Texturing: process that takes a surface and modifies its appearance at each location using some data

Texturing Pipeline: projector function > corresponder function > obtain values > value transform function.

Applied at model space so that when the object moves, the texture moves with it.

1. Projector function: obtain the surface’s location and projecting it into texture coordinate space.
2. Corresponder function: convert the texture coordinates to texture space. Produce texture space coordinate.
3. Texture values: coordinates are used to obtain texture values.
4. Transform values by value transform function. These new values are used to modify some property of surface such as material or shading normal.

Texel: Smallest unit of information that makes up a texture.

Nyquist rate: sampling rate equal to exactly twice the highest frequency.

Aliasing: Happens when Nyquist rate is not satisfied. Patterns that are not in original image can appear.

Bump Mapping:

Shading: process of rendering light and color on the surfaces of 3D models to create appearance of varying depths and contours. Crucial for adding realism to images.

Four types of shading models

1. Gooch: non-realistic rendering used to compare surface normal to light location as warm color to cool color. designed to increase legibility of details in technical illustrations.
2. Flat: single color for all vertices
3. Smooth (Gouraud): interpolates color across the surface of polygon based on vertex colors, resulting more realistic image.
4. Phone: Not only color but also surface normal across polygons. Most realistic.

Four types of light

1. Directional: Emit parallel light rays across all areas. Shadow at opposite side of light direction.
2. Point: Emit light uniformly in all directions. Illumination varies by distance.
3. Spot: Emit light as a cone. Illumination varies by distance and direction.
4. Ambient: Light reflected so much that it is no longer from any distance. Equal intensity in all areas.

Light material Interaction

1. Specular: Makes same angle with the surface as incoming ray. Viewer can see reflection only if viewer is exactly in right area.
   1. Specular Highlight: reflection of light that is dependent of viewer’s place and position of light source.
2. Diffuse: Reflection made on surface called Lambertian reflection
   1. Lambertian reflection: Surface appears bright from all viewing directions.
3. Ambient: Approximately models average reflection of undirected light from all light sources.

BRDF: Fundamental concept that describes how light reflect off a surface. Used to model the way light interacts with materials.

Types of BRDF

1. Specular: Reflect light in single direction. Like mirror.
2. Diffuse: Scatters light in all direction. Often modeled by Lambertian reflectance model.
3. Glossy: Hybrid of specular and diffuse. Concentrated reflection with spread.

Models

1. Lambertian: used to describe perfectly diffuse reflection of light from a surface. Used due to simplicity and effectiveness in light on matte surface.
2. Phong: Most realistic graphic.

Magfilter: used to determine how texture will be rendered if texel covers more than one pixel. Minfilter is used for the opposite.