

Introduction to Computer Animation

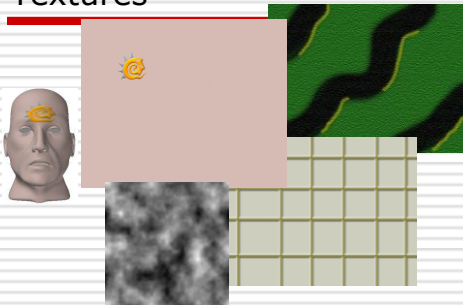
Lecture 9

Module Coordinator: John McQuillan
E-mail: john.mcquillan@uws.ac.uk

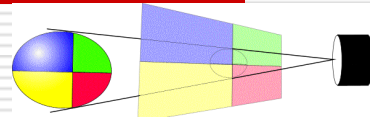
Surface Texture Mapping

- 2D picture applied to a 3D surface
 - images from external programs or from internal functions/plugin-ins
- Two types:
 - Projection mapping
 - Parameterised texture mapping

Textures



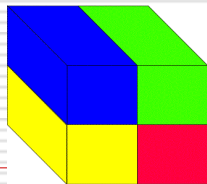
Projection Mapping



- Three forms:
 - Planar
 - Cylindrical
 - Spherical

Planar Projection Mapping

- Flat projection against one surface
- Very simple technique
- projects in the X, Y, & Z planes
- Causes 'streaking'



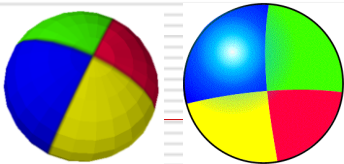
Cylindrical Projection Mapping

- Object effectively sits inside a cylinder made up of the image map that is projected from all sides
- Still can have streaking problems.
- Most useful objects such as vases



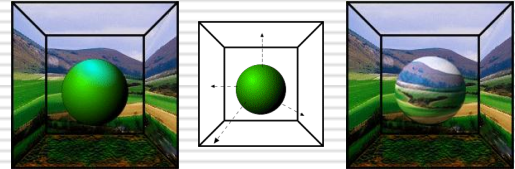
Spherical Projection Mapping

- ❑ Image is wrapped around the object like a sphere and projected from all directions
- ❑ Most useful for roughly spherical objects and cubes



Cubic – the fourth method!

- ❑ Often used in reflection mapping
 - 6 pictures – one for each side of a cube
 - Mapped directly onto the '6' surfaces of the object



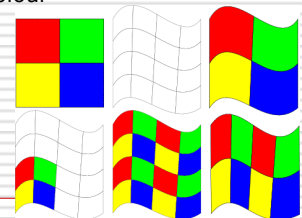
Flight of the Navigator

- ❑ Reflection mapped spacecraft

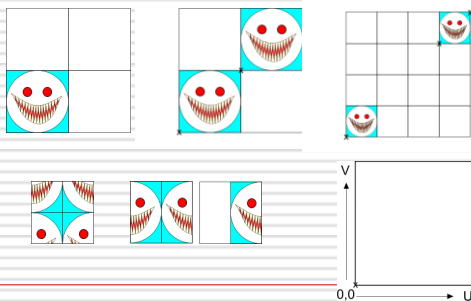


Controlling Mapping

- ❑ Scale
 - usually a percentage
 - can also scale colour
 - ❑ called 'effect'
- ❑ Placement
 - UV co-ordinates
 - Off-set
- ❑ Wrapping



Placement & Wrapping

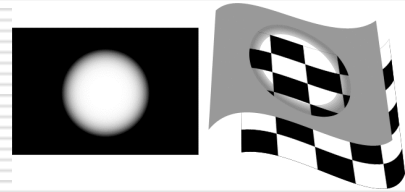


Colour Texture Mapping

- ❑ Pixel colours mapped directly to the corresponding region of the object surface.

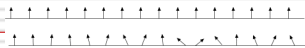
Transparency Mapping

- ❑ Pixel values are used to apply a degree of transparency to the surface
- ❑ Can be used to vary the opacity of regions of a surface
- ❑ Brighter the pixel value the greater the transparency



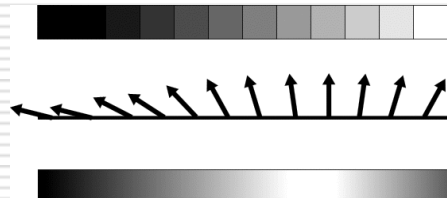
Bump Mapping

- ❑ Creates the impression of a 'bumpy' surface
- ❑ Flat surface - normals point in one direction
- ❑ Bumpy surface - normals point in different directions
- ❑ The normals are 'perturbed'



