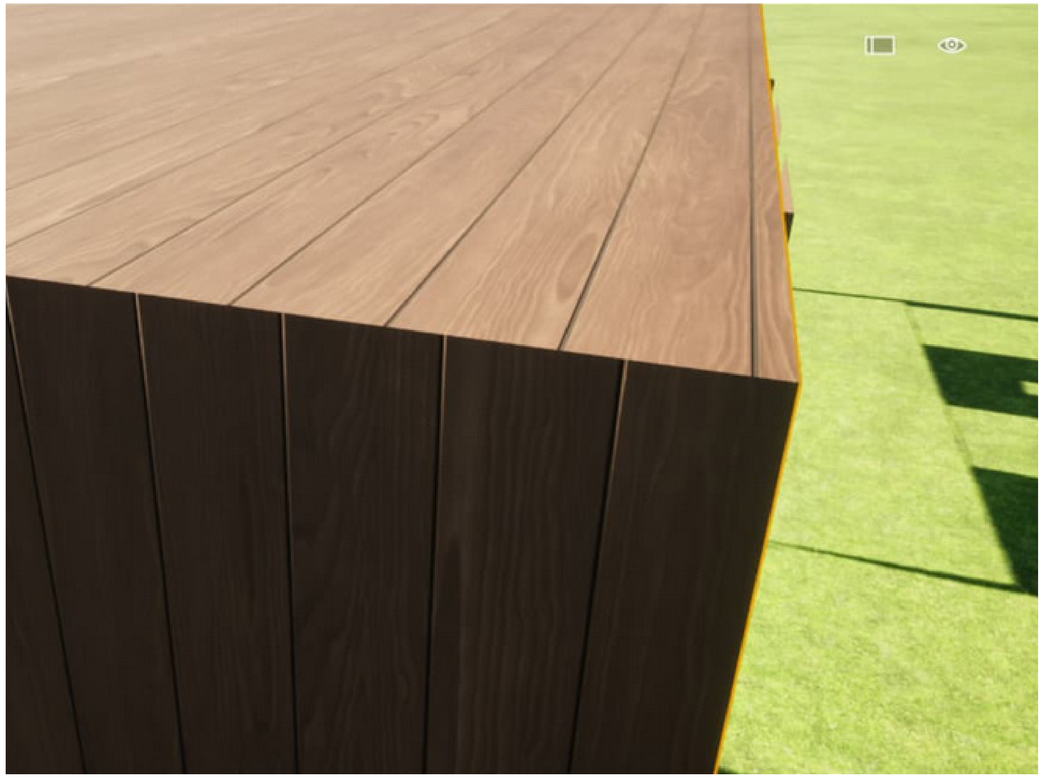
Problem: **Visible texture connection**

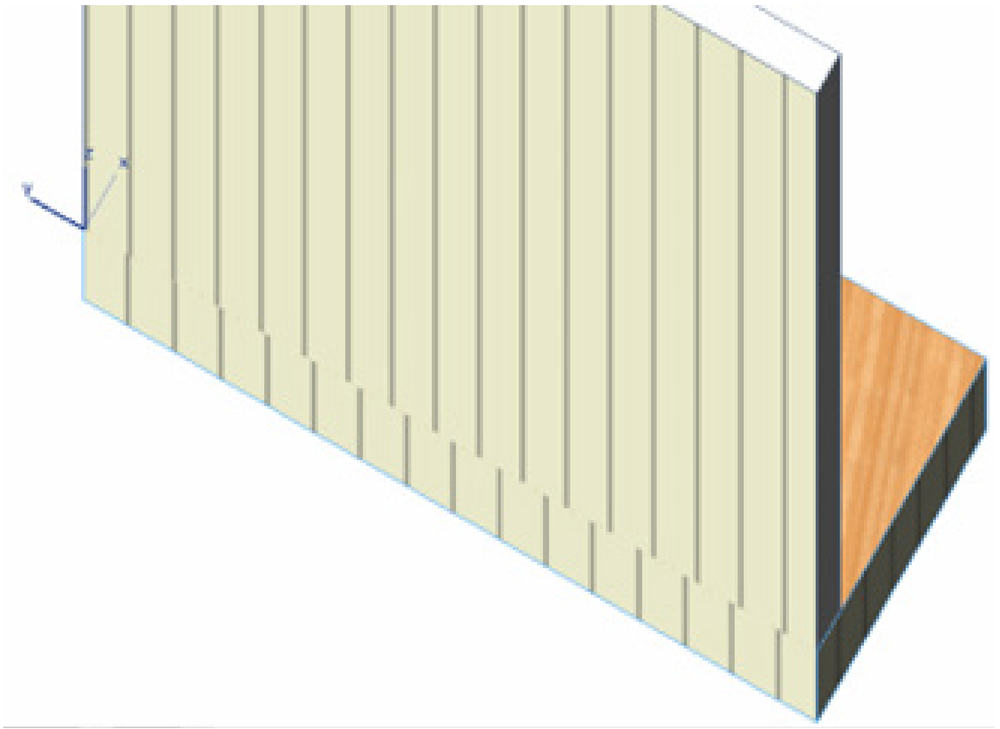


Solution: Cropping texture at correct breaks

https://plusspec.com/wp-content/uploads/2017/08/Seamless-Texture-blog9.png

Problem: **Texture misalignment**





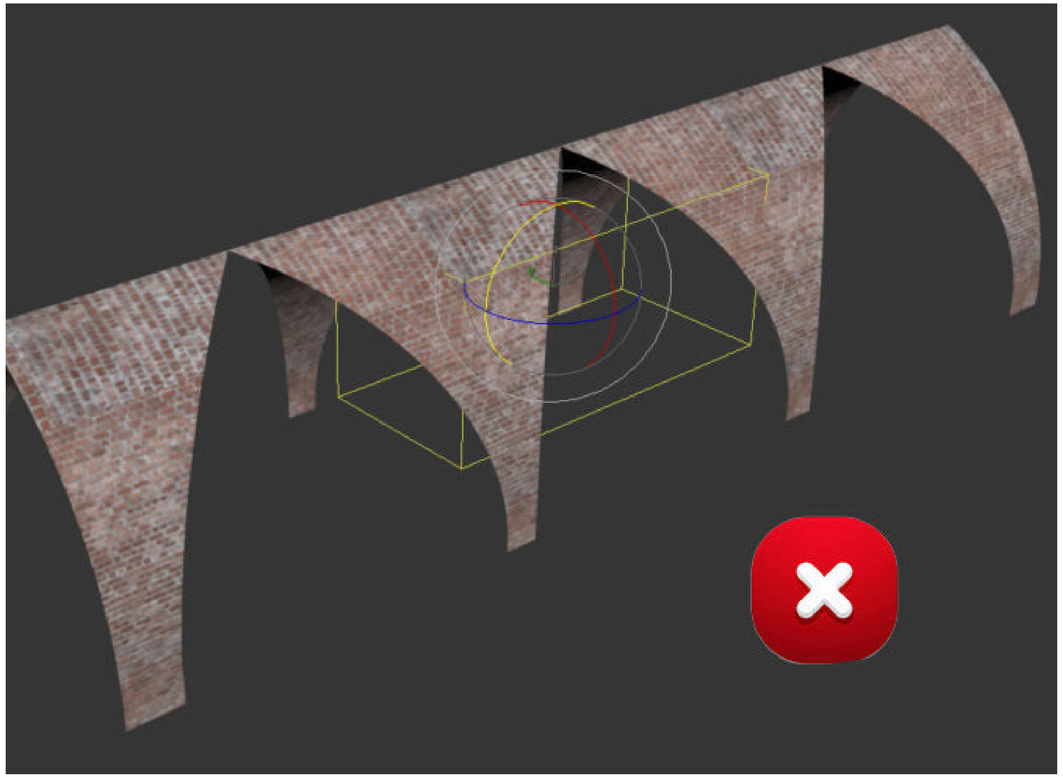
Solution: Adjusting UV rotation, scale, base point

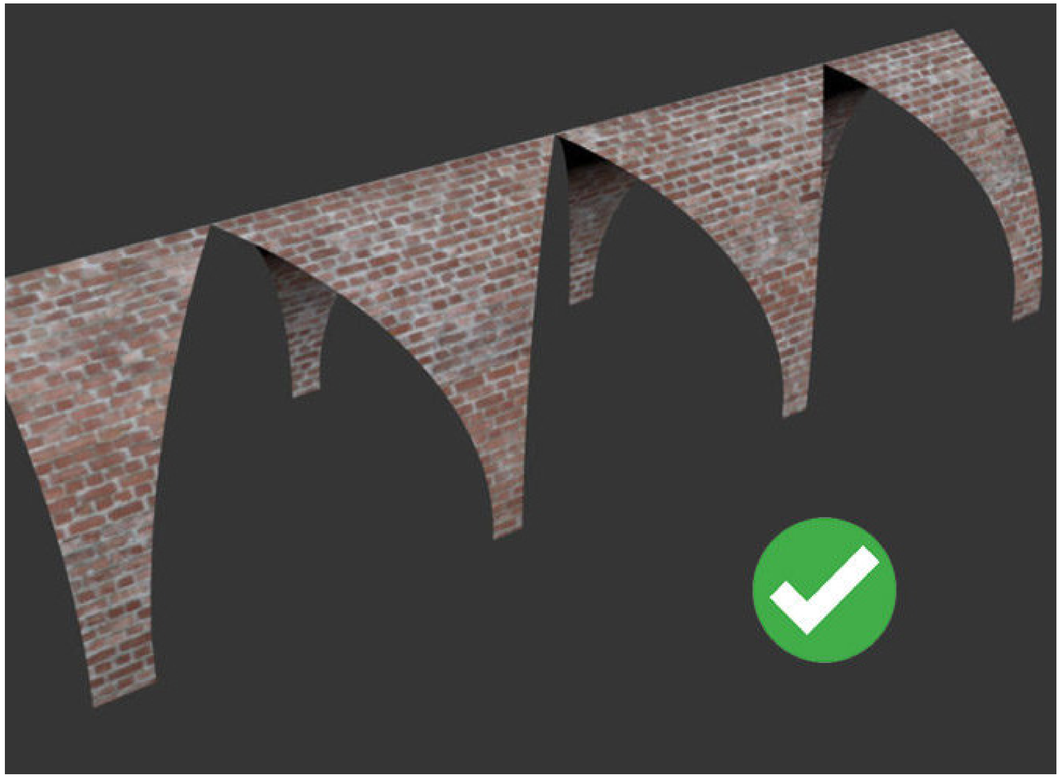
Problem: **Wrong texture mapping**

Solution: Switch to correct mapping

UV mapping programs: **Blender**, Maya, **3Ds Max, V-Ray, UV Reactor**, Unwrella-IO, RizomUV, Rhino

Problem: **Incorrect mapping of complex model**





Solution: Unwrap and align on texture

Zdroje:

https://3dstudio.co/3d-texture-mapping/#non-pbr-texture-maps

https://www.youtube.com/watch?v=CeR-PPmBGVE&t=53s

https://3dstudio.co/uv-unwrapping-software/

https://saint-paul.fjfi.cvut.cz/base/sites/default/files/POGR/POGR2/11.mapovani_textur.pdf

https://cseweb.ucsd.edu/classes/wi18/cse167-a/lec9.pdf