Advanced Texture Mapping:
Environment Mapping
Bump Mapping

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Environment Mapping (or Reflection Mapping)


- The Abyss

- Terminator II
Environment Mapping

• Approximation
  – if the object is small compared to the distance to the environment, the illumination on the surface only depends on the direction of the reflected ray, *not* on the point position on the object

• Algorithm
  – pre-compute the incoming illumination and store it in a texture map
Environment Mapping

Eye

V

N

R=?

E-Map

Object
Environment Mapping

\[ R = V - 2(N \cdot V)N \]
Environment Mapping

Eye

Object

E-Map

R = 2(N\cdot V)N - V
Environment Maps Forms

- Spherical Mapping
- Cubical Mapping (or Cube Map)
- Paraboloidoidal Mapping
Spherical Mapping
Spherical Mapping

Matt Loper, MERL
Spherical Mapping

Matt Loper, MERL
Spherical Mapping: Renderings
Cubical Mapping
Cubical Mapping: Renderings
Bump Mapping


• Simulates small surface variations
• Key idea: tweak normals used for lighting (geometry stays the same)
• Benefit: much more efficient, geometry-wise, than creating an approximation using very small triangles
Bump Mapping

- Each texel stores two offsets (in u and in v)
Bump Mapping Demo

• http://neilwallis.com/projects/java/bump/bump2.php