3D Solid Texture Mapping

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Concept
• This texturing technique creates a three-dimensional volume of color
  • Irregularities of the texture are the result of noise/randomness in the color
  • Your model is “floated” inside that volume
    • The model picks up whatever texture is in that portion of the volume
    • It looks like your model is made of the material
  • Technique is variously known as “3d”, or “solid”, or “volumetric” texturing

Model a Thick Bowl
• Draw a curve and revolve it to make a bowl
  • Give the edge of your bowl a substantial thickness,
    • so we will be able to see the texture pass through it

Assign a 3d Texture
• >Window >Rendering Editors >Hypershade
  • >Create >Material (e.g., Blinn, or Phong)
  • Double click on the material’s icon to open its Attribute Editor
    • Next to Color of the material, click the checkered texture icon
      • >3D Textures
        • NOTE: Maya’s default is 2D Textures
          • Select 3D Textures instead
• In the 3D Textures menu that opens up
  • select the Marble procedure
    • This will automatically generate a marble-like volume of color

• Assign the material your model:
  • In the Hypergraph or Outliner,
    • middle-mouse drag the material’s icon on top your model in a modeling window

View the Rendered Texture
• First, view the hardware rendering:
  • In the Persp window
    • >Shading >Smooth Shade All
    • >Shading >Hardware Texturing
      • You should see your bowl with a marble texture on it
        • It probably looks very crude
  • To improve the quality of the hardware texturing…
    • Select your model
    • Go to the material node in the Attribute Editor
      • (for example, the blinn1 node)
      • >Hardware Texturing
        • >Texture Resolution = Highest (256x256)

• Now, render with the software renderer:
  • Select the Persp window
  • >Render >Render Current Frame

    • Notice how the texture appears to go through the model

Adjust Texture Parameters
• Double click on the marble texture icon to open its Attribute Editor
  • >Marble Attributes,
    • Change the Filler and Vein colors
    • Change the Vein Width
  • >Noise Attributes
    • “Noise” = the randomness of the pattern
• Try changing \textit{Amplitude}, or \textit{Ratio}, or \textit{Ripples}
  • All of these affect the appearance of the noise pattern

\textbf{3D Texture Node Placement}
• The texture volume is represented by a small cube icon in the modeling window
  • It may be very small
  • If your model is large, you may have to zoom way in to see it
  • This icon represents the \textit{placement} node of the texture

• Select the 3d texture placement node,
  • either by selecting the small cube icon in a modeling window,
  • or by selecting \texttt{place3dTexture} node in the Hypershade window

• Scale the placement node cube icon
  • Scaling makes the texture patterns larger
  • Also, in the Attribute Editor of \texttt{place3dTexture} node,
    • \texttt{>3D Texture Placement Attributes}
      • \texttt{>Fit to group bbox}
        • This makes your place node cube icon the same size as the bounding box of your model
      • You can then fine-tune the \textit{size} and placement of the icon
  • Try rotating or translating the placement node cube icon

\textbf{Sliding 3d Textures!}
• A 3d texture volume is an independent three-dimensional entity
  • \texttt{>Window >Outliner}
    • Notice that the surface and the placement nodes
      • are completely separate entities
  • This means…
    • \textbf{WARNING:}
      • By default, the texture volume is \textit{not} fixed to your model
        • If you transform your model
          • the texture volume does NOT transform with it
        • That is, as your model moves, rotates, or deforms,
          • it will slide \texttt{through} the volume of texture
            • and your texture will appear to slide over the surface
• Test for the problem
  • Software render your model with its 3D texture
  • Rotate your model a little, and re-render
    • The texture stays where it was,
      • while the model slides through it
    • The visual result is…
      • that the marble patterns appear to change

• WARNING & BUG:
  • The hardware renderer does NOT render correctly here
    • It shows the texture sticking to the model
      • the way you want it to
    • It does not show the true, nasty sliding effect

• Another test:
  • Select a surface point of your model
  • Translate it to deform the model
  • Re-render with the software renderer
    • The texture stays as it was,
      • while the model deforms through it

  • Note that the hardware renderer again renders inaccurately

Fixing the 3d Texture to the Model
• Solution is to create a “texture reference object”
  • This is an automatic duplicate of your model
    • It allows Maya to calculate deformations of the 3D texture,
      • so the texture remains fixed to your model,
        • no matter how you move or deform your model

• Select your model
• >Rendering
• >Texturing >Create Texture Reference object
  • Notice in the Outliner window
    • That there is now a name_reference node
• Try rotating your model and re-rendering
• The 3d texture should stay stuck to your model
  • and rotate with your rotating model

• **TIP:** Before the invention of texture reference objects
  • You got the same effect
    • by putting both your surface and your texture nodes
      • into a group
  • *This no longer works!*
  • Use the texture reference approach instead

**Multiple Textures**
• As with any texture mapping,
  • you can apply several types of textures to a single model

• Try adding a 3D solid bump map to your existing material
• In the Attribute Editor for your shader,
  • hit the checkered texture icon next to Bump Mapping
    • >3D Textures
      • Try using >Stucco
        • The *shaker* parameter controls how deep the pits are

• You now have a Marble 3d texture for color mapping
• And a Stucco 3d texture for bump mapping

• You can also combine 3D and 2D textures in one material