

Johns Hopkins
Engineering for Professionals
605.767 Applied Computer Graphics

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Module 9G

Light Maps



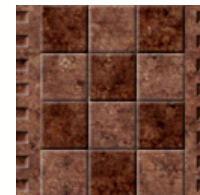
Lightmaps



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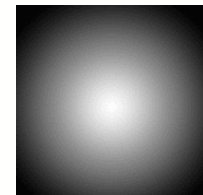
Lightmaps

- Diffuse lighting is constant in static scene
 - View independent
- Allows lighting to be precalculated and stored as a texture map
 - Arvo and Heckbert first implemented
 - Very complex lighting computations can be performed during modeling stage
 - Ray-tracing and radiosity
 - Carmack applied to real-time rendering - Quake
 - Modulated a texture indicating lighting intensity with the underlying surface
 - More accurately termed “dark mapping”
 - Original surface actually decreases in brightness
 - DirectX supports boosting intensity to help maintain brightness
- Lightmaps are commonly used in computer games
 - Often called **diffuse light maps**



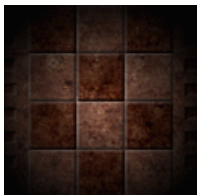
Texture

+



Lightmap

=



Final texture

Lightmaps with Multitexturing

- Method 1): combine lightmaps with surface textures during modeling phase
 - Use texture map in single pass rendering
 - Good approach if lighting does not change
 - Allows any type of advanced lighting
- Method 2): use multitexturing to combine during rendering
 - Source texture modulated by the intensities of the lightmap
 - Resulting texture is then applied to objects in the scene
- Advantages with using multitexturing
 - Lighting often varies slowly across the surface (except at shadow edges)
 - In these cases can use a lower resolution texture for lightmap
 - Combine a source texture with a low resolution texture map approximating light intensities
 - Use high-pass filter to eliminate banding issues
 - Easy to modify or swap small light textures on the fly
 - Recalculate light maps to show changing light environment
 - Using texture animation can approximate effects like a moving spotlight



Storing Light Maps

- Watt discusses issues with sampling and storing light maps
 - Modeling issue
- Inverse of texture map coordinate assignment
 - Mapping from three dimensional space back into 2D light map
- Storage economy issue
 - Wish to store a single light map and allow many polygons to share
- Watt Figure 8.13 illustrates forming a light map
 - World coordinate plane is divided into square “lumels”
 - Project lumel back onto polygon
- Watt Page 242 describes method for computing light maps for scenes made up of triangles with vertex/texture coordinate association

