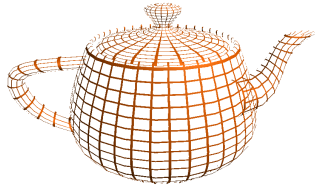




# Texturas - Cube Mapping

Computação Gráfica

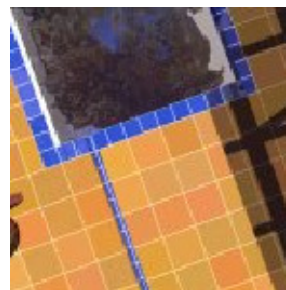


# OpenGL - Environment Map

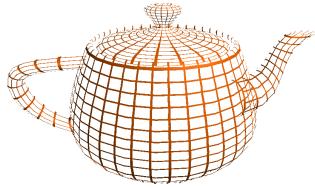
## Cube Mapping



[www.nvidia.com](http://www.nvidia.com)

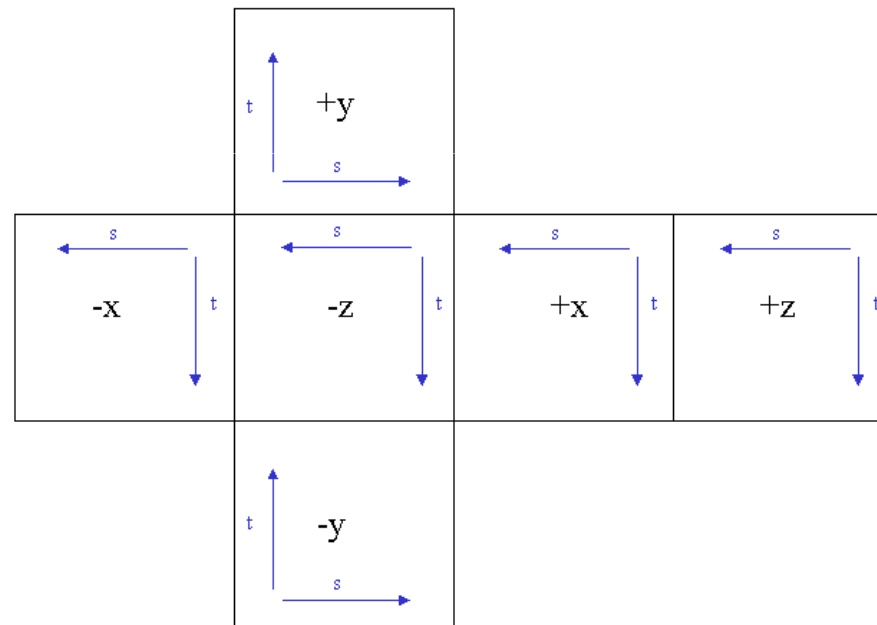


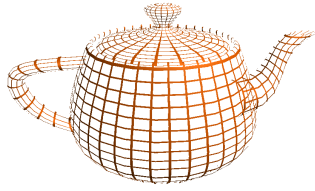
- Cubo centrado na origem.
- Cada texel representa o que seria visto a partir da origem nessa direcção



# OpenGL - Environment Map

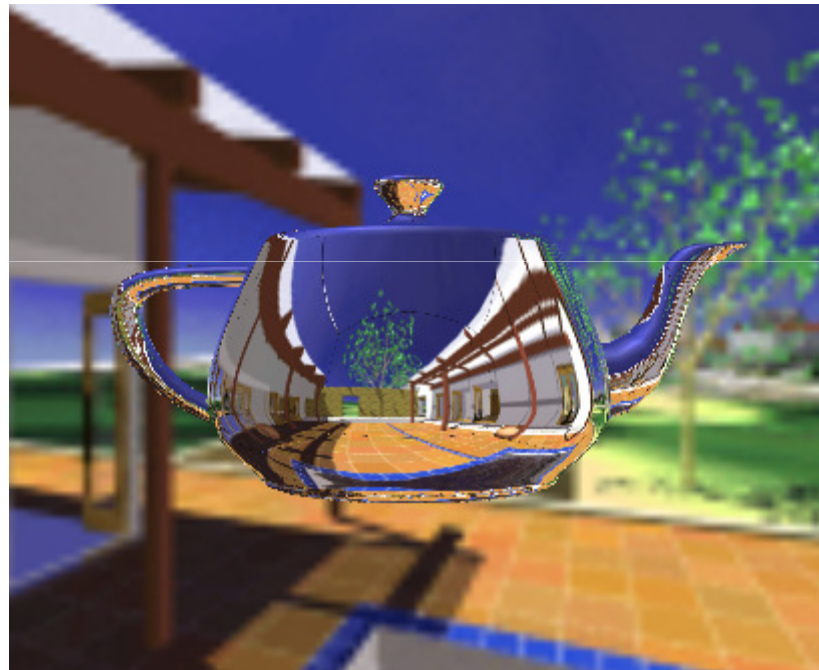
- Orientação das Imagens

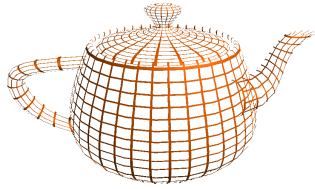




# OpenGL - Environment Map

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# OpenGL - Environment Map

- Código OpenGL para criar Cube Map

```
glGenTextures(1, texName);  
glBindTexture(GL_TEXTURE_CUBE_MAP, texName[0]);
```

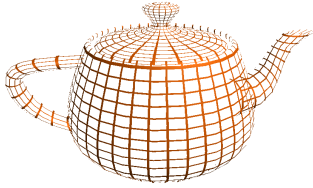
```
for (i=0; i<6;i++) {
```

```
    glTexParameteri(GL_TEXTURE_CUBE_MAP, GL_TEXTURE_MIN_FILTER, GL_LINEAR);  
    glTexParameteri(GL_TEXTURE_CUBE_MAP, GL_TEXTURE_MAG_FILTER, GL_LINEAR);
```

```
    glTexImage2D(faceTarget[i], 0, GL_RGB, imageWidth, imageHeight,  
                0, GL_RGB, GL_UNSIGNED_BYTE, imageData);
```

```
}
```

```
static GLenum faceTarget[6] = {  
    GL_TEXTURE_CUBE_MAP_POSITIVE_X,  
    GL_TEXTURE_CUBE_MAP_NEGATIVE_X,  
    GL_TEXTURE_CUBE_MAP_POSITIVE_Y,  
    GL_TEXTURE_CUBE_MAP_NEGATIVE_Y,  
    GL_TEXTURE_CUBE_MAP_POSITIVE_Z,  
    GL_TEXTURE_CUBE_MAP_NEGATIVE_Z  
};
```

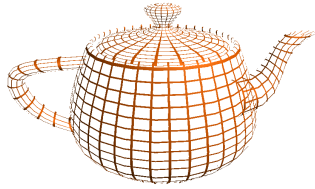


# OpenGL - Environment Map

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- Código OpenGL para preparar estado para Cube Map

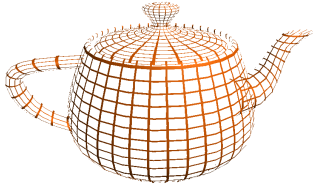
```
glEnable(GL_TEXTURE_CUBE_MAP);  
glEnable(GL_TEXTURE_GEN_S);  
glEnable(GL_TEXTURE_GEN_T);  
glEnable(GL_TEXTURE_GEN_R);  
glTexGeni(GL_S, GL_TEXTURE_GEN_MODE, GL_REFLECTION_MAP);  
glTexGeni(GL_T, GL_TEXTURE_GEN_MODE, GL_REFLECTION_MAP);  
glTexGeni(GL_R, GL_TEXTURE_GEN_MODE, GL_REFLECTION_MAP);
```



# OpenGL - Environment Map

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- Vantagens:
  - Rápido em Hardware
  - Fácil de Gerar em Runtime

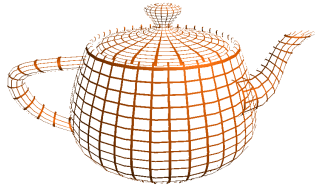


# OpenGL - Environment Map

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- Geração para cenas artificiais:
  - Definir uma camera com ângulo de visão de  $90^\circ$  centrada na origem do objecto
  - Apontar a camera no eixo do  $X+$  e capturar o frame buffer para uma textura do cubo
  - Repetir para as restantes 5 direcções.

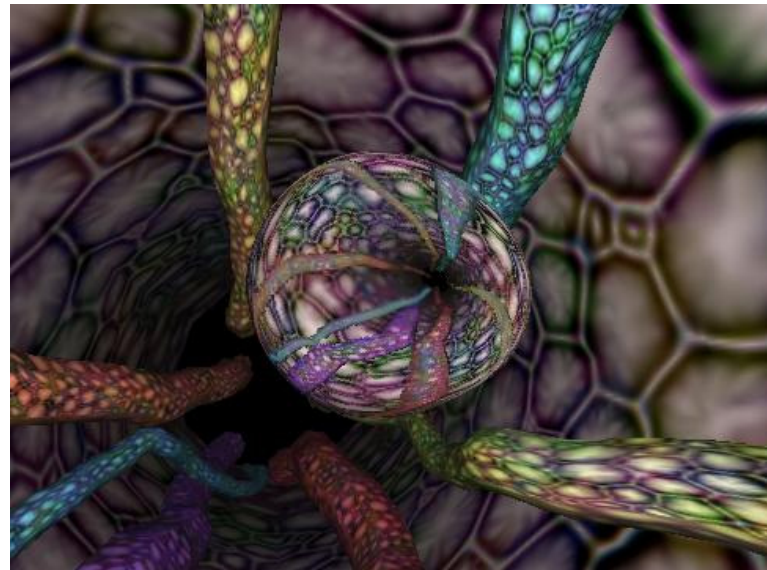




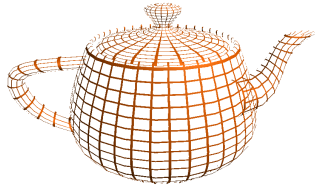
# OpenGL - Environment Map

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- Geração em tempo real



[www.nvidia.com](http://www.nvidia.com)



# OpenGL - Environment Map

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- Ray Tracing Simulado