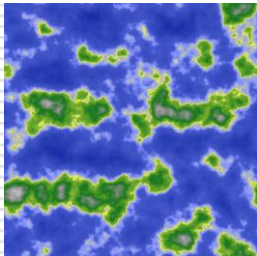
Bump Mapping (2)

- ❑ Based on pixel brightness values

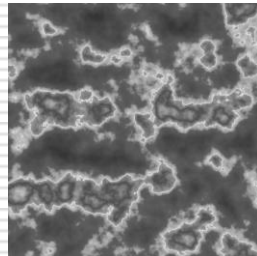


Example Bump Map

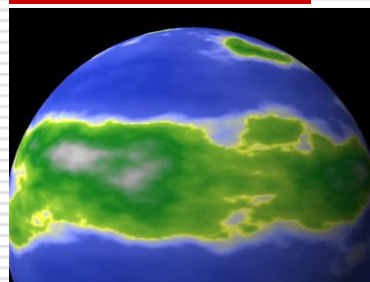
Colour Texture Map



Greyscale Bump Map

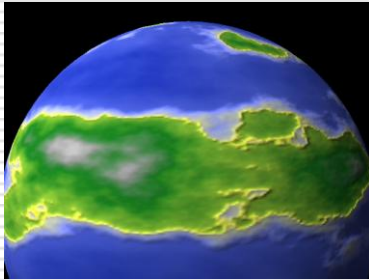


Before Bump Map



Colour texture map only
Polygons look smooth and flat

After Bump Map



Colour texture map and Bump Map

Surface geometry appears more detailed

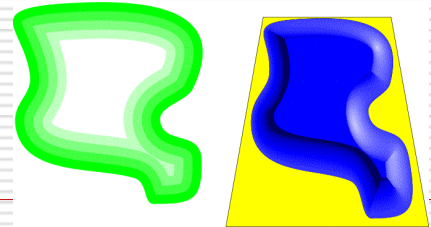
The bump map creates this impression but doesn't require or add any extra geometry

Works entirely by altering the angle of the normals across the surfaces of the polygons

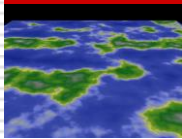
Doesn't work at the edges of polygons

Displacement Mapping

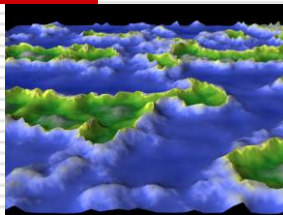
- ❑ Uses pixel brightness to lift areas of the surface out of the plane



Displacement example



Unlike Bump Mapping, Displacement Mapping actually distorts the geometry of the surface and requires a high polygon object to work on



The effect of the displacement can be seen at the edges of the object, unlike in bump mapping

Effect Factors

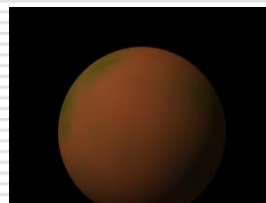
- ❑ Effects of the mapping can be altered through effect factors (parameters)
- ❑ Most mapping techniques have a large number of effect factors such as:
 - Bump/Displacement maps
 - ❑ Degree of displacement
 - Reflectivity
 - ❑ Degree of reflectivity of effected area
 - etc...

Other types of surface texture mapping

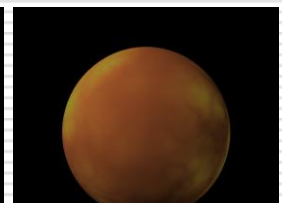
- ❑ Incandescence mapping
- ❑ Specularity mapping
- ❑ Reflectivity mapping

Incandescence/Luminosity (LW) Map

Procedural Colour Texture Map

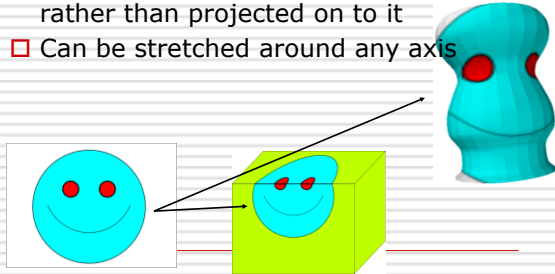


Procedural Incandescence Map



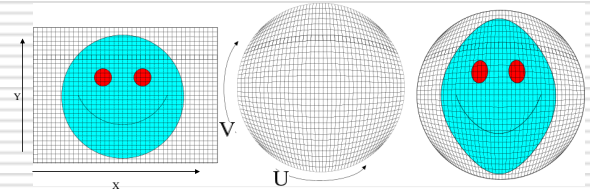
Parameterised Texture Mapping

- Image is 'stretched' over a surface rather than projected on to it
- Can be stretched around any axis

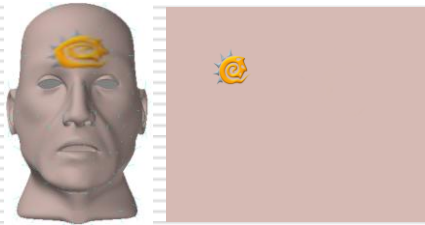


How does it work?

- Texture image is mapped pixel-by-pixel to the object

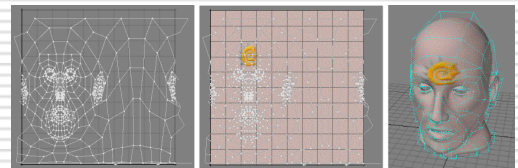


UV Mapping



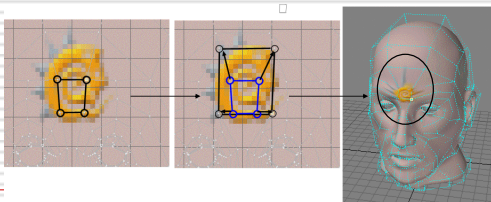
UV Mapping (2)

- Powerful technique

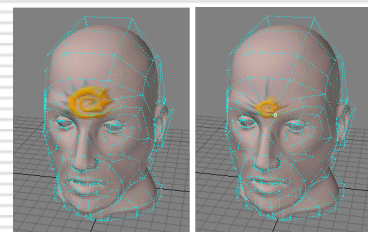


UV Mapping (3)

- Places image on to model based on UV coordinates

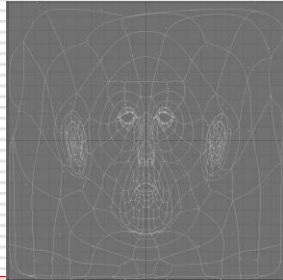


UV Mapping (4)

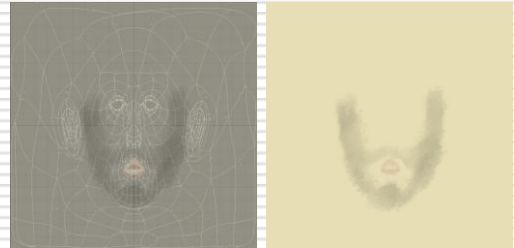


Creating UV textures

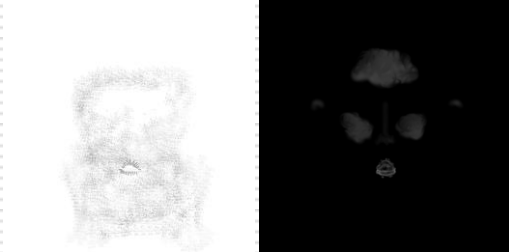
- ❑ Start with the guide
- ❑ Adjust the geometry to fit the area of the UV map
- ❑ Stretch geometry out to reduce number of overlapping polys
- ❑ Copy the guide image into your favourite graphics application
 - Photoshop or the GIMP are best



UV Colour Texture



UV Bump and Specular maps



No UV maps



UV Colour Texture



UV Colour & Bump



UV Colour, Bump & Specular

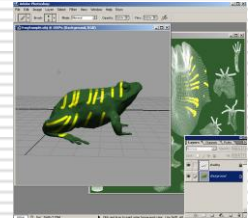


3D Paint Programs

- Plug-in or Standalone application

- **Enzo (Photoshop plug-in)**

- **Future Paint 3D**



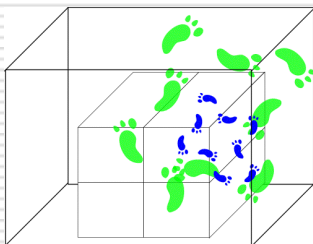
Procedural Mapping

- 3D package created 2D images for mapping
- From simple grids to complex fractal terrain
- Popular for generating
 - wood, metal, stone, marble, etc. surfaces
- Noise parameters can add to the effects

Solid Texture Mapping

- Difficult to render certain 3D surfaces using 2D texture maps
 - most noticeable with wood grain that goes around a corner
- Solid texture mapping 'immerses' the object in a volume of texture and applies the texture to all surfaces evenly - maintaining the 3D pattern

Solid texture mapping (2)



Today

- Continue to experiment with texture maps
- Animating a camera and light around a scene
 - This is practice for the final assessment!
- Subdivision modelling techniques